

United Nations Environment Programme



Examples of good practices in integrated environmental assessments in Latin America and the Caribbean

. Methodological guidance document

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The current document has been translated from Spanish. Figures and maps are yet to be inserted from the original Spanish version.

I. Background:

The South-South Network of GEO Collaborating Centres for integrated environmental assessment (IEA) and reporting aims to support policy formulating and informed decision-making processes at national, regional and global levels through innovative use of information and communication technology for networking and knowledge access and management.

The overall project objective is to improve environmental decision and policy-making at regional and sub-regional levels; while its specific objectives are:

- a) To make relevant IEA information, data, tools, methodologies and approaches available and accessible;
- b) Establish a mechanism to facilitate and promote exchange of ideas and expertise through peer interaction and networking;
- c) Enhanced use of ICTs for information and knowledge management and networking; and
- d) Enhanced capacities of GEO CCs and environmental practitioners to undertake IEAs.

To accomplish the above mentioned objectives, the project contemplates the following activities:

- a) Establish a mechanism to facilitate professional interaction amongst GEO CCs and those involved in IEA at inter- and intra-regional level in Africa, Asia and the Pacific, Latin America and the Caribbean;
- b) Improve access to IEA reporting tools and methodologies;
- c) Enhance capacity of GEO CCs in developing countries to undertake IEA and reporting at regional and sub-regional level;
- d) Improve ICT-based networking, knowledge management and information management.

A regional research on *Best Practices in IEA and reporting* was seen as one essential component to improve access to IEA reporting tools and methodologies. The results of implementing this project component in Latin America and the Caribbean are presented hereafter, and constitute a first attempt towards a methodological guide.

II. INTRODUCTION

In recent years many integrated environmental assessments (IEAs) have been developed at global, regional, national, or local level. These assessments have been conducted with well-delineated purposes, and with various methodological tools defined that correspond to each assessment's objectives (1,2). In general they are all characterized as involving many stakeholders from different sectors and regions who have different perceptions and play very specific roles in society. This growing interest in IEAs is a reflection of the need for the various social stakeholders to have sound scientific knowledge that is validated, properly formulated, summarized and integrated to allow the inherent challenges of sustainable development to be met at different levels of decision making.

This report was prepared at the request of the Regional Office for Latin America and the Caribbean of the United Nations Environment Programme (UNEP-ROLAC). It aims to demonstrate the use of elements of good practice by analyzing concrete examples of integrated environmental assessments. This will help everyone involved in these processes, and especially those who are responsible for putting them into practice, to:

- understand and act in accordance with each person's role;
- achieve effective and committed participation in the process and its results;
- considering the assessment's objectives, develop or implement specific models, approaches, tools, instruments, methodologies, indicators and representations.
- assess various alternatives and recommend how to put into practice coherent and interconnected public policies based on accumulated knowledge and advances in science and technology.
- rigorously and clearly visualize the results of the assessment to encourage changes in how people act, both individually and collectively, in all spheres of society, and influence public and private sectors so that policy and management tools are more coherent and effective and result in values being formed and a greater commitment by present and future generations.

An assessment is a social process to make an appraisal and an objective and critical analysis of data and information so as to meet the needs of users and support decision making. It applies the criteria of experts to available knowledge in order to propose credible answers to questions of public policy and, where possible, quantifying the confidence level (3). It is, therefore, a key mechanism to strengthen the relationship between science and politics, where science can establish the importance of a problem, provide elements for its successful solution, identify new research directions, and demonstrate the benefits of different policy options, risks and costs (4).

The assessments analysed in this report are Integrated Assessments most of which are classified as Integrated Environmental Assessments (IEAs) (Figure 1). These are characterized by being an institutional analysis and participatory process to interrelate the state and trends of the environment with the impacts on ecosystems and on human well-being, and with managing current and plausible environmental policies. They have been designed, planned and conducted in line with their concrete objectives, their geographic extent, timing and themes and, therefore, they are distinguished by applying a specific methodological framework that greatly helps to guide the assessments, find the necessary information, and connect knowledge and stakeholders, as well as to answer questions expressed in their terms of reference.

Most of them describe gaps in information and knowledge, suggest possible ways stakeholders might take action, and how sectors might be integrated and interconnected when the time comes to develop and implement policies and build new and improved capacities. It is recognized that integrated environmental assessments are ongoing processes that include re-analysing and re-assessing past actions and possible future action, taking account of potentialities and limitations.

As many key stakeholders are involved in the IEA participatory process, a potential capacity is created to make changes, manage knowledge and develop shared values, all of which leads to the stakeholders involved being able to take coherent action so that the analysis is gradually improved, making clear the seriousness of the environmental problems identified and giving much more explicit guidance about how policies are linked to the environment and sustainable development.

INSERT FIGURE 1

Environment and sustainable development relation
Scientific and relevant responses sought
Integrated and participatory process
Direct and indirect causes
 Integrated Environmental Assessments
Environment change due to: natural processes, human actions, policies
Different socioeconomic sceneries assesses
Multi- inter- and transdisciplinary process
Including spatial and temporal characteristics of change
Quantitative and qualitative analysis of change

Figure 1. Schematic representation of the concept of Integrated Environmental Assessment

Many different information sources (2.....) have been taken to provide a methodological basis to analyse good practices in integrated environmental assessments. They stress, first of all, that the process must be carefully designed and planned, for only thus will it be relevant, legitimate and credible so that its results will be considered when making decisions at different levels and in different areas.

It is because of this that, in analysing the cases developed in this document, emphasis is placed on how, when and by whom the assessment's objectives were approved; what is the target public for the results; whether the geographic context was defined as to timing and themes; whether the conceptual framework and key questions to be answered are in line with the assessment's objective. Particular interest has also been shown about who have been involved in the process as stakeholders, with what modality and when; what were their responsibilities; how and by what means was the quality of the intermediate and final products followed up; and what use has been made of the available data, information and knowledge; how up to date they are and to what extent it has been possible to integrate,

summarize and make a clear and understandable representation of the information and of the assessments made.

Consideration has been given as to how the interests and motivations of the different stakeholders in the process and final products have been expressed and how, throughout the process, whatever has been done and expressed has always been protected. An analysis is made of by whom and how the process was conducted, what is essential in order to comply with the terms of reference approved, with the timetable, periods, and how the work is organized and executed with workshops, consultations, by drafting, revising, preparing and presenting the report and other products. Cases where this has been achieved show how important and pertinent it is to have developed a dissemination and communication policy with the target publics in mind, not only once the process has ended, but throughout the entire assessment period.

INSERT FIGURE 2

Stakeholders involved
Creating capacities and networks
Science and policy interface
Elements of IEA Good Practices
Assessment
Effective communication
Data and information accessibility

Figure 2. Good practices elements in an Integrated Environmental Assessment

From the methodological point of view, to better understand and implement integrated environmental assessments based on best practices, Jill Jäger provides a guidance framework that points to six key aspects (Figure 2), indicating the content, scope and the need for each one to be taken into account (2). Notwithstanding this, because they are usually closely interrelated, it is not possible to establish a precise limit for each one. And by way of example it is pointed out how "the design of the science-policy interface" also affects decisions about stakeholders' participation, availability of data and communication strategy.

The following table shows the most important aspects analysed in integrated environmental assessments and considered to be essential good practices components.

Stakeholders involvement	Define the stakeholders who participate in the assessment from the planning stage and how they do so, documenting this participation in the final report. Achieve a balanced participation of experts that responds to the assessment's objective and scope.
Effective communication	Provide regular reports that show the results being achieved and make them available to different clearly identified stakeholders for revision and comments, in addition to a strong external peer review; develop and implement a clear and precise communications strategy, with products that are differentiated, thorough and understandable; use maps, spatial data, diagrams, graphs and indicators to present information and thereby attract the attention of key, but less specialized, stakeholders. Make sure the report and related products, are prepared on a scientific basis but can be utilized and understood by different users, which means carefully choosing the authors and editors. Develop products also meant for people who are often not taken into account, such as indigenous communities, youth and children.
Date and information accessibility	Establish a process to review data, information and methods used by experts from different disciplines, professions, with different roles in society; ensure that information and relevant and technically competent publications are used; include, if necessary, the results of still unpublished research but that has undergone a peer review and been accepted by the principal authors; explain whether the information handled for a specific theme has a limited temporal or spatial scope; establish clear procedures to collect, check the quality and point out any limitations, if any. This will also guide governments as to action to be taken to improve the quality of their data and information. Ensure future availability of all data, metadata and information used and generated.
Assessment	Ensure that an explicit review is made of previous assessments in some way related to the purposes and themes of the assessment about to be undertaken. If an integrated environmental assessment has already been made for this geographic area, the new assessment must include advances achieved relating to scientific knowledge and methodology; an assessment must be made of the effectiveness of the previously proposed response measures and how they influenced decision-makers; and a determination must be made as to how the products and the process can, and should, be improved. Therefore, involved in this review process should be those who use the assessment and those who produced it, to ensure that the next assessment responds to the changing needs of all the stakeholders.
Building capacities and networks	Establish networks of specialists and institutions that help to expand contacts and exchange information between experts involved in the assessment and with others. Build capacities so that governments and regional bodies may increase their surveillance and continuous assessment in order to set priorities, to connect stakeholders with relevant knowledge or with the ability to develop it so that it, as well as technologies, may be transferred to stimulate collaboration and coordinated cooperation. Provide materials, use instruction and training mechanisms to develop future assessments.

After reviewing more than 30 integrated environmental assessments developed in the Region or worldwide but with a great effect in LAC, nine were selected because of different criteria: their proposed objectives; the conceptual model developed and the methodological approach applied; time period; the characteristics and extent of the terms of reference; the possible interconnection of some of the assessments presented here to reflect the traceability of the results and, most important when making the selection, that they complement one another so

that elements of best practices may always be found in some of them that are not present in others.

The cases selected are as follows, and they will be analysed in chapter II of this document:

GEO Latin America and the Caribbean: Environment Outlook 2003
GEO MERCOSUR: Integration, Trade and Environment. 2008
GEO Amazonia: Environment Outlook in Amazonia. 2007
GEO Uruguay: Report on the State of the Environment. 2008
GEO Brazil. Water Resources. Part of the series of reports on the State of the Environment and the Outlook in Brazil 2007
Climate Change in the Caribbean and the Challenge of Adaptation 2008
International Assessment of the Role of Agricultural Knowledge, Science and Technology for Development (IAASTD). 2009
Environmental Profile of Guatemala 2006: Environmental Management Trends and Reflections.
Integrated Geographic Study of Island Groups and Coastal Zones of the Cuban Archipelago for Tourism 1992.

III. EXAMPLES OF GOOD PRACTICES IN IEA

II.1: GEO Latin America and the Caribbean: Environment Outlook 2003

II.1.1 Brief outline and main results

The first GEO report for the Latin America and Caribbean Region was published in 2000 with the title Environment Outlook, and was one of the responses to the Agenda 21 goals and the decision of the UNEP Administrative Council of May 1995 to prepare environmental reports that enable an integrated analysis to be made about the state of the environment, by interconnecting global, regional sub-regional, national and local assessments using the same conceptual framework.

From that date until 2003, when the second GEO report for LAC was published, several GEO reports had been produced, and in the Latin America and Caribbean Region many countries and cities already have their own environmental assessments. During that period the international, regional, sub-regional and national context had also changed, as was recognized at the 2002 Johannesburg Summit. Under this new landscape, the Forum of Ministers of the Environment of Latin America and the Caribbean approved carrying out a continuous

assessment of the state of the environment in the Region using the GEO methodology and with the active participation of policy-makers, academia, the productive and services sectors, and civil society. This type of approach would make it possible to offer concrete action alternatives that could be adopted to address major sustainable development challenges at various levels of decision making and with time and space limits.

This IEA process was conducted by UNEP-ROLAC and the Development Observatory of the University of Costa Rica; the result was real space was made available to analyse, advise and assess current and future environmental problems, with the participation of various institutions and organizations in the Region, environmental policy-makers, more than a hundred experts in various disciplines and specialized in environmental issues, representatives of non-governmental organizations, governments and other regional agencies, from more than 25 countries in the region.

As a result of this integrated environmental assessment, technical and information capacities were strengthened in Latin America and the Caribbean and allowed:

- up-to-date information to be obtained and validated about the state of the environment with data, and to monitor so as to achieve better environmental management;
- capacities to be strengthened on the use of and assess to information and, no less important, to identify research gaps and needs as a basis for successive and indispensable integrated environmental assessments;
- the inclusion of new criteria and mechanisms to design environmental policies and strategies that are more integrated and to assess their implementation efficiency;
- recommendations to be prepared and scientifically discussed concerning responsible and coordinated action by all concerned when useful and timely instruments are needed to confront important challenges such as, for example, “to improve the quality of life and conserve natural resources”;
- new sub-regional and national initiatives to be formulated and developed and, in fact, agreements to be followed up that were reached at the Johannesburg World Summit on Sustainable Development and, in particular, the objectives of the Latin America and Caribbean Initiative for Sustainable Development (ILAC);
- a consensus reached about critical environmental issues and priorities established among a wide range of environmental problems. In this respect it may be seen that the priorities for LAC pointed out in GEO 4 (2007) are in accord with those reported in GEO LAC 2003 in spite of the four year period between both publications (Figure 3).

INSERT FIGURE 3

GEO LAC 2003

° Accelerated and uncontrolled urban expansion, synergic repercussions of this and other pressures on water resources, land, forests and biodiversity: degradation of coastal and marine areas and risks and vulnerability of ecosystems and human populations to extreme natural phenomena.

GEO 4 2007

- ° Unplanned urbanization.
 - ° Threats to biodiversity and terrestrial ecosystems.
 - ° Coastal degradation and marine pollution
 - ° Vulnerability to climate change
-

Figure 3. Coherence between GEO ALC 2003 and GEO 4, according to Latin America and Caribbean priority themes.

In general GEO LAC 2003 was a relevant process, and its final report was scientifically rigorous, methodological and technical and the result of collective work and complied with the essential criteria of good practices, which allowed:

- ▶ different stakeholders to be mobilized, their views and opinions to be collected and for them to be involved according to their assigned roles;
- ▶ information available in the Region to be integrated and expressed concisely and in a way that is technically correct, so that it is understandable to decision-makers and could be used when taking concrete action, whether nationally, sub-regionally or throughout the whole LAC Region;
- ▶ a critical mass of stakeholders to be created prepared to defend criteria in different scientific, managerial and political forums and platforms.

II.1.2 Good Practices

For this case highlighted will be some relevant aspects of good practices in the process and in the results of GEO LAC 20093, and particularly those concerning:

- A.** Correct selection of the coordination team and how the process is conducted.
 - B.** Appropriate selection of stakeholders and how they participate so that they are actively involved and have effective communication.
 - C.** Proper definition and application of a conceptual framework and methodological approach throughout the process so that an interface is achieved between Science and Policy.
 - D.** Orderly identification and strengthening of existing capacities, with a concerted creation of new capacities to deal with core problems.
- A. Correct selection of the coordination team and how the process is conducted.**
This team should: thoroughly understand the objective of the IEA; have excellent mastery of the issues to be dealt with and the methodology to be used; be able to convene, cooperate and guide the process itself; ensure traceability of the analyses and the consistency of the proposed actions.

These objectives were achieved because acting as coordinators of the IEA were UNEP-ROLAC and the Development Observatory of the University of Costa Rica, one of the regional GEO Collaborating Centres for the GEO that had a clear understanding of the mandate issued by the Forum of Ministers of the Environment of Latin America and the Caribbean and the objectives of this IEA; they had a technical mastery of the issues to be assessed and of the methodology (DPSIR) to be used; their work was coordinated and they cooperated with others including: governments, academics, civil society and the other six Collaborating Centres in the Region: Brazilian Institute of the Environment and Renewable Natural Resources (Brazil), Latin American Social Ecology Centre (Uruguay), Institute of Public Affairs, University of Chile (Chile), Island Resource Foundation (U.S. Virgin Islands), Centre of Environment and Development, University of West Indies (Jamaica) and the Centre for Global Economic Research (Cuba).

- B. Appropriate selection of stakeholders and how they participate so that they are actively involved and have effective communication.** It is important to consider that this can be achieved by dissimilar routes and methods, at different moments in time and with the most diverse stakeholders playing specific roles.

In this case, various consultation, drafting and review activities were organized during the 2001-2003 period in an interdisciplinary, multidisciplinary and transsectorial framework. Notable among them were:

- Organizing the two regional consultation workshops (Figure): one in 2001 in Costa Rica and the other in 2002 in Cuba, both as mechanisms of exchange, agreements, building and strengthening relations of trust between different stakeholders.

INSERT FIGURE 4

First workshop 2001

There were 40 participants at the first workshop: 50% were representatives of environmental authorities from 24 countries, 30% experts from scientific institutions and universities and the rest were representatives of regional or international environmental organizations.

Second workshop 2002

The second workshop was attended by 24 experts, most of them representatives of the scientific sector who had been preparing the report, and from the collaborating centres.

Figure 4. Participation of stakeholders in the two GEO LAC 2003 consultation workshops.

- Agreements and specifications achieved and principal results of the workshops (Figure 5).

INSERT FIGURE 5

First workshop 2001

- The objectives and context of this assessment were described.
- A definition was given of how, who should take part in the process and how they should participate.
- Commitments were established, key and an analysis was made of key and emerging themes, and the principal messages to be delivered.

Second workshop 2002

- Presented for analysis were the data and information used, the methods employed and the literature reviewed.
- The texts on Latin America and the Caribbean prepared for the *GEO-3 Global Environment Outlook* report published in 2003 resulted from the discussions.
- They were presented for consultation and were revised and expanded, and other texts were added.

Figure 5. Principal results of the GEO LAC 2003 consultation workshops, as an example of good practices

The first workshop was crucial because, for example, it defined the context of this IEA (Figure 6), for which issues were taken into account such as: environmental challenges and opportunities; unique and common aspects, natural, cultural and social values; accumulated, emerging and the most significant environmental problems; representative socioeconomic trends.

INSERT FIGURE 6 - MAP

Space limits	The whole Region and its sub-regions Latin America and Caribbean countries
Time scale and historic context	Analyse historic process of environmental theme from 1972 to 2002 (Stockholm to Johannesburg) reviewing important events and debates such as the Brundtland Report and the impact of population growth, economic growth and ecological trends
Thematic approach	Forests, Biodiversity, Coastal and marine areas, fresh water, urban areas, atmosphere, disasters and the Environment and Human health.

Figure 6. Space limits, time scale and key IEA themes: GEO LAC 2003

- Different institutions and experts were included in reviewing the draft texts, and 21 experts from eight countries (Barbados, Brazil, Chile, Costa Rica, Cuba, the USA, Mexico and Uruguay) were included as authors in the production team to draft the chapters of the final report.

C. Proper definition and application of a conceptual framework and methodological approach throughout the process so that an interface is achieved between Science and Policy.

The Driving forces-Pressure-State-Impact-Response (DPSIR) assessment framework was adopted and was discussed, assimilated and used by numerous experts and representatives of the public, private and civil society sectors and included throughout the process. Encouragement was given to assessing the different pressures and activities, the associated risks and vulnerabilities, and the response options. In this respect, by using the GEO methodology a response was given to the five basic questions that characterize it and allow an integrated approach to be made to assessing and preparing the environmental reports: What is happening to the environment and why? What are the consequences for the environment and humanity? What is being done and how effective are the measures? Where are we going? And, what measures could be taken to ensure a more sustainable future? These questions were analysed and answered with an integrated economic, policy, social and environmental systemic approach and were reflected in the five chapters of the final report: “From Stockholm to Johannesburg: The environment and development in Latin America and the Caribbean!; “The state of the environment in Latin America and the Caribbean 1972-2002”; “Policy responses to environmental problems; “Scenarios of regional development” and “Options for action”.

D. Orderly identification and strengthening of existing capacities, with a concerted creation of new capacities to deal with core problems.

In this sense numerous institutions and experts were identified with the capacity to contribute to the process, providing relevant data and information and, in turn, were able to commit to it, were able to recognize their own limitations and built new capacities and ways of operating in future in terms of scientific research and management.

Regional, sub-regional and national networks were established to develop and apply new knowledge, tools and technologies on economic, social and environmental management.

The environmental information base associated with the Latin America and Caribbean Sustainable Development initiative was updated, increasing confidence in assessing the level of preparation, organization and disposition in the Region on priority areas such as: climate change: disasters and conflicts; management of ecosystems; environmental governance; harmful substances and toxic residues; resources-production efficiency and sustainable consumption.

The GEO methodology became more dominant in the Region and this led to the generation of new IEAs with different scopes: sub-regional, national, city, thematic and ecosystems. In fact, today in the Region, and after GEO LAC 2003 was published, 42 cities in 17 countries have applied the GEO Cities methodology to prepare their environmental assessments.

II.2 GEO MERCOSUR: Integration, Trade and Environment 2008

II.2.1 Brief outline and main results

The GEO MERCOSUR report: Integration, Trade and Environment, published in 2008, was the result of a complex process of multiple analyses and considerations in which the government environmental agencies of the participating countries (Argentina, Brazil, Paraguay, and Uruguay as full members of the Southern Common Market, and Chile as an Associate Member), the MERCOSUR Sub-Working Group No. 6 on the Environment and UNEP played key roles. In this process acting as technical coordinator was the Latin American Social Ecology Centre (CLAES), which is the GEO Centre in the Region, which was able to correctly consider the different opinions, points of view and approaches in terms of producing an integrated environmental assessment specifically combining environmental, trade and regional integration issues in terms of sustainable development.

Crucial for completing this process was the fact that MERCOSUR, since its inception, has included the environmental theme in its priorities for which the MERCOSUR Sub-Working Group No. 6 on the Environment has designed various regional and coordination instruments and maintains an intense negotiating agenda. In this respect it is noteworthy that the background of implementing the GEO methodology in various IEA processes at national and city level in the participating countries provided relevance and novelty to be used also in order to make this assessment. As a result of the analysis of the state of the environment, the pressures and impacts induced exchanges, discussions and assessments of the costs and benefits of the ecosystem services for human well-being, of the costs of failing to take act, of the effectiveness of the responses and existing management actions.

In GEO MERCOSUR, given the similarity of objectives between environment/trade/regional integration, account was taken of the impact on the sub-region's economy of trading in natural resources. For example, it is pointed out that in 2004 of total exports 60.5% came from primary goods obtained from nature that generated approximately US\$105,000 million. It was likewise important that throughout the whole assessment process consideration was given to the influences of the international trade fluctuations in the timing and intensity of exploiting natural resources, as well as their trends over recent years, which helped to provide the background for the analysis of the environmental impacts and the policy responses.

In this respect, it was important to identify the 55 ecoregions for which taken into account were the classifications made in each country, and especially those that appear in the cases of the reports on GEO Argentina, GEO Brazil, GEO Chile, and GEO Uruguay, as well as in those developed on a global or continental scale by international and other national and regional conservation institutions (Figure 7).

INSERT FIGURE 7

Ecological framework

55 Ecoregions

INSERT MAP

	Argenti	Bra	Ch	Paragu	Uruguay
Number of ecoregions the country	22	52	11	5	1
Number or restrict eco-regions in the country	7	41	4	0	0
Number of ecoregion shared with other countries	15	11	7	5	1

Figure 7. Ecoregions in the area covered by the GEO MERCOSUR assessment

As a result of the consultation process key emerging themes were established as well as the different pressures causing risks and threats to natural and human ecosystems (Figure 8). Therefore, analysed were the complex connections and the great challenges associated with the goals of economic growth, poverty reduction, environmental preservation and the sustainable use of natural resources.

INSERT FIGURE 8

<i>Indication of emerging themes in the national constation workshops</i>	Argentina	Brazil	Chile	Paraguay	Uruguay
On exploiting natural resources for exports	+	+	+	+	+
Advance of agricultural frontier, deforestation	+	+	+	+	
Fragmentation, loss of soil quality, water	+	+		+	+
Impacts of monocultures for exports	+	+		+	+
Ecological backpack			+		+
Appropriation and illegal trade	+	+		+	+
Hazardous residues, harmful substances	+	+			+
Physical interconnection	+	+	+	+	+
Energy interconnection	+	+	+	+	+
Export megaprojects	+	+	+	+	+

Figure 8. Key emerging themes highlighted in the GEO MERCOSUR process.

It is not certain whether all the participating institutions necessarily recognize each and every one of the contents, opinions figures, maps, indicators and designations that appear in the final report, if it is considered that it is all the result of a extensive and participatory process by institutions and individuals that reflects a diversity of postures and opinions and that in this respect expressed are key elements with which to analyse the policy and management responses linked to the environmental them in integration and international trade. The MERCOSUR Sub-Working Group No 6 on the Environment recognized that the GEO MERCOSUR report may be useful in supporting dissemination and with the technical and

political work to help those who are responsible for decision making on trade, integration and environment, and may also promote a greater commitment to the environment with more trade, more integration, more transparency, as well as helping Member States to implement a regional environmental policy that benefits the people.

II.2.2 Good Practices

In this case, given their results and characteristics, emphasis is placed on the following essential components of good practices:

- A. Proper planning process of the main actions and the technical coordinator's communication with the environmental authorities and other institutions in the region.
- B. Precise and consensual definition of the terms of reference.
- C. Orderly and effective communication at different stages of the process.
- D. Successful process of reviewing the data and information by experts from different disciplines, professions, and roles in society.

A. Proper planning process of the main actions and the technical coordinator's communication with the environmental authorities and other institutions in the region;

These aspects were clearly manifested in the IEA because, from the beginning, concrete agreements were established between UNEP and the environmental government agencies of Argentina, Brazil, Chile, Paraguay and Uruguay to support the GEO MERCOSUR process. Consultation and review processes were designed, especially a workshop for each country, one on scenarios and, finally, a technical review workshop (Figure 9).

INSERT FIGURE 9

High-level Consultation to Prepare GEO MERCOSUR

- March 2005

GEO MERCOSUR Consultation workshops in each country

- | | | |
|-------------|---------|----------------|
| • Uruguay | 06/2005 | |
| • Brazil | 09/2005 | |
| • Argentina | 12/1005 | Work documents |
| • Chile | 05/2006 | |
| • Paraguay | 07/2006 | |

GEO MERCOSUR Scenarios workshop

- October 2006

GEO MERCOSUR Technical Review workshop

- January 2007

Figure 9. Outline of how to plan workshops and include consultation documents

Those who would participate were also selected with an appropriate country-theme balance and were defined by their responsibilities. Many important work documents were produced, most by the academic sector when they were needed and made available to other sectors as well as at the workshops (Figure 10) and the final report explicitly recognizes the specific contributions made by certain experts in the Region from different institutions and organizations who are considered to be direct collaborators: Argentina 23; Brazil 37; Paraguay 14; Uruguay 37; and Chile 11. The right selection of principal authors and collaborators was assured for the chapters and as reviewers.

INSERT FIGURE 10

Date	Work documents
07/2005	Shared ecoregions in MERCOSUR
08/2005	Important biodiversity conservation areas in MERCOSUR
08/2005	Energy and environment in MERCOSUR
08/2005	Organic production in MERCOSUR – Brief summary and trends
10/2005	Energy and environment in MERCOSUR - ii. Preliminary assessment of possible futures
11/2005	Environmental goods and services. Introduction to the discussion
11/2005	Biodiversity conservation in MERCOSUR: International strategies and distribution patterns of the wealth of species
01/2006	Urbanization and environment in MERCOSUR
02/2006	Closed to MERCOSUR
04/2006	How the dialogue evolved about environmental goods and services at regional and local levels

Figure 10. Production by date of work documents consulted

B. Precise and consensual definition of the terms of reference.

This was the result of the first High-level Consultation Workshop to Prepare GEO MERCOSUR convened by the MERCOSUR Sub-Working Group No. 6 on the Environment and the UNEP Regional Office (Figure 9) as key authorities to begin the process. The following aspects were defined:

- designation of the assessment’s technical coordinator, a CLAES responsibility;
- selection of the methodological approach to be applied, in this case it was the GEO, based on identifying the Driving Forces, Pressures, State, Impact and Responses;
- geographic area to apply this assessment (Argentina, Brazil, Paraguay, Uruguay and Chile), as well as identifying ecoregions on border or shared zones;
- extent of the assessment which in particular would address the relationship between trade and the environment, and the integration process where account would be taken of the main commercial characteristics and the environmental history of the countries included;
- determination of the key emerging themes that could be included and that would be the final result from the consultations to be carried out;
- building plausible scenarios for MERCOSUR

C. Orderly and effective communication at different stages of the process;

In this IEA the terms of reference were made available for consultation by policy makers at different levels, sectorial users, researchers, civil society and opinions were sought by various means, so as to achieve a critical, objective analysis of the available data and information needed to meet them.

Periodic reports were provided on the results being achieved, the intermediate products were made available to different well-identified stakeholders in order to seek their reviews and comments that were available online. For example, the work documents shown in Figure 10, studies and reviews, prepared by well-known specialists and scientists in different countries, were analysed and discussed at the planned GEO consultation workshops (Figure 9).

It was possible to prepare a well structured final report, logically presented and easy to read by different publics, in which were identified gaps in knowledge, uncertainties and issues not shared by all.

D. Successful process of reviewing the data and information by experts from different disciplines, professions, and roles in society.

In the IEA a rigorous analysis was made of the information and indicators generated both by the countries involved and by international agencies or other sources deemed to be reliable.

Specific indicators were selected and accepted by governments (generally those used regionally and internationally) to compare countries, although it is pointed out that this means working with data that often are not so recent. The way out of this difficulty was to give more emphasis to trends in the indicators than to absolute values reported.

Gaps in knowledge and information were identified, 190 bibliographic sources were used including scientific articles, reports from different institutions and environmental assessments made in the Region.

II.3. GEO Amazonia: Environment Outlook in Amazonia, 2007.

II.3.1 Brief outlook and main results.

This particular report gives a full and integrated assessment of the state of an ecosystem of global significance and is one shared by the Amazonian countries. To make the integrated environmental assessment the GEO conceptual framework was used, adapted for ecosystemic analysis. Worth mentioning is that GEO Amazonia was characterized by a participatory, multidisciplinary, multisectorial and multiproduct approach. In this integrated environmental assessment the objective was to analyse: the pressures and driving forces that explain the existing environmental situation; the impacts caused by environmental degradation on ecosystems and human welfare, and the main actions and responses by the various stakeholders to reverse the environmental degradation process. Finally, once the diagnosis is completed, it is a question of showing the future environmental outlook for Amazonia, based on analysing scenarios and emerging themes. Taking part in this IEA were representatives with different responsibilities from all the Amazonian countries (Brazil, Bolivia, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela).

GEO Amazonia provides national, sub-national and local policy-makers in the Amazonian countries with a firm foundation for efforts to ensure long-term sustainability of development initiatives. This IEA seeks to give a view of Amazonia as seen by Amazonian countries and with the participation of Amazonian stakeholders; it also seeks to explain, based on scientific evidence, that Amazonia is a heterogeneous region of great contrasts, both as to physico-geographic aspects and natural wealth, as well as socio-cultural, economic and political-institutional aspects. However, responses and actions are still limited in relation to the magnitude of the environmental problems that have to be addressed. A committed willingness and coordinated action will be required to make the transition to sustainable development and ensure the human well-being of the present and future generations in the region.

II.3.2 Good Practices

The GEO Amazonia assessment shows different examples of good practices that may be summarized as follows:

- A.** Combined use of the GEO conceptual framework and the ecosystemic approach as a strategy for integrated ecosystem management.
- B.** Proper design and organization of the IEA process.
- C.** Correct identification and characterization of the types of stakeholders, their relationship with the environment and the expected contributions.
- D.** Logical and coherent structure of the report's contents.
- E.** Appropriate database and information sources to describe the baseline and monitor the ecosystem.
- F.** Clarity in formulating and discussing the key messages and contents of the executive summary for decision-makers on the principal aspects, issues and problems of which they must be aware.

A. Combined use of the GEO conceptual framework and the ecosystemic approach

A distinctive feature of the GEO Amazonia assessment is the combined use of the GEO conceptual framework and the ecosystem approach as a strategy for integrated management and for restoring ecosystems, their conservation and sustainable use that takes into account social, economic, ecological and cultural aspects. This approach is particularly important in GEO Amazonia that has assumed the complex challenge of making an integrated assessment of a complex ecosystem of global significance with a huge variety of species of flora, abundant water resources, extensive forest areas with an important role as a carbon sink and oxygen producer but which, nevertheless, is undergoing a process of environmental degradation expressed in increasing deforestation, biodiversity loss, water pollution, the loss of indigenous peoples and cultural values, and degradation of environmental quality in urban areas.

B. Proper design and organization of the IEA process;

The proper design and organization of IEA process is a demonstration of good practices to achieve rationality of the process at its different stages. In this respect GEO Amazonia, as befits its scope and complexity, was conducted under an organizational technical conception that grouped those who took part according to their functions with respect to

general and technical coordination, supplying data, processing information, dissemination, including workshops to deal with methodological aspects, discussing and reviewing results. By way of example the organizational structure adopted is shown, as well as the different participants in this IEA.

- *The United Nations Development Programme (UNEP)* team composed of the Regional Director of the Regional Office for Latin America and the Caribbean, the GEO Amazonia Project Coordinator (Programme Officer of the Division of Early Warning and Assessment), the UNEP Coordinator in Brazil
- *The Amazon Cooperation Treaty Organization (ACTO) Team* composed of the Secretary General a.i. and the Environment Coordinator.
- *The University of the Pacific (CIUP) Research Centre Team* with technical responsibility for the assessment.
- *The General Coordination Team*, including representatives of the United Nations Environment Programme (UNEP), Amazon Cooperation Treaty Organization (ACTO) and the Research Centre of the University of the Pacific (CIUP) in charge of the project's technical coordination.
- *The Technical Committee*, comprising representatives of ministries that deal with the environment in Amazonia countries. .
- *The Organization of Communication Platforms* of the Research Centre of the University of the Pacific.
- *A Mapping Team* composed of specialists from the University of Buenos Aires, Argentina and UNEP / GRID.
- *Contributing institutions* represented by numerous ministries, agencies, companies, research institutes, universities, regional bodies, etc.
- *Collaborators* represented by dozens of specialists and ministry officials, agencies, companies, research institutes, universities and regional bodies.
- *Workshops* with the participation of nearly 200 experts and officials from the same number of organisms (ministries, agencies, companies, research centres, universities, NGOs) to: address methodological issues, present the project, identify environmental problems, engage in dialogue, review, present and discuss results and make the final revision. Seven workshops were held in Peru (1), Colombia (1), Bolivia (1), Suriname (1), Guyana (1) and Brazil (2).

C. Correct identification and characterization of the types of stakeholders, their relationship with the environment and the expected contributions.

Identifying and characterizing the types of stakeholders, their relationship with the environment and their expected contributions is a major step towards preparing an IEA. GEO Amazonia managed to involve a wide range of key stakeholders linked to the environmental management of this ecosystem with different characteristics and action areas. These stakeholders, their roles and contributions have been appropriately characterized and differentiated as shown in Box 1.

Box 1.**Characterization of the social stakeholders according to their functions and contributions**

- *Public stakeholders, responsible for formulating and managing national, regional, state and local environmental public policies.* Authorities at different levels of government have an important role in articulating national and international policies, and are involved in different bilateral and multilateral actions for Amazonia, although it must be pointed out that differences are still evident between countries when it comes to Amazonia's political priority.
- *Private stakeholders, responsible for producing different goods and services, and support organizations such as non-governmental organizations (NGOs).* National and international NGOs are a very active group of stakeholders in Amazonia. Most countries in this region have at least one international NGO working on Amazonian issues and the best known representatives are: the World Wildlife Fund (WWF), Conservation International (CI), The Nature Conservancy (TNC), among others. For their part, national NGOs have played a distinctive role in the countries of the region. Some have focused on specific environmental issues such as conservation of particular species, while others have identified with more general themes such as resources and forest policy. NGOs have also served to channel international cooperation financial resources to specific issues, sometimes supplemented by national financial resources. It should be noted also that many NGOs have played an important role in promoting initiatives between countries on managing adjacent areas of Amazonia.
- *International cooperation.* Another stakeholder in the Amazonian region is international cooperation that initially worked directly with governments but in recent years has also done so with NGOs. In Amazonia, German cooperation (GTZ), Netherlands cooperation, and the Agency for International Development (USAID) work on different themes. International cooperation not only provides financial resources but also helps to discuss ideas and support the consolidation of national policies. It is, therefore, important to take advantage of this cooperation, to strengthen integration and cooperation in Amazonia so that it adjusts to the region's established principles and priorities.
- *International agencies,* International organizations like the United Nations, intergovernmental such as ACTO, and multilateral institutions such as the World Bank (WB) and the Inter-American Development Bank (IDB), actively participate in Amazonia. In this case, their participation is on transversal themes such as capacity building for environmental management and developing science and technology to use certain natural resources. These organizations have different funding sources that enable them to develop programmes and projects.
- *Academic stakeholders, including universities and other higher education centres.* Academic and scientific institutions in Amazonia are important stakeholders in the region. In an effort to connect to universities in Amazonia and their research, two decades ago the Association of Amazonian Universities (Unamaz) was established. The results of that integration are still ongoing because of the lack of incentives to publicize it and the limitations placed on joint research issues such as biodiversity that need to be very well understood. In this respect, strengthening research networks on science and technology and other topics crucial to sustainable development in Amazonia under Unamaz is still a goal that has to be met.
- *Civil society stakeholders including different social organizations with specific objectives such as, for example, organized indigenous communities.* Amazonia has a wide range of social organizations. These organized community groups allow better coordination with the government. In general, all countries have organized civil society institutions that permit the civilian population to have greater coordination with other national stakeholders. Community and religious groups are other stakeholders actively involved in environmental management of Amazonia. However, their interests are more specific and vary from country to country. In Bolivia, for example, religious groups focus on the issue of water resources; in Colombia and Guyana their main interest is environmental education; while in Brazil these groups cover a wide variety of topics from biodiversity and forests to integration issues.

Each actor has specific objectives and competences. However, Amazonian stakeholders have strengths such as their influence on public policy formulation, generating information, an interest in Amazonian environmental themes, communication and dissemination channels. Recognizing these strengths will enable long-term joint efforts to be made and synergies created to optimize how human and financial resources are used, as well as the extent of their results.

The diversity of stakeholders involved in GEO Amazonia has permitted different disciplines to be included, as well as specialized knowledge, perceptions and approaches, while it has promoted reconciled criteria and methods of analysis, particularly in areas of uncertainty, and has helped to better understand the assessment process and its objectives.

D. Logical and coherent structure of the report's contents

Another distinctive feature of GEO Amazonia is the logical way the structure of the report's contents has been organized. It contains seven chapters of which the first is devoted to research, the outstanding features of Amazonia and its historical background, with the aim of providing the study with an appropriate context and frame. The second chapter explains the various processes affecting environmental conditions, such as socioeconomic and demographic trends, changes in land use, climate change, among others. The third chapter explains the state and trends of biodiversity, forests, water resources and aquatic ecosystems, agro-productive systems and human settlements. The fourth chapter examines the impact environmental degradation has had in Amazonia on natural ecosystems and human well-being. The fifth chapter deals with the most common responses given about how to curb environmental degradation and its respective impacts. In the sixth chapter, four probable scenarios likely to arise are discussed and an explanation is given of the environmental situation we could be experiencing in Amazonia, bearing in mind the suppositions of each scenario. Also identified are emerging issues that require attention. Finally, chapter seven presents the main conclusions of the study and outlines a set of guidelines for action to help reduce Amazonian degradation.

E. Appropriate database and information sources to describe the baseline and monitor the ecosystem.

GEO Amazonia includes a valuable set of data and information sources that form the baseline of the continuous assessment and monitoring process. An attempt has also been made to support and expand opportunities for dialogue and exchange of information and, thus, become a platform for coordinating and systematizing available information. In the GEO Amazonia report literal information is well supplemented with plenty of tables, graphs, boxes, maps and photo-maps that make the text easier to understand. By way of example, a series of maps and photo-maps is presented. (Figure 11).

INSERT FIGURE 11 -- MAPS A, B, C AND D

<p>Figure 11. (A) Areas managed in Amazonia, (B) extension of drainage in the Amazon Basin and the region's vegetation, (C) the percentage contributed by the principal Amazonian sub-basins to the Basin's total discharge and (D) most important cities in Amazonia.</p>

F. Clarity in formulating and discussing the key messages and contents of the executive summary.

Clearly formulating and discussing key messages is vital if the principal results of an assessment are to be understood by the different social stakeholders. In this respect, the

GEO assessment has managed to accurately reflect the relevant issues and problems of this ecosystem, as can be seen in the summary in Box 2. Like the key messages, the executive summary for decision-makers must accurately and concisely set out the main aspects and problems that result from the knowledge required for different levels of public administration and managers. For example, Box 3 contains a brief overview of the contents of the GEO Amazonia executive summary.

Box 2. Summary of key messages

- *Amazonia is a region of great wealth and many contrasts.* Amazonia has a wide variety of flora and fauna species and is an important endemism area, making it a genetic reserve of global importance for humanity to develop. While Amazonia is known for its abundance of natural resources such as minerals, oil and natural gas, the population is often very poverty stricken, more so than the national average in the individual countries.

- *Amazonia is changing at an accelerating rate and there are deep-rooted ecosystem changes.* Changes in Amazonian land use because of the growth of economic activities, infrastructure construction and human settlements, have led to a rapid transformation of the Amazonian ecosystem. Biodiversity loss is expressed in the increasing number of endangered species. Despite environmental changes, Amazonia still has spaces that are untouched or have little sign of intervention, and this is a stimulus for all countries to take joint action to promote the region's sustainable development.

- *Internal and external factors account for Amazonia's environmental degradation.* Amazonia has been the centre of attraction for populations expelled from areas with limited productive activity and few sources of jobs, or from colonization zones and promoted by public policies. Meanwhile, Amazonia's natural resources have made it a significant attraction for investing in numerous different sized projects with unprecedented road infrastructure development and changing production methods that have an effect on ecosystems and on the population's quality of life.

- *Climate change threatens Amazonia.* The Amazonian region is being affected by the increase in average temperatures and the changing rainfall regime. These changes affect the equilibrium of ecosystems and increase the vulnerability of both the natural environment and of human populations, especially the poorest. Climate change could cause 60% of Amazonia to become savannah in this century.

- *The degradation of Amazonian ecosystem services affects human well-being, but this is little known or assigned any economic value.* The wealth of Amazonia is not only based on the supply of tangible goods, but is also underpinned by the performance of its varied natural ecosystems and socio-cultural systems that provide an assortment of ecosystem services. Unfortunately, environmental degradation is reducing human well-being in the region, and this is reflected in the increased incidence of diseases in the population, higher operating costs of economic activities, more social conflicts, and increased vulnerability to climate change. For all these reasons, a regional priority is to carry out studies and take action to make an economic assessment of Amazonian environmental services.

- *Steps are now being taken to connect Amazonia to the national system and national economy.* In Amazonian countries the view has persisted of the region as being a peripheral space with little connection to the national economy; this is a result of its remoteness from the main political-administrative centres and its fragmented and sectorial policies that mean environmental management is limited in terms of efficiency and effectiveness. In most countries of the region Amazonia is not yet fully considered as part of the national "active space"; however, Amazonia is gradually being connected to the national political system, society and economy. On the other hand, decentralization processes now taking place at different stages of development are attempting to strengthen environmental governance by local and regional governments.

- *In recent years, stakeholders in the Amazonian region, both governments and civil society, have shown great dynamism in undertaking initiatives to deal with Amazonian environmental problems.* As part of an integration, articulation and decentralization process, various countries have made use of a series of national instruments on planned management of Amazonia; in general, the countries have sustainable development plans, regional development strategies, economic ecological zoning instruments, as well as regional programmes and projects, and others. National efforts are beginning to be made to design and use management tools such as environmental financial instruments, including financing funds created to implement Amazonian environmental programmes. However, Amazonia is a natural unit and functions as such and, therefore, cannot be preserved and managed in isolation by each country making individual efforts.

- *Public policies related to natural resource use, market performance and the application of science,*

technology and innovation for sustainable development would be three determinants of the future environmental outlook of Amazonia. Amazonia is particularly sensitive to changes in how markets function so that it is obliged to become more engaged in how regional development is viewed and in the development strategy required. Efforts have to be concentrated on three areas of work: conservation of Amazonian forests and climate change; integrated water resource management; and sustainable management of biodiversity and environmental services. Matching environmental policies on issues of relevance to the region, producing and disseminating environmental information in the region and promoting economic assessment of environmental services in Amazonia, are examples of recommended actions to improve the region's environmental outlook. Amazonian countries should extend their integration efforts and regional cooperation towards building a joint sustainable development vision and model and move beyond energy and infrastructure integrations.

Box 3. Main aspects dealt with in the executive summary

Amazonia: territory, society and economy over time

Amazonia is a region of South America characterized by riches and by natural and cultural contrasts. There is no universal definition of the Amazonian area. Amazonia has been occupied and in use since time immemorial. The level of economic development varies widely within Amazonia.

Dynamics in Amazonia

Socio-demographic dynamism is rapidly changing Amazonia from a region of low population density to one that is more populous and fast growing. Economic-productive dynamics in response to the demand from international markets exert pressure to make intensive use of natural resources in the region, and socioeconomic processes have caused a rapid change in land use in Amazonia. The result of economic and social dynamics in Amazonia has been the cultural erosion of native populations. There has been a marked expansion of unsustainable agro-productive systems. Unplanned urbanization in Amazonia has accelerated and that has led to approximately 62.8% of its population living in cities. Scientific and technological development in the region has been limited to producing alternatives for the sustainable use of natural resources

Amazonia today

Deforestation and a reduction in biodiversity caused the loss of habits and ecosystem fragmentation. Amazonia has a high value in the global and continental water balance, but there is still limited action being taken on integrated basin management.

The footprints of environmental degradation

Increasing environmental degradation is altering Amazonian ecosystem services and affecting health, the local economy, and social relations, and has led to a growing number of conflicts. There is a trend towards increased vulnerability to floods, droughts and climate change.

Responses from stakeholders to Amazonian environmental problems

Governments are making efforts to manage Amazonian environmental problems; civil society has successfully undertaken projects and programmes that allow the most urgent problems to be solved; international cooperation and international agencies have played an important role in providing financial resources and technology. Advances have been made concerning management tools, but there is still limited action being taken on basin management. Only fragmented information is available about Amazonia. There are opportunities for cooperation and the capacity exists for taking action.

The future of Amazonia

Four possible scenarios are considered showing that the style of development chosen by Amazonian countries and their citizens is reducing both the options for future Amazonian sustainable development, and making it harder to believe in an alternative future for the region. The impossibility is recognized of preserving the integrity of the Amazonian ecosystem, but some decisions taken today are critical in determining the degree of changing from environmental degradation to a socioeconomic development that would be acceptable to Amazonian citizens.

The possible Amazonia

Lines of action suggested as a result of the IEA and the consultations between representatives of the eight Amazonian countries were to construct an integrated Amazonian environmental outlook and define the role of the region in national development; harmonize environmental policies on issues of regional relevance; design and use integrated environmental management; design and use regional strategies that allow sustainable use to be made of Amazonia's ecosystem; place risk management on the public agenda; strengthen Amazonian environmental institutions; intensify efforts to produce and disseminate environmental information in the region; promote studies and action on the economic assessment of Amazonian environmental services; design a system to monitor and assess the impact of policies, programs and projects.

II.4 GEO Uruguay. Report on the State of the Environment 2008

II.4.1 Brief outline and main results

Integrated assessment processes go beyond preparing and presenting the report; they are the result of the political will to make the assessment, of clear agreements in the stages of planning, developing and applying a strategy that gradually includes, whenever required and by different means, the key stakeholders, committed experts on different themes and holding different views. GEO Uruguay 2008 is an example of this.

GEO Uruguay 2008 is distinguished first of all by the expressed commitment of the country's Environmental Authorities to go ahead with the process. This was reflected when, in presenting the report, the Minister of Housing, Lands and Environment, Mr. Carlos Colacce, stated: "We are very pleased to present the GEO Uruguay report, prepared on the initiative of our Ministry's National Department of the Environment (DINAMA) and the United Nations Environment Programme (UNEP) that assigned the technical coordination of this task to the Latin American Centre on Social Ecology (CLAES)."

This GEO was not a classic work of experts but an interactive process of qualified stakeholders from different sectors and from civil society, in which themes were respected that emerged from open participation and, in a general sense, was able to reflect key problems, possible response options and their likely success. It analysed the environmental impacts in terms of their effects on the components of human well-being – effects on health, on material goods and on personal or community security, thus considering development as a means of improving human well-being. To do this use was made of the conceptual framework (DPSIR) that had been updated in the GEO-4 report.

From the beginning environmental priorities were identified and determined that had been cited by decision-makers and the public in general, as well as the key messages, and there is no doubt that this helped to bring about the interface between science and the policy needed for an IEA. As a background for this assessment the results of GEO Montevideo 2004 was considered and data and information were appropriately handled. The results were presented in the final report in a way that was precise and coherent in each chapter and throughout the document. In general effective communication was achieved as well as recognition by the country's authorities, examples of which are the following opinions:

- Carlos Colacce, Minister of Housing, Territorial Planning and Environment: "We understand the GEO Uruguay Report is a valuable additional tool for all those concerned with environmental management as it provides up-to-date information that allows a definition to be made of local and national policies meant to ensure

environmental quality and, therefore, citizens' quality of life in a sustainable development model.”

- Alicia Torres, National Director for the Environment: "After almost two years of work, it is with great satisfaction that we present this report -- with agreements and some discrepancies as to the conclusions -- sure it will be an important tool for those who now have government responsibilities, those who have assumed this commitment, from NGOs or study and research centres and society in general. ":
- Congresswoman Nora Gauthier, recognizing the work and products of GEO Uruguay 2008, stated "It is important to strengthen the steps that have been taken and will be taken in this respect (positive 2025 scenario trend), requiring the concurrence of all institutional forces, with the budget that the task demands, and taking into particular consideration education, because only thus will the objectives of sustainable development be met with equality, and the country will embark on the path to lead this process in the region and worldwide. (Published by Noticiasderionegro 6/02/09).

II.4.2 Good Practices

Below are shown some of the aspects of good practices that helped GEO Uruguay 2008 to be considered as a credible, legitimate and relevant Integrated Environmental Assessment.

- A. Sound assessment planning and active and balanced participation of experts in keeping with its objective and range.
- B. Effective management of the IEA process.
- C. Assessment guidelines to be pinpointed and clarified from the beginning.
- D. coherence, logic and technical rigour in the final report's presentation and content, with proper handling of scientific information.
- E. Effective communication throughout the process and in the report itself.

A. Sound assessment planning and active and balanced participation of experts in keeping with its objective and range.

The assessment was designed with a participatory workshop methodology and by stages (Figure 12).

INSERT FIGURE 12

Consultation stage	7 workshops 320 people
Drafting stage	50 authors, coordinators, main collaborators
Review stage	25 reviewers, 600 written comments

Figure 12. Schematic representation of the interconnection between the stages of the process and participation in each stage.

The consultation phase was designed at three national workshops in Paysandu, Minas and Montevideo and three thematic workshops with more than 170 participants. The terms of reference were defined at this stage and an understanding was reached, and shared by all the participants, about the objectives and the process itself. A workshop was also held on scenarios, with more than 150 people linked to government authorities, NGOs, academia, and the private sector, resulting in the narratives presented in the chapter on Scenarios.

For the drafting stage researchers were invited who were working on the issues raised in the consultation. The affiliations of these researchers include NGOs, government, academia and the private sector. In all, more than 50 authors participated as coordinating authors, main authors or collaborating authors who were also responsible for analysing and deciding whether or not to include the comments made during the review stage and, as far as possible, updating information published since the last draft.

In the review stage, which was an open process and involved more than 25 reviewers, more than 600 written comments were received. These comments, coming from different sectors and with different approaches, were analysed and passed to the authors for their consideration. The quality of the data was reviewed as well as the methods used to prepare and extrapolate them, the models used, and this helped to make the process and the report credible and legitimate.

In all these stages opinions were collected and concrete examples were provided that allowed key themes to be identified on environmental management issues: Land use changes; Coastal zones; Biodiversity; Urban-Industrial; and Energy. On the other hand, researchers who specialize in these themes were convened and made decisive contributions to the scientific basis of the multiple causes and consequences, and of the interrelationships between environment and development, thus helping to develop relevant tools for environmental management at different levels of decision making and spatial scales. This method of planning and organizing the process allowed a distinction to be made between the roles of the different participating groups.

B. Effective management of the IEA process;

The responsible institution and the principal coordinator had an excellent command of the GEO (DPSIR) methodology, had recognized prestige and convening power, and had the support of the environmental authority to conduct the process, including to act freely and independently of criteria, so that the experts assessed options and risks, as well as probable results, without outside influences.

The most important decision making groups and stakeholders involved in the different stages were accurately identified as well as the researchers and sectorial and local users most likely to make use of the results of this IEA. This is essential as an element of good practices and more so if the IEA is unprecedented, as was the case of this GEO. The plans made at the beginning of the IEA were always complied with, collective knowledge was respected and considered, as was the experience of field experts and different points of view and this was a basic input in the drafting stage by considering and complementing the available quantitative information, as well as improving qualitative judgements. All the appraisals were subjected to an open review process.

C. The assessment guidelines to be pinpointed and clarified from the beginning.

It was, therefore, necessary to update the previous assessment with the information now available. A start was made by updating what had been achieved with GEO Montevideo, since there was no precedent for a GEO for the whole country, but it had to be taken into account that more than half the population and a large number of industries are concentrated in the metropolitan zone of Montevideo and, therefore, to consider additional efforts to seek and complete that on the interior of the country, especially in the urban-industrial analysis.

It was necessary to resort to the conceptual framework updated in the GEO-4 report to be able to use the concept of human well-being as a basis for analysing the state of the environment and the impacts. It was possible to compile assessment cases as a means of exemplifying the costs of poor environmental management, and to show that the economic instruments and their potential uses are available and real management tools.

D. Coherence, logic and technical rigour in the final report's presentation and content, with proper handling of scientific information.

In each chapter account was taken of the logic of development and in particular for each theme determined to be a priority, on the one hand making clear the risks and threats associated with the different pressures and activities expressed in each case by indicators and tools that show the vulnerability levels of the different natural and social ecosystems and, on the other, the effectiveness of the different types of existing responses and the possible costs of failure to take action.

The most important responses were highlighted and their effectiveness assessed. This made it possible for the authorities to give clear responses, among other things to: How far has it gone? What is missing? Could it be done otherwise? Is it possible to do? These ideas should also be summarized in the messages. It was possible to clarify that many of the impacts are not the result of a single pressure, but that multiple pressures generate synergy and changes in the state of the natural component. Emphasis was placed on the justification for all conclusions and recommendations, with the available scientific information being rigorously managed, including areas of disagreement, as well as achieving transversalization of the environmental theme, and calculating the costs of the lack of inclusion and of not considering the environmental variables in development projects and strategies.

For example, in GEO Uruguay, in the chapter dedicated to Land Use Change, the messages reflect the key results of this assessment (Figure 13); the structure presented shows the components of the analysis and the contents (narratives, graphs, images, etc.), the aspects included and substantiated that carry their own messages.

INSERT FIGURE 13.

Messages of the Chapter on Land Use Change

The principal agricultural and livestock production land use.

In the past two decades gradual changes were produced in land use, strongly increasing the rhythm of changes in the past five years.

This productive intensification has environmental consequences. The greatest impacts and emerging threats are water soil erosion from agricultural activities, loss of biodiversity (native flora and fauna species) and water resources being affected.

There is no proper monitoring system in operation. Monitoring state and socioeconomic indicators is essential to plan and execute sustainable development policies.

While there is a basis of environmental and territorial norms regulating the rural environment, they have not been totally implemented.

There must be positive incentives and more public participation

Figure 13. Schematic representation of the messages of the chapter on land use changes

To make an assessment of this theme (chapter 2 of this GEO) a first general analysis is made of the state and the main environmental and socioeconomic impacts, and Climate Change is introduced because of its interaction with agricultural and forest production systems. Then dealt with are the main productive activities that lead to land use change and its impacts, as shown in a section of the same chapter on groundwater and eutrophication (Figure 14). This illustrates the existing situation, the changes occurring during the period assessed and the need for the authorities or sectors to make specific decisions.

INSERT FIGURE 14.

Change in Land Use

State and trends
socioeconomic

Impacts:
Environmental and
Change

Climate

Agriculture

- Evolution and present state
- Impacts: Soil and water, use of agrochemicals
- biological diversity

Livestock production

- Land use and meat and milk livestock characteristics
- The natural ecosystem
- Impacts: Soil and water and biological diversity

- **Industrial forestry**
- **Land use and industrial forestry characteristics**
- **Impacts: soil and water, biological diversity, socioeconomic**

Mining

Groundwater and eutrophication

Figure 14. Schematic representation of the Chapter on Land Use

The narrative of this GEO reflects areas disagreement and criteria; for example a debate on forestation in Uruguay expressed in the opinions given by two recognized experts. Clearly indicated are the gaps in information and the real risks of not having systematized information on the state of natural resources and how changes in the environment affect human well-being; this is possible because an extensive bibliography is managed with, for example, 148 documents being consulted or used just for chapter 2.

The chapter coordinators, main authors and contributing authors included 10 specialists, and one of the coordinators of the chapter is the coordinator for most of the others, especially the Introduction, Geographic and Socioeconomic Context, Scenarios, and Conclusions, Recommendations and Economic Instruments,

There is a table in the last chapter, partially reproduced below (Figure 15) that exemplifies the interconnection of chapter 2 with the general conclusions, and showing the traceability of the issues addressed.

INSERT FIGURE 15.

Change in the environment

Intensification of agricultural production and expansion of the agricultural frontier

Effect on the components of human well-being

Economy

Economic yields of crops

Increased costs of activities that compete for land use (e.g. dairy)

Loss of genetic stock of species positive for agriculture (pollinators, grasses)

Health

More use of agrotocics increases accidents and poisonings

Environment

More pressure on native fauna

Habitat destruction and fragmentation

Loss of species

Pollution of water resources

Culture and society

Loss of landscapes with cultural value

Figure 15. Table showing the connection between environmental change and human well-being

Thus, the idea is well accepted that it is essential for decision-makers to be aware of "transversalization of environmental issues, and what the costs are of failing to include it and of not considering environmental variables in development projects and strategies", and more so since the Uruguayan economy is fundamentally based on natural resources with eight of the 10 main branches of the economy depending on them. That is why in the report's conclusions explicit mention is made of the relations between a healthy environment and ensuring human well-being .

E. Effective communication throughout the process and in the report itself.

This is reflected as follows: a short and easy to understand executive summary; in all the chapters use is made of maps, data and graphs, a total of 103, allowing the information to be understood and used by a wide audience.

In this case (GEO Uruguay) the two-page executive summary shows:

- o The main driving forces and pressures associated with them in the current international, regional, and national context: those that determine the main changes in the state of the environment point to the need for greater institutionality and availability of systematized information on the state of the environment and the changes, and the effects of such changes on human well-being.
- o The situation and what differentiated actions need to be taken for each key issue analysed: Changes in land use; Coastal zones; Biodiversity; Urban-Industrial; and Energy.
- o How, as shown by the exercise on GEO future scenarios, if the current trend in the environment-development relationship continues, environmental problems will intensify and have greater impacts on human well-being, principally on health and social conflicts related to environmental issues.
- The relevance of: considering the environmental component from the beginning of any process, action, or project as a way to prevent future costs in good time, and of improving human well-being; having a monitoring system in operation with the collaboration of institutes and with data to which the public has access, as well as expanding the environmental management tool base, and achieving effective public participation.

For example, by analyzing soybean cultivation, it was seen that there was a increase in the 2006/07 harvest of 360% compared to the 2002/03 planting, representing 44% of the intensive crop area; an analysis is made of how this increase occurred at the expense of the area devoted to other summer crops (sunflower, maize and sorghum) and, to a lesser extent, of land used for livestock, and that 10% of soybean fields were planted on natural and/or old pastures in purely livestock areas, as shown on a map that allows a quick look (Figure 20) at how this expansion has affected other non-traditional areas of this crop and which, as mentioned, would disrupt the natural grassland ecosystems, in particular the genetic diversity of associated flora and fauna.

INSERT figure 16 -- MAP

“Traditional” zone, 2000 Census

New zones, 2003-2004 harvest

Figure 16. Expansion of soybean cultivation in the 2004/05 harvest by the areas listed

Notwithstanding this, when applicable the limitations of some of the data are noted if not covered is the whole assessment period or all the national territory, and if these data have been processed by the authors or taken directly from specialized and recognized sources.

The messages of each chapter are clear and precise and correspond to those in the last chapter on Conclusions, Recommendations and Economic Instruments. The report is characterized by a high scientific and technical level; nevertheless, it has been drafted in such a way that it can be understood by a wide public interested in and motivated to use it for different objectives, and especially for decision making.

II.5. GEO Brazil. Water Resources. Component of the Series of Reports on the State of the Environment and the Outlook for Brazil 2007

II.5.1 Brief outline and main results

The GEO Brazil Water Resources is the first in the GEO Brazil series and, by using the possibilities of the GEO methodology, made a comprehensive and integrated assessment of environmental, organizational and management aspects of one of the world’s greatest water patrimonies. This complex assessment was made over a vast territory that occupies almost half the area of South America, with almost 60% of the Amazon Basin which drains close to one-fifth of the world’s fresh water. It faced the difficult paradox of having, on the one hand, the availability of Amazonia’s super abundance and, on the other, critical areas of extreme water shortages in the semiarid northeast. To that is added the disparity between population distribution and water resources, for example the Amazonian Water Basin with 74% of available water has less than 5% of the Brazilian population. The solution to deal with these extremes include: integrating public action instruments; articulating all government policies linked to this area; improving social participation mechanisms in decision making; putting into effect permanent actions to control and assess the entire process. This case shows examples of good practices involving participation by different

stakeholders, terms of reference, identifying decision making networks, researchers and users, and the use of graphic resources.

II.5.2 Good Practices

The GEO Brazil assessment, Water Resources, has a wealth of examples of good practices summarized below:

- A.** Connection between IEA's international commitments and the information needed to meet sustainable development goals.
- B.** Close link between the IEA and the National Information System on the Environment and its value as an input to formulate and implement public policies.
- C.** Proper analysis of the impacts of legal and management instruments on water resources.
- D.** Association of the GEO process to current and future national development and the use of the results to build a knowledge and sustainable environment capacity base.
- E.** Massive use of graphic resources and a didactic language to facilitate understanding of the results by a wide range of users.
- F.** Clear and exhaustive assessment of the pressures and impacts on water resources and of what causes them.
- G.** Relevance of the responses to address these pressures and possible future scenarios.

A. Connection between IEA's international commitments and the information needed to meet sustainable development goals.

GEO Brazil Water Resources gives an irrefutable response to the expectations of the Agenda 21 programme about the inevitability of adopting planning and integrated management of water as a finite and vulnerable resource, and the need to integrate sectorial water plans and programmes into national economic and social plans. It is also a response to the precepts of the Human Development Report (UNDP, 2006), which raises the question of why meeting the Millennium Development Goals cannot be separated from the proper treatment of water resources. There is hardly anything that can demonstrate more clearly the problems, risks and achievements of this trajectory than the use of water, which is not only a critical resource in terms of human and environmental safety, but also offers great opportunities for new advances in terms of sustainable development. Thus, as in the case of the other issues addressed by the GEO Brazil series and consolidated in GEO Brazil II, this report provides inputs to enable the country to fully meet its sustainable development needs. For these reasons GEO Brazil Water Resources was supported by the highest authorities of the Federal Republic of Brazil, the Ministry of the Environment, the National Water Agency and the United Nations Environment Programme.

B. Close link between the IEA and the National Information System on the Environment and its value as an input to formulate and implement public policies.

The GEO Brazil process was organized in the framework of the National Information System on the Environment (SINIMA) as a Thematic Series that seeks to make available consistent integrated information as well as an integrated analysis that will enable

continuous improvement of the country's environmental management processes.

The GEO Brazil Water Resources Assessment systematizes and presents information and a number of key recommendations on putting into practice public policies designed to meet the goals set in terms of sustainable access, conservation and management of the country's water resources with a view to improving governance of the system and the effectiveness of how it is managed. The option of continuing the GEO process in the form of a series of reports on Brazil, with emphasis on environmental management, recognizes not only the diversity and size of the country, but also that it has the political, technical and institutional capacities needed to make advances on effectively managing its natural resources.

The focus on water management - perhaps the most vital and strategic resource for a sustainable future - reflects the importance of the subject, the size of existing resources and the complexity of managing them in a country like Brazil. The assessment highlights Brazil's responsibility in strategically managing this heritage in times of global water scarcity, as well as its global leadership responsibilities concerning the problem of water resources.

Brazil is a signatory to the most important international conventions and declarations that deal directly or indirectly with the issue of water resources, including the Millennium Declaration, Agenda 21, the United Nations Convention on Biological Diversity, the Ramsar Convention, the United Nations Framework Convention on Climate Change, and the United Nations Convention to Combat Desertification. In South America, Brazil has sought to contribute to making a broader analysis of the problems and challenges of water resource management in order to achieve effective articulation and integration that would be of mutual benefit to the countries. Such commitments are embedded in the principles adopted by Brazil in its National Water Policy, which includes the National Water Resources Management (SINGREH) and a set of new strategies and instruments developed and adopted by the country that offer society and public managers state-of-the-art integrated and participatory water resources management.

C. Proper analysis of the impacts of legal and management instruments on water resources;

The assessment points out the leap made by Brazil in the quality of its handling of managing water resources by applying the novel three-direction approach:

- a) inclusion in an environmental, social and economic framework;
- b) the search for a regulatory framework and institutional spaces that are compatible;
- c) formulation of appropriate concepts to describe and operate the new political arrangements and social pacts to gradually consolidate integrated, shared and participatory public policies.

The National Water Resources Management System (SINGREH) is recognized as a landmark in the current phase that articulates multisectorial efforts to ensure full implementation, and it is a major protagonist, together with the National Environmental System (SISNAMA), of changing how the socio-environmental policy that is at the centre of action taken by the Ministry of the Environment is understood.

GEO Brazil Water Resources is included in building strategic planning tools as part of the efforts to achieve the sustainability contemplated by those scenarios. Among the very important tasks of this assessment, perhaps the most worthy of note are the commitments implicit in mobilizing and training Brazilian society to accept citizenship's socio-environmental responsibility. This is true sustainability that protects and rationalizes society's aspirations.

The assessment points out how a group of circumstances, such as the emergence of environmental issues, disseminating the principles of sustainable development and confirming the planet's progressively increasing water shortage induced Brazil to conduct a thorough revision of the strategies and the government apparatus in the direction of integrated water resources management. Milestones of that fundamental change are: including national water resources management in the Federal Constitution; regulating and institutionalizing the National Water Resources Management (SINGREH) and establishing the National Water Agency, a federal organism to implement the National Water Policy and to coordinate with SINGREH, the National Water Resources Plan which, besides being responsible for Brazil's international commitment to the Millennium Development Goals, is an important instrument of governance.

In the opinion of the President of the National Water Agency, GEO Brazil Water Resources expands the international visibility of water resources management in Brazil and, with its analysis and recommendations, helps to fully implement the National Water Resources Management System by making it more decentralized, participatory and, therefore, more transparent, democratic and socially effective. A central aspect of this GEO is to support decision-makers in the different authorities by making available better, more up-to-date and reliable information that encourages developing integrated and sustainable public policies.

D. Association of the GEO process to current and future national development and the use of the results to build a knowledge and sustainable environment capacity base.

Brazil has adopted the GEO process, associated it with the country's development, and uses the results to build a knowledge and sustainable environmental management capacity base. That is made evident in this report, the first in a series of thematic reports on the state and outlook for the environment in Brazil that follows up on and updates the work begun with GEO Brazil I, launched at the World Conference on Sustainable Development in Johannesburg in 2002.

Another unprecedented feature of this assessment is that it goes beyond the analysis of state and the availability and quality of water resources, and includes the construction of scenarios that project the future 2020 outlook. An in-depth analysis is made of the country's planning issues and management tools; it also deals with aspects of participatory management and economic instruments with recommendations about how to make them increasingly effective tools for policy making on water conservation and sustainable water management in Brazil. At the same time it gives careful consideration to the importance of water in a broader spectrum and as an input for many economic activities, ranging from life support for the country's vast biodiversity to its use to improve quality of life and allow

development to take place at all levels. Besides being the first Latin American country to develop its National Water Resources Plan, Brazil now has mature environmental institutions and an installed capacity fully capable of meeting the challenges it faces. That enables the country to make systematic advances to meet the Millennium Development Goals, particularly those critical to fighting poverty and expanding access to safe water and sanitation .

Regarding the state and trends of water resources, the report provides detailed practical information on the distribution of fresh surface and groundwater, flow volumes, water availability, exploitable groundwater reserves, total water withdrawal by area per capita, distribution of water uses in the regions, coverage of sanitation services, as well as other closely linked socioeconomic aspects such as population, demographic density, urbanization rates, and others.

E. Massive use of graphic resources and a didactic language to facilitate understanding of the results by a wide range of users.

An unquestionable example of good practice in GEO Brazil Water Resources is the extensive use of graphics (maps, photos, graphs, boxes, tables, figures) and a teaching language to help a wide range of users understand the issues addressed. As examples, some of these graphic resources are represented in Figures 17, 18, 19, 20 and Boxes 4 and 5.

INSERT FIGURE 17 -- MAP

Figure 17. Satellite image of Brazil

INSERT FIGURE 18 --MAP

Figure 18. Map of water regions and the political-administrative division of Brazil

INSERT FIGURE 19 -- GRAPH

Figure 19. Graph of the area of water basins

INSERT FIGURE 20 -- PHOTO

Figure 20. Aerial photo giving a perspective of the Itaipú hydroelectric plant

Box 4. Data collection networks

Hydrological records in Brazil have been kept for more than 100 years when the first rainfall stations with regular measurements were installed. Even at the beginning of the twentieth century the first stations were installed to control river levels and flows to exploit hydraulic power.

At present the Water Resources Information System has a significant data collection capacity installed that includes the National Hydrological Network, led by ANA (the national water agency), and the water quality networks operated by the states.

The Hydrological Network has 14,169 fluviometer and pluviometer units, as well as 267 data collection platforms that operate via satellite. The water quality networks already have 1,566 monitoring points that analyse from 3 to 40 parameters depending on the different states. Nine states have water quality systems considered to be optimal or very good, five have good or regular systems, while 13 have emerging systems.

Box 5. Table of sources of the matrix of electric energy in Brazil

Type	Installed potentials		(kW)	%
	No. of plants	Installed capacity		
Hydroelectric				
Gas				
Petroleum				
Biomass				
Nuclear				
Coal				
Wind				
Imports				
Total				

Source: www.aneel.gov.br – updated 09/11/2006

F. Clear and exhaustive assessment of the pressures and impacts on water resources and of what causes them;

GEO Brazil Water Resources presents a clear and exhaustive assessment of the pressures and impacts on water resources the result, among others, of a dynamic and diversified economy, a high rate of urbanization and a strong demand for energy. These pressures have impacts on the present and future supply of water resources, as well as on their quality and capacity to provide environmental services. Population distribution in the country is quite uneven, which in turn produces a mixed picture of pressures on water resources. The concentration of population in the southeast is also reflected in economic activity and income: with 11% of Brazilian territory, the region contains about 43% of the population and has 56% of the country’s purchasing power, while the northern region, corresponding to 45% of the national territory, has 8% of Brazilian population and only 4.5% of its purchasing power. The country is also responsible for three-fifths of the South American economy’s industrial production with agrobusiness being one of the economy’s most dynamic sectors and the one with the most impact on water resources. The determining factor in problems of water resources is how sewage is dealt with in the agricultural expansion frontiers in these regions. This means a high cost of harnessing water resources for domestic water supply, agriculture and industry.

Even with relatively high economic incomes in national terms, their unequal distribution prevents good coverage of sanitation services in Brazil among the poor populations who pay proportionately more for drinking water. The prospect of adding new customers means greater use of water resources and more effluents being produced, as well as other impacts. The critical tables on water quality in the country relate to urban sewage and industrial effluents from intensive animal husbandry and extensive agricultural activities.

G. Relevance of the responses to address these pressures and possible future scenarios.

The GEO Brazil Water Resources assessment highlights the role of the new Constitution adopted in 1988 to establish principles and guidelines that have strong repercussions on water resources management. National Law No. 9.433/97 establishes the following principles:

(i) water as a public good; (ii) water as a limited resource with economic value; (iii) priority for human consumption and to water animals; (iv) multiple use of water; (v) a watershed as a planning and management unit; and (vi) decentralized and participatory management.

It proposes:

(i) to ensure current and future generations have the good quality water they need; (ii) rational and integrated use of water resources; and (iii) preventing critical hydrological events.

It sets general guidelines for action:

(i) systematic quantity and quality management; (ii) conforming to regional differences (physical, biotic, economic, social and cultural); (iii) integrating with environmental management; (iv) coordinating with regional planning and land use management; and (v) integrating coastal estuarine systems and coastal zones.

This assessment also examines the various existing instruments, their synergy and application, to consider social participation in such exclusive government actions as making grants and imposing controls. It is designated as the new paradigm for better *governability* (in the sense of the State's performance) and governance (interaction with society) and provides greater transparency, integration and cooperation between levels of government and civil society.

An important step in the production, use and dissemination of scientific knowledge is the establishment of the Water Resources Information System, designed as a tool for collecting, processing, storing and retrieving information about these resources and the management factors involved. The system is intended to provide inputs for decision making by communities of users and the public power. In addition to providing hydrological or sectorial information, its basic operating principles are decentralizing the production of data and information, unifying coordination, and ensuring access to data by society in general.

With respect to quantifying and qualifying future water demands, prospective analyses were used that were consolidated in national and global scenarios for 2020, a period consistent with the recommendations of the GEO methodology. Three possible global scenarios are proposed that may influence how the Brazilian scenario is produced and three possible scenarios for Brazil depending on political conditions, economic growth, environmental sustainability and the degree of social inclusion that the country may, or may not, attain in the coming years. These are important inputs so that decision-makers may analyse various risks and response options.

From the picture painted in the chapters on the state of water resources, pressures and

impacts that affect them, and the responses adopted to address such pressures and possible future scenarios, 95 proposals and recommendations were presented to those responsible for decision making to help to build a sustainable future for water resources in Brazil. These proposals were included in the GEO Brazil Water Resources report. A review of these proposals and recommendations leads to the conclusion that the National Water Resources Management System brings together the fundamentals needed to allow Brazil to achieve long-term, sustainable water resources management. However, for that to occur, the National Water Policy and its instruments must be fully implemented taking into account regional peculiarities, and this means successfully meeting the need for institutional coordination among various interested stakeholders and securing viable financing sources to advance the process.

II.6 Climate Change in the Caribbean and the Challenge of Adaptation 2008

II.6.1 Brief outline and main results.

The "Adapting to Climate Change in the Caribbean (ACCC)" assessment was developed by the Regional Office of the United Nations Environment Programme for Latin America and the Caribbean in cooperation with CARICOM. It is an integrated assessment of the threats, risks, challenges and opportunities of climate change in Caribbean Small Island Developing States (SIDS). It analyses the repercussions of climate change in the general context of the Caribbean: it assesses the principal effects in the region such as the rise in sea levels and extreme meteorological events; it analyses the state of the principal natural components and socioeconomic aspects; it assesses measures to reduce vulnerabilities, adaptation needs and for the Caribbean countries to take concrete and concerted action. This assessment is intended to help the issue of climate change in the SIDS to receive appropriate and timely attention by governments and other interested groups in the Caribbean, emphasizing the importance of considering adaptation strategies in socioeconomic development plans, building capacities on information and on regional and international cooperation among others.

II.6.2 Good Practices

The ACCC assessment has some of the main characteristics of an IEA process such as having been prepared to produce information on the state and dynamics of the environment and how it interacts with human well-being, it points out environmental problems and priorities; and assesses how the region responds to the impacts of climate change. This assessment has the great merit of having identified, analysed and integrated into a single document a wide range of issues such as environmental problems, risks, challenges, priorities, initiatives, actions, gaps in knowledge, institutional weaknesses and instruments, all linked to climate change in the Caribbean and its impacts on ecosystems and human well-being. This assessment, therefore, is an example of good IEA practices.

In this case emphasis is placed on the following aspects considered to be good practices:

- A. Generate knowledge and strengthening capacities to adapt to climate change.
- B. Correctly identify the main environmental and socioeconomic challenges that make the SIDS more vulnerable to the effects of climate change.
- C. Correctly define strategies responding to the vulnerability and the needs for climate change adaptation.
- D. Strengthen the "information on the environment" capacity.

- E. Include the theme of climate change and disaster management in development strategies and programmes.

A. Generate knowledge and strengthening capacities to adapt to climate change.

The "Adapting to Climate Change in the Caribbean (ACCC)" assessment analyses the climate change trends and climate variability, its impacts in the Caribbean region with particular emphasis on the Small Island Development States (SIDS), the efforts to address these problems, and stresses national and regional efforts, highlighting successful experiences.

The report of this assessment is well drafted with scientific rigour and is harmoniously structured in four chapters organized in sequence, whose summarized contents are shown in Box No. 6, where all the emphasis is on the SIDS and in particular those in the Caribbean.

Box No. 6. Contents of the assessment report.

- The impact of Climate Change and the Caribbean contains an overview of climate change, taking into account the region's general characteristics.
- The SIDS, the Caribbean region, and the climate change political framework summarize how the climate change and SIDS debate has evolved, both internationally and within the region in: the Barbados Programme of Action; the United Nations Millennium Summit (2000) and the Millennium Development Goals (MDG); the World Summit on Sustainable Development; the Mauritius Strategy for further implementation of the Programme of Action for the Sustainable Development of the SIDS; the United Nations Framework Convention on Climate Change (UNFCCC); and the Kyoto Protocol.
- As a response to the need of the Caribbean region to adapt and its vulnerability, these issues are addressed in the region's overall context, including the availability of methodologies and tools to assess vulnerability and adaptation and to consider regional scenarios, institutions and relevant projects. It also examines how it is responding by adapting to vulnerability and climate change challenges. Projects and key institutions are identified, as is the issue of insurance (as a tool for risk reduction and management), as well as international cooperation, capacity building and regional frameworks. It emphasizes the role of CARICOM, OECS, the Forum of Ministers of the Environment of Latin America and the Caribbean, and others.
- Timing of specific agreed actions identifies certain types of concerted actions to be taken in the region to address climate change.

To the question "What is happening to the environment and why?" the assessment provides extensive and well discussed information about the state of the environment in SIDS (climate, water resources, biodiversity, forests, coastal areas, economic activities, energy, health, natural disasters) and potential threats associated with sea level rise and extreme weather events, which is of great practical importance to support environmental governance and to meet the goals of social and economic development.

B. Correctly identify the main environmental and socioeconomic challenges that make the SIDS more vulnerable to the effects of climate change.

This assessment was able to clearly summarize the main environmental and socioeconomic challenges that make the SIDS vulnerable to the effects of climate change, most notably: dependence of the productive sectors on their limited natural resource base, especially water and agricultural land, susceptibility to the swings of international trade, high transport and communication costs, great vulnerability to extreme weather events and other natural disasters, increasing pressures on coastal marine environments and resources, great dependence on imports (especially food and fuel), limited opportunities for economic diversification, among others. The assessment also analyses in detail the impacts on ecosystems and human well-being associated

with vulnerability to the effects of climate change, sea level rise and extreme events, among which stand out: deterioration of coastal conditions (increase of beach erosion, coral bleaching, deteriorating fisheries and tourism values), floods, storm surges with risks to infrastructure, settlements and means of subsistence of island communities, reduced freshwater resources with the threat of being unable to meet demand during periods of low rainfall, increased invasion of non-native species as a result of higher temperatures, economic losses due to reduced agricultural yields, loss of mangrove forests and coral reefs due to sea level rise, reduced tourism due to increased frequency and severity of extreme weather. All this provides guidance as to where the main actions should be directed.

C. Correctly define strategies responding to the vulnerability and the needs for climate change adaptation.

Regarding the responses to vulnerability and adaptation and the need to adapt to climate change in the region, a logical sequence is defined in three main directions in relation to vulnerability:

- identify the magnitude of the source of risks (regional climate change, increased extreme events and rising sea level);
- identify the key vulnerable zones in each country;
- provide a solid base of information, knowledge and capacity building to design and apply adaptation strategies.

The assessment is based on the conceptual apparatus of addressing adaptation to conceive it as a mechanism for adjusting natural and human systems (in response to the effect or impacts of climate change) that moderate damage or take advantage of the beneficial opportunities related to climate change. In this respect it warns that the Caribbean is already experiencing some of the negative effects expected from climate change and that, therefore, now is the time to take action at regional, national and local levels to reduce vulnerability and adapt to changing conditions. It shows the different adaptation measures undertaken by the Caribbean countries, including creating networks and strengthening institutional capacities.

INSERT FIGURE 21

-
- Risk management plans
 - Responsibility for development
 - Links with other planning processes
 - Education and communication
 - The eight elements of an adaptation strategy
 - Legislation and compliance
 - Information and good science
 - Financing adaptation
 - Support networks
-

Figure 21. Elements of adaptation strategy. Source: Thompkins and others 2005

By way of example Box 7 gives a brief summary of the most relevant actions.

Box No. 7. Principal adaptation actions undertaken by the Caribbean SIDS

Caribbean Planning Project on Adapting to Climate Change in the Caribbean -- ACCC (1997 - 2001). This was a response to the Barbados Programme of Action and its objective was to build capacities in the region to adapt to the impacts of climate change, in particular the rise in sea level (Figure 22). This action was achieved by assessing vulnerability, adaptation planning and capacity building activities. Outstanding among its specific achievements are: the establishment of a sea level and climate control system; improving access to and availability of data; increasing awareness about questions concerning climate change when making policies; integrating the needs of countries to broaden vulnerability assessment; establishing protocols to monitor coral reefs; articulating climate change adaptation policies and application plans; creating a harmonized regional network.

Project on Adapting to Climate Change in the Caribbean - ACCC (2001-2004)

Among its principal components this project contemplates: public education and outreach; integrating climate change into physical planning, using a risk management approach; strengthening regional technical capacity; implementing adaptation strategies in the water sector; human health; agriculture; and nutrition.

Project on Incorporating Adaptation to Climate Change (MACC)

The main objective of the MACC project is to include adaptation to climate change in national development planning. The project has five components (Figure 23).

In this project vulnerability assessments of communities at risk are conducted by studying their history and possible climate change impacts in order to design options for adaptation policies.

Caribbean Community Climate Change Centre (CCCCC). This centre coordinates the region's response to Caribbean climate change and is the central point for information, risk management and adaptation in the Caribbean. The CCCCC is now the executing agency for the MACC project.

Project on pilot adaptation in Saint Lucia, Dominica and Saint Vincent and the Grenadines (2007-2011). The project's objective is to support these countries in applying integrated measures to adapt to climate change. It emphasizes the impact of climate change on the region's natural resource base, especially on biological diversity and land degradation along the coast.

Capacity Building for Stage II Adaptation to Climate Change in Central America, Mexico and Cuba. This aims to demonstrate how policy adaptation can be integrated into national efforts for sustainable development in at least four human systems: water resources, agriculture, human health and coastal zones.

INSERT FIGURE 22.

Figure 22. Principal components of the ACCC project

Regional projects

Pilot projects

<ul style="list-style-type: none"> – Design and implementation of the sea level and climate monitoring network. – Development of databases and geographic information systems. – Inventory of coastal resources. – Formulation and use of initial adaptation policies. 	<ul style="list-style-type: none"> – Monitoring coral reefs (Bahamas, Belize and Jamaica). – Assessment of coastal vulnerability and risk (Barbados, Guyana and Grenada). – Economic assessment of coastal and marine resources (Dominica, Santa Lucia and Trinidad and Tobago). – Formulation of economic proposals/regulatory). – National communication.
--	--

Source: MACC

INSERT FIGURE 23

Principal MACC project components

- ° Including adaptation to climate change in development planning and public and private sectors strategy
- ° Support the formulation of a regional adaptation strategy and specific adaptation measures
- ° Amplify and strengthen the present knowledge base to facilitate assessment of the impact of climate change as a basis for decision making adaptation
- ° Public education and outreach activities, including dissemination in the region
- ° Project management

Figure 23. Principal components of the MACC project

D. Strengthening the “information on the environment” capacity.

The ACCC assessment highlights capacity building on "information on the environment", i.e. observations about the current situation and modelling and forecasting future states, as one of the crucial activities for Adaptation to Climate Change in the SIDS. It makes a comprehensive review of the principal capacities in the Caribbean region that are relevant to information on climate change (Box 8).

Box 8. Summary of the main capacities in the Caribbean region

Institutional:

- *The Caribbean Meteorological Organization (CMO)*. A specialized agency of CARICOM that coordinates a set of scientific and technical activities on weather, climate and water related sciences in

16 Caribbean countries. The CMO objectives are to promote and coordinate regional efforts in the fields of meteorology and related sciences.

- *University of the West Indies (UWI)*. Regional higher education institution in the Caribbean Community. Performs statistical analysis of regional climate and its dynamics, is involved in Assessments of Impacts and Adaptation to Climate Change (AIACC), educational and training activities as well as institutional strengthening in all aspects of climate change to benefit the CARICOM region.
- *The Caribbean Disaster Emergency Response Agency*. This is the CARICOM agency responsible for disaster response. It has been working to create a methodical preventive approach to disaster management by assessing the vulnerability of programmes. It is executing the Caribbean Hazard Mitigation Capacity Building Programme (CHAMP) designed to assist Caribbean countries to develop national policies to reduce vulnerability and risk and to implement associated programs. CHAMP includes the development of geographic information systems, hazard mapping, sectorial assessments, among other activities.
- *The Inter-American Institute for Global Change Research (IAI)*. Conceived as a regional organism to conduct research that requires participation by countries in the region, IAI serves as a collaborative network of research institutions working together to implement its scientific agenda on four key issues: Changing Climate and its Variability in the Americas; Comparative Studies of Ecosystems, Biodiversity, Land Use and Cover, and Water Resources in the Americas; Global Modulations of the Composition of the Atmosphere, Oceans and Freshwater and Human Dimensions; and Policy Implications of Global Change, Climate Variability and Land Use.

Capacities and assessment instruments and analysis:

- *Development of regional scenarios*. System of regional climate models developed by the Hadley Centre of the Office of Meteorology of the United Kingdom so that they can be used by countries. The system is based on the assumption that the scale of the "models" is not enough to address climate change in Small Island developing States.
- *Modelling the vulnerability of biodiversity to climate change in Mesoamerica and the Dominican Republic*. The Water Centre for the Humid Tropics of Latin America and the Caribbean (CATHALAC) worked on applying high resolution global change data models at the level of Mesoamerica and the Dominican Republic to assess the vulnerability of ecosystems to climate change. The work was undertaken in the context of the Regional Visualization and Monitoring System (SERVIR) that CATHALAC carries out with NASA, the U.S. International Development Agency and other partners.
- *Insurance as a tool for Risk Reduction and Management*. A vital tool for most Small Island Developing States, especially for coastal areas, communities and sectors such as tourism. It offers a unique opportunity to spread and transfer risks, provides incentives to reduce and prevent risks and, therefore, helps to withstand external shocks, while stimulating private sector participation in climate change response actions. One of the benefits of promoting insurance-related measures is that they help to encourage efforts to quantify the risks and potential losses due to climate change.

Based on the analysis of the International Framework for Cooperation and Regional Capacity Building, the ACCC assessment recommends that systematic spaces be created in the region where experiences and lessons learned could be shared by communities facing similar problems; it also recommends that, in order to achieve concerted response initiatives, climate change be included in the work of different regional organizations and networks, in particular in the sectors associated with water, energy and agriculture,

Box 9 Principal actions in the Regional and International framework for Cooperation and Capacity Building

- The Regional Framework suggests more integration of different capacity building actions developed by the Caribbean Community and the CARICOM Common Market, the Organization of

Eastern Caribbean States, the Regional Seas Programmes (Caribbean Environment Programme), and the Association of Caribbean States.

- The International Framework for this purpose makes an in-depth study of the actions and results of:
 - *The Small Island Developing States Network*, whose main objective has been to use information and communication technologies (ICT) based on the Brussels Programme of Action;
 - *Forum of Ministers of the Environment of Latin America and the Caribbean* is a high-level regional policy meeting where agreements are reached about environmental policies and integrated responses, and where more efficient and coherent regional and international cooperation is promoted;
 - the *World Climate Observation System* that ensures observations are made and information given to address issues related to the climate and make them available to all potential users;
 - the *Impact Assessment and Adaptation to Climate Change Project* that aims to: advance scientific understanding of climate change, its impacts, vulnerabilities and adaptation options in developing countries; develop scientific and technical capabilities to bolster national communication on climate change; support the participation of experts from developing countries in the IPCC and other international scientific activities, and develop networks that link science and policies to implement adaptation plans and actions.

E. Include the theme of climate change and disaster management in development strategies and programmes.

On this basis, the assessment points to the urgency of translating many actions into practical measures in the countries and in the region, with specific concrete mitigation and adaptation measures included in development strategies and programmes; it emphasizes the need for environmental and energy security, of making more use of renewable energy and energy efficient technologies, and uses the opportunity to take advantage of the Kyoto Protocol and the emerging carbon market to advance towards a more efficient, reliable and economically competitive and less carbon intensive energy sector. Also underlined is the crucial importance for Caribbean countries of adapting to climate change, stressing that only by implementing adaptation options and policies included in planning frameworks such as those developed by ECLAC, OECS and CCCCC, can the region's vulnerability be minimized.

As a mechanism to monitor the actions undertaken, it recommends that more use be made of vital tools to assess and put into effect responses to climate change, such as systematic assessments of regional climate trends and their projected impact, vulnerability and adaptation; to do so, scientific knowledge, models, tools and methodologies must be made available and training provided on how to use them, as well as technical support.

It also notes that, in the short term, knowledge and technologies are already available that can be applied to adaptation, and they include: specific building codes, restrictions on construction in flood-prone coastal areas, changing crop varieties and management of agro-ecosystems, among others. Some of them are shown in figure 24.

INSERT FIGURE 24

Sea level rise

- ° Build seawalls and breakwaters
- Improve conservation of natural sea defences (mangroves)
- Relieve anthropogenic tensions on reef systems
- Rebuild beaches (expensive)

Prohibit sand exploitation
Create a local protected marine areas system

Water sector

° Water desalinization
Water conservation
Recycle industrial greywater
water collection
groundwater recharge
drip irrigation in agriculture

Buildings in keeping with the environment

° Design buildings with efficient refrigeration
Sufficiently far from the coast
Access to coastal infrastructure outside the zone of costal erosion

Incentives (taxes, insurance) for industry

Policy

° Tax incentives for tourism infrastructure changes

Tax regime to encourage sustainable construction in less vulnerable coastal zones

Include climate change considerations when in land use planning

Retraining of displaced workers

Sea level rise

° Build seawalls and breakwaters
Improve conservation of natural sea defences (mangroves)
Relieve anthropogenic tensions on reef systems
Rebuild beaches (expensive)
Prohibit sand exploitation
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Policy

° Tax incentives for tourism infrastructure changes

Tax regime to encourage sustainable construction in less vulnerable coastal zones

Include climate change considerations when in land use planning

Retrain displaced workers

Figure 24. Some adaptation indicators in the Caribbean. Source: Trotz 2007

It stresses that the issue of climate change and disaster management must be integrated and incorporated as a substantive part of risk management actions in the region, including early warning systems.

The ACCC assessment states that regardless of the region's limitations, Caribbean countries have taken significant steps to improve their ability to act in concert in pursuit of common objectives to meet the challenges associated with climate change. The Caribbean countries have had to include environmental considerations in their development policies because of the potential threats climate change poses to the natural resource base that sustains their economic growth. Although poverty eradication, education, health and housing problems continue to be priorities, climate change is increasingly becoming an issue of the utmost importance on Caribbean countries' national agendas because of its undeniable synergy with the above issues that reinforces the already existing vulnerability of the Caribbean island countries.

Therefore, this report about the elements of good practice included while it was being prepared and in the final results, provides guidance on how the region should respond not only by developing a national agenda on climate change, but also by creating an international climate change adaptation mechanism and implementing the Kyoto Protocol, taking into account the special needs of Caribbean SIDS.

II.7 International Assessment of the Role of Agricultural Knowledge, Science and Technology for Development (IAASTD). 2009

II.7.1 Brief outline and main results.

The International Assessment of the Role of Agricultural Knowledge, Science and Technology for Development (IAASTD), was the result of a lengthy worldwide consultation process. It was initiated in August 2002 by the World Bank and the United Nations Food and Agriculture Organization (FAO) and involved more than 800 representatives of governments, the private sector and civil society. The results of the consultation process, overseen by a steering committee, were presented at a plenary intergovernmental meeting in Nairobi in September 2004. In this framework it was proposed that an international assessment be made of the role of agricultural knowledge, science and technology (AKST) in reducing hunger and poverty, improving livelihoods in rural areas and promoting environmentally, socially and economically sustainable development. Approval was given and this assessment was initiated in 2005 .

The general context in which this assessment would be developed is characterized by a world in which changes are rapid and unprecedented; urbanization, more inequality, human migration, globalization, changing food preferences, climate change, environmental degradation, tendency to use biofuels, and population growth. Pointed out also are problems that lie ahead in supplying food in a global trading system in which agricultural and other natural resources are converted to other uses.

For Latin America and the Caribbean (LAC) this context is shown with a panorama that matches that reflected in other integrated assessments conducted in the region over the past five years. There are about 209 million poor and 54 million malnourished people representing 37 and 10 percent respectively of the total population, although food production is three times the amount of food consumed. It is the region with the world's highest rates of inequality implying a lack of access to and poor distribution of food, and the purchasing power of a large population sector. In contrast, food production in LAC is not severely limited because it has natural resources such as arable land, water and biological diversity. These resources have been underutilized or misused. Urbanization and agricultural expansion and intensification have resulted in an increasing loss of soil and biological diversity. Conventional technologies have displaced traditional and local knowledge. This process of cultural, genetic and technology erosion has neglected the rural ancestral cultural heritage that is adapted to the environment and has left the way open for the appearance of relatively uniform external knowledge and cultures.

The development of a model focussed on the knowledge of agricultural systems and the application of an appropriate methodology leads to the following important considerations for Latin America and the Caribbean,

- Agricultural knowledge, science and technology systems in the region have not responded to the problems of small producers, indigenous and traditional communities, and of reducing poverty, hunger and environmental degradation. At present, neither do they fully satisfy the new demands of society that mean making compatible the goals of competitiveness, sustainability, social and cultural inclusion.
- The need to promote greater participation and democratization when defining and implementing the IAASTD agenda to integrate excluded sectors, to increase access to information, build or strengthen capacities to participate in decision making, to encourage reciprocal interaction between traditional agroecological and conventional knowledge and know-how in order to effectively help to achieve greater sustainability of production systems so that they can evolve into more agroecological systems.
- The urgent need to redirect research as a contribution to strengthening urban agriculture and peri-urban diversify and to revitalize activities in rural areas; to develop and prioritize new fields of knowledge (complexity of biological systems, biotechnology information, precision agriculture, biomedicine and alternative medicines); carry out more integrated studies to link ecological and social systems and that take into account the possible impacts on the environment and human well-being.
- The obligation to develop and strengthen innovations that foster sustainable competitiveness, internalize environmental and social costs and improve access to markets (domestic and export) by all sectors but, in particular, by the most vulnerable social groups, to give women a special role by having access to knowledge and by actively participating in the different processes.

- The urgent need to promote institutions and networks, build local capacities and skills to provide collective benefits while being mindful of individual interests.
- The importance of improving and increasing social control of IAASTD made possible by genuine civil society participation in a system in which developing and implementing public policies in support of IAASTD is based on a broad political and social consensus, on concrete realities and on participatory assessment mechanisms, both before and after different public policy instruments are developed
- The urgent need for greater IAASTD interaction and coordination in LAC, both locally and internationally to take advantage of the relative strengths of each country in the Region to provide benefits to the destination countries and their more vulnerable communities.

The global report, the summaries and summary reports were accepted by the intergovernmental plenary meeting held in Johannesburg in April 2008. They were fully approved by the governments of all the LAC countries attending (Belize, Brazil, Costa Rica, Cuba, El Salvador, Honduras, Panama, Dominican Republic, Paraguay and Uruguay). The results of this assessment have attracted widespread interest by many different stakeholders because of its implications and the various response options to strengthen and manage the Agricultural Knowledge, Science and Technology system that are plausible, efficient and effective in the context in which they develop, and the willingness of decision-makers to make a decisive contribution to the Millennium Development Goals.

II.7.2 Good Practices Examples

In this integrated assessment and interconnection was achieved between science and policy that was supported by a proper process of communication and dissemination. Mentioned below are some aspects of good practices that characterized this assessment.

- A. Terms of reference and accurate definition of the context in which the integrated assessment was developed and made available to all those interested.
- B. Use of a conceptual framework for this specific IEA, according to the objective to be assessed.
- C. Successful selection of experts nominated by different interested parties, and active participation by a large group of stakeholders at different times during the process.
- D. Solid external peer review and well designed consultation process.
- E. Use of a wide range of relevant scientifically and technically recognized information and publications throughout the process and references in the final report.
- F. Effective communication and dissemination during the process and subsequent to the final report.

A. Terms of reference and accurate definition of the context in which the integrated assessment was developed and made available to all those interested.

The central objective, geographic area, theme and time period of this assessment, the way it was conducted, participation and possible products to be prepared, were defined with an intergovernmental process.

The central objective was to assess how to use agricultural knowledge, science and technology to improve the means of subsistence in rural zones and promote environmentally, socially and economically sustainable equitable development. The initial good practices link with respect to interconnection between science and policy would be to adopt this objective as well as the scope of the assessment (Figure 25),

INSERT FIGURE 25

General Scope

Show how useful, necessary and essential agricultural knowledge, science and technology are to achieve the desired development objectives and sustainability. But it is recognized that the complexity and political and social dynamics of the problems described in the context cannot be solved by this approach alone.

This is how the principal objective of this assessment is framed.

public and private sectors generating, having access to, disseminating and using agricultural knowledge, science, technology by the public and private sectors, including local, traditional and formal knowledge,

technologies, practices, policies and institutions and the impacts, both past and possible.

the role of markets and trade.

A global assessment and five regional assessments (Central and Western Asia and North Africa; East and South Asia and the Pacific; Latin America and the Caribbean; North America and Europe; and Africa South of the Sahara). The geographic area defined allowed the selection of experts, specific priority themes and basic sources of information.

° Geographic range

It was decided to take the past 50 years and assess what had happened, what was learned and how it has been, and will be, used. Look forward with a projection for the year 2050 by considering possible development alternatives.

° Time range

Figure 25. General scope of the International Assessment of the Role of Agricultural Knowledge, Science and Technology in Development (IAASTD)

From the beginning key considerations shared by all interested parties were defined. This helped to conduct the process and direct it towards the main objective.

In this case, defined as examples were: agriculture's multiplicity of functions involving development and sustainability while also boosting agricultural production; the role of knowledge, and the conceptual difference between it and information; The recognition of the contribution made by science and structured technology, as well as by local and traditional knowledge; the complexity of agricultural production systems that depend, on

the one hand, on the concrete and current characteristics of the different agroecosystems and, on the other, on their political, economic, social and cultural contexts; how local, regional and global environmental problems ((biodiversity loss, climate change and availability of safe water) caused by very varied complex and interconnected pressures, are linked to the services provided by ecosystems and the impact these problems have on food security and, therefore, on human well-being; the need to assess intersectorial issues: bioenergy, biotechnology, climate change, human health, natural resources management, trade and markets, local and traditional knowledge and community-based innovation, as well as the role of women in agriculture.

To conduct this assessment a bureau was established with various interested parties and with geographically balanced representation that included key stakeholders. At global level 60 representatives were included from: governments, NGOs, the private sector, producer and consumer groups, scientific and United Nations organizations, unions and foundations, as well as recognized scientists. The bureau was structured to allow continuous follow-up of all intermediate products, consultations, and of how all the reports were reviewed, drafted and prepared.

Everything expressed here helped to provide coherency to the analysis, issues and interconnected and often discordant complex areas such as: the environmental impact of increasing productivity; the impact of transgenic crops on the environment and on human health; the consequences of bioenergy development on the environment and the price and availability of food over the long term; as well as the impacts of climate change on agricultural production. It also showed that in the present context more plausible and feasible response options can be developed by using different combinations of traditional knowledge together with new knowledge.

B. Use of a conceptual framework for this specific IEA, according to the objective to be assessed.

In this assessment a model is applied that focuses on knowledge of agricultural systems and produced by multiple stakeholders: researchers, farmers, civil society and public administration organizations. These stakeholders are interconnected internally and between one another in the framework of the Agricultural Knowledge, Science and Technology system.

This system is expressed in policies in the areas of: science, higher education, technologies, extension, technical and vocational training, innovation, intellectual property, financial credits and environmental impacts. These policies affect different stakeholders' access to knowledge, technology, financial and other resources and the benefits they receive from them. It also recognizes that the dynamics of the system itself strongly depends on the development and sustainability goals formulated, as well as on the characteristics of food systems and the direct and indirect driving forces that play a part.

This is why this assessment accurately places its objective as part of the sustainable development problem and on allowing the main interrelationships to be identified within and among the different components and helping to establish concrete indicators to make a qualitative and/or quantitative measurement of causes and effects, and helps to identify response options.

C. Successful selection of experts nominated by different interested parties and active participation by a large group of stakeholders at different times during the process.

As a first step, the bureau selected around 400 experts nominated by different interested parties. These experts, from various disciplines, specialties, sectors and regions, all linked to agricultural and rural development, made a personal commitment to the process. They participated as coordinating authors, main authors, contributing authors and editors-reviewers of the different chapters. The global report involved 20 Latin America and Caribbean experts from Argentina, Bolivia, Brazil, Costa Rica, Ecuador, Jamaica, Mexico, Peru, Trinidad and Tobago, and Uruguay and, specifically for LAC, 43 authors from 15 countries in the region took part. Local stakeholders also took an active part and the assessment brought together 110 governments.

There was outstanding support and participation by international organizations: United Nations Food and Agriculture Organization (FAO), the Global Environment Facility (GEF), the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Bank and the World Health Organization (WHO) that cosponsored this assessment, and financial support was provided by others. This extensive backing shows the need for and the relevance of the assessment, its transversal character and its decision making importance at different levels and extents, closely linked to the sub-context of the United Nations Millennium Development Goals (MDGs).

D. Solid external peer review and well designed consultation process.

This process was noteworthy for reviewing the preliminary version of the report that was published on a free access web site for those wishing to comment: there were two rounds of peer reviews by participating governments, organizations and individuals and an external review with the participation of governments among other stakeholders to complement the peer review by specialists. The peer review of the report was made by ten experts in LAC countries (Argentina, Brazil, Chile, Colombia, Costa Rica and Mexico).

The participation achieved throughout the entire assessment process allowed for different criteria to be used, opinions to be expressed that were often contradictory and reflected the variety of interests and perspectives of the different parties and interested sectors.

The stakeholders involved took an active part and came to share an understanding of the objectives, thus creating a climate of trust and responsibility among them and, therefore, a commitment to the principal results.

All this is an indication of the legitimacy of the process and the results.

E. Use of a wide range of relevant scientifically and technically recognized information and publications throughout the process and references in the final report.

The complete range of information and publications used were analysed, compared, integrated and summarized.

An explicit review was made of earlier assessments linked to the purposes and themes of the assessment about to begin. This came from analysing the results of relatively recent assessments which, in one way or another, are concerned with the agricultural sector: The State of Food Insecurity in the World (FAO, 2004); InterAcademy Council Report: Realizing the Promise and Potential of African Agriculture (2004); The United Nations Millennium Project Task Force on Hunger (2005); U.N. Millennium Ecosystem Assessment (2005); CGIAR Science Council Strategy and Priority Setting Exercise (2006); Comprehensive Assessment of Water Management in Agriculture: Guiding Policy Investments in Water, Food, Livelihoods and Environment (2007); reports of the Intergovernmental Panel on Climate Change (2001 and 2007); Fourth Report on the Global Environment Outlook (UNEP, 2007); World Development Report 2008: Agriculture for Development (World Bank 2007); IFPRI Global Hunger Indices (yearly publication), and Internal Report of Investments in SSA (World Bank 2007). It also considered hundreds of publications (referenced in each chapter), with different views, time frames and geographical zones. Also recognized were the criteria of local stakeholders that broadened approaches with their traditional knowledge and helped to complete data, make the historic assessments and demonstrate other ways of doing things.

F. Effective communication and dissemination during the process and subsequent to the final report.

Different products were developed aimed at specific target publics, including a global report and five regional reports with their respective summaries prepared for decision-makers. Each chapter of these reports includes the main messages, the methodology used, the most relevant aspects, and makes coherent use of the available information and data. Some of them also describe various problems and how they evolved, including some key concepts such as food security and organic agriculture. All this makes the text more understandable and believable, despite the complexity of the issues addressed.

The summary report with the main conclusions of the global and regional assessments is intended for a broad group of stakeholders including: policy-makers, the private sector, NGOs, producer and consumer groups, international organizations and the scientific community. There are no recommendations in these documents, but they suggest different measures for taking action.

From the assessment reports various documents were directly extracted such as: thematic synthesis reports (Bioenergy and biofuels; Opportunities and limitations; Business as usual is not an option; The role of institutions, trade and markets; Continuing along the same path is not an option; Food security in an unstable world; Food safety, animal and plant health; Aspects related to human health and sustainability; Human health and nutrition; and Towards multifunctional agriculture to achieve social, environmental and economic sustainability). They reflect the problems, are easily understood and call for action to be taken.

There is also a group of well-designed multimedia, accessible and scientifically sound, that show the main conclusions reached by this integrated assessment.

All the reports and other products are characterized by being well illustrated with graphs, figures, maps, and are able to present the information that has been managed or produced so that it can be used and understood by a specialized public and others including high-level officials.

It is recognized that this integrated assessment of knowledge, science and agricultural technology, provides for the period specified integrated and expert scientific information on various complex and closely related themes (agriculture, poverty, hunger, human health, natural resources, environment, development and innovation). This definitely helps the responsible authorities to make decisions, be better prepared to address critical issues concerned with policy making and management about scientific research, capacity building, technology, innovations, the role and strengthening of institutions and investments, and in their direct link with environmental changes and globalized economic systems, and with local, sub-regional and global peculiarities. It identifies uncertainties, how new jobs are created, new research and new assessments.

II.8 Environmental Profile of Guatemala 2006: environmental management trends and reflections.

II.8.1 Brief outline and main results

To prepare the Environmental Profile of Guatemala 2006, the objectives of were declared from the outset. In a general sense these are to:

- Analyse the main trends related to the state of resources and environmental conditions in Guatemala, using as a base the previous report and the analysis made of the information available and provided by the process's different stakeholders for the period 2000 to 2006;
- Make a responsible, timely and systematic contribution to filling information gaps on environmental issues in order to make more effective the different policy making processes and public and private strategies linked to the national environment;
- Strengthen or redesign schemes on natural capital management and show areas of opportunity where this can be strengthened.

The technical development, production and publication process of the Environmental Profile of Guatemala 2006 was the responsibility of the Rafael Landivar University (URL) through its Faculty of Environmental and Agricultural Sciences (FCAA), and basically by the Institute of Agriculture, Natural Resources and Environment (IARNA) and the Environmental Impact Institute Association (IIA). The Royal Netherlands Embassy in Guatemala actively participated as co-sponsor of the project, and it make conceptual contributions during the entire process. Different entities with various roles and responsibilities participated, most of them potential users of the results of the assessment.

To analyse the Capital Equilibrium model the following concepts were used: Natural, Financial, Physical, Human and Social (Figure 26). This model proposes that the balance of these capitals determines whether economic growth is sustainable, based on the premise that natural capital does not degrade over time, human capital maintains and improves its quality and that injections of physical and financial capital are linked to the above.

INSERT FIGURE 26

Capital from the sustainable development viewpoint

Natural capital	Is that created by nature as a stock of goods and services useful for the present and future
Financial capital	Financial services used by people to achieve their livelihood objectives
Physical capital	Includes basic infrastructure and assets to support livelihoods
Human capital	Based on human knowledge and intellectual capacity
Social capital	Formal and informal relations that give people different opportunities and benefits for their livelihoods

Figure 26. Concepts of natural, financial, physical, human and social capital

Applying this model and assessing how a group of selected indicators behave reflects the existing panorama in Guatemala and is described in the final report. It is suggested that the socioeconomic model prevailing in the country favours economic growth (physical and financial capital) at the expense of human, natural and social capital. With respect to natural capital it is pointed out that the natural capital indicators developed to assess the pressures, the state and the country's responses show a negative balance, because economic activities have increased pressure on natural resources and, therefore, have caused accelerated degradation of the environment. All this inevitably results in reproducing the vicious circle of environmental degradation and social instability.

In selecting the themes to be dealt with in the process and the report account was taken of the following aspects: Guatemala's great natural and cultural diversity, distinguished by its large variety of species and ecosystems; the economic activities developed and their impact on the natural capital; and perhaps most important, the ability to show that opportunities been missed or underused and might be taken advantage of by using consistent and balanced models of environmental management and, therefore, bringing about a significant change in the existing panorama. That is why the following responses were analysed: Do they exist? What are they? Who develops them? Are they sufficient? And proposals are made about national environmental management considered as a set of actions undertaken by society, or part of it, in order to protect the environment and change a current situation into one that conforms with how it is perceived by the stakeholders involved; for this reason environmental management does not only refer to government, but increasingly depends on very diverse social forces.

Based on the report Environmental Profile of Guatemala 2006, four thematic reports were published on socio-environmental vulnerability, water resources, land, and environmental accounts that make an in-depth study of them. All are available and accessible to a wide public.

II.8.2 Good Practices

A clearly written, well founded, final report was prepared. It points out the gaps in knowledge, data and information and the direction that should be taken in future. This process and its results have strengthened and developed new capacities to maintain and provide society with different levels of reliable information about the state and trends of the environment and the implications for sustainable development in Guatemala. The following summary highlights the main elements of good practices.

- A. Use different mechanisms to ensure participation in the process by different entities and experts, as is documented in the final report.
- B. Develop and make coherent use of a conceptual framework and new methodological approach, to guide the process and the final report.
- C. Establish clear procedures to collect and present data and information, verify the quality and point out limitations.
- D. Give a precise description of and substantiate the justification for all the conclusions and recommendations.
- E. Build capacities to provide the country with more possibilities to continuously monitor and assess the environment, its causes and consequences.

A. Use different mechanisms to ensure participation in the process by different entities and experts, as is documented in the final report.

Coordinating the whole process was the responsibility of the Rafael Landivar University (URL) while the team conducting the process had a General Coordinator and an Operations Coordinator, who also worked as editors and authored some chapters. Authors were selected according to the chapters, and key responsibilities, for example on systematizing and processing information and on the use and management of Geographic Information Systems, were given to other specialists,

Many entities, both public and private, provided information according to their roles and institutional responsibilities, including representatives from different sectors and civil society. This participation is acknowledged in the final report.

The participating organisms included: Ministry of Environment and Natural Resources, Ministry of Agriculture, Livestock and Food, particularly the Geographic Planning and Risk Management Unit and the Fisheries and Aquaculture Management Unit; Ministry of Energy and Mines, especially the Directorate General of Energy, and the Information and Promotion of Renewable Energy Centre; Ministry of Health and Welfare; National Council of Protected Areas, especially the Monitoring and Assessment Centre and the Technical Biodiversity Office; National Forestry Institute; National Institute of Statistics; National Institute of Vulcanology, Meteorology and Hydrology; Bank of Guatemala; Secretariat of Programming and Planning of the Presidency; National Geographic Institute; the Wholesale Market Administrator; the Third Millennium Association; Wildlife Defenders Foundation; Institute for Environmental Law and Sustainable Development (IDEADS); Mario Dary Foundation; Centre for Legal and Environmental Legal Action of Guatemala; Research and Social Studies Foundation; International Resources Group; The Nature Conservancy; National Nature Conservation Fund; United Nations Representation in Guatemala; Air Quality Laboratory at the University of San Carlos de Guatemala; and the Geographic Information Systems Laboratory of the Valley of Guatemala University. In fact, all of these are important target publics for the products of this initiative because they include decision-makers, researchers and sectorial users, all of whom are most likely to make use of the results.

B. Develop and make coherent use of a conceptual framework and new methodological approach, to guide the process and the final report.

This good practices aspect leads to the central objective of the assessment being addressed and complied with.

By using the Capital Equilibrium Model, it is considered that this equilibrium determines the speed of long-term economic growth and the level of social equality such growth produces. Therefore, this balanced accumulation of capital is unfailingly generated by social capital and, consequently, generates sustainable development.

The analysis of the equilibrium capital model is begun by using key concepts and considerations, clearly outlined in chapter 1, in only 12 pages (Figure 27).

INSERT FIGURE 27

Chapter 1. CONCEPTUAL FRAMEWORK: EQUILIBRIUM CAPITAL AND SUSTAINABLE DEVELOPMENT

1.1 Prior considerations about equilibrium capital and sustainable development	1.2 Equilibrium and disequilibrium of capitals	1.3 A change of model: towards equilibrium capital
Presents basic considerations in relation to economic development and the growth of the economy, with more conventional measurements	Explains what this equilibrium is and if it determines whether growth is environmentally compatible and government responses to this imbalance. Indicators are given for Guatemala.	Points out what this development model should include, indicating that the problem is not just technical, but rather political; changing the model requires significant political work.
The Gross Domestic Product (GDP) Implications about natural capital and human capital	What causes imbalances Human capital Natural capital Government responses to imbalances How the model is reproduced and imbalances accentuated	Social capital accumulation Social participation and strategic movements needed to achieve capital accumulation and equilibrium

Figure 27. Schematic description of chapter 1.

This chapter is crucial because it is where the model is developed and explained with precision and clarity. It answers questions like: What is the problem? What is wanted? What are the interrelationships between the model's components? Figure 28 summarizes the components of physical, human, natural and social capital. Social capital is described as the result of investment and equilibrium among the other capitals and depends on the mechanism by which investments are made in each of them. It makes clear that it is only possible to accumulate social capital by means of a balanced capital accumulation resulting from social participation in defining and executing decision making policies.

INSERT FIGURE 28

Human capital components

Food Security, Health, Culture, Sports, Education, Training, Housing, Public Services

Physical capital components:

Constructions, Highways, Communications, Energy, Financial Services

Social capital components:

Citizen Rights, Local Associations, Social Organization, Solidarity and Confidence

Natural capital components:

Land Use, Protected Areas, Sanitation, Basin Management, Hydrological-Forestry Management, Clean Production

Integrated Human Development (Human Capital)

Infrastructure and Capital for Production Development (Physical-Financial Capital)

Participation, Institutional Development and Good Government (Social Capital)

Integrated Environmental Management and Natural Resources (Natural Capital)

Figure 28. Capital equilibrium and its components. Source. Environmental Profile of Guatemala 2006

This ensures that the model is understood and used by all participants in the process and, finally, by the main users of the results of this assessment. It helps, therefore, to link science and politics.

The methodological approach used in Chapter 2: Pressure-State-Impact-Response (PSIR), together with the capital equilibrium model, guides all the analyses and assessments. The approach allows us to simultaneously analyse the state and trends of the environment; the pressures that loom over it; the impacts on society in general and the responses given by the country that directly affect its state. Among the responses, primary consideration was given to those coming from the public. Among them both those about eliminating or at least minimizing the pressures, and those on taking advantage of the opportunities provided by the country's natural capital, sought more responsible development schemes by making use of nature.

The document is coherent with the methodological approach to each of the themes analysed. The topics selected were: land, forests, biodiversity and protected areas, water, coastal marine resources, climate and environmental vulnerability, agriculture and food security, solid waste and energy. As an example a schematic demonstration is presented as to how the issue of water was treated (Figure 29).

INSERT FIGURE 29

Chapter 2. Water Theme

Pressure

Current demands for water: for irrigation; industry and other uses
Dynamics of total demand for water

State

Available of water resource (water supply)
National water balance

Impacts

Water quality surface water: and household water
Morbidity

Responses

Public investment in water and sanitation
Disaster risk management
Protection of water recharge sources
Treatment of sewage
Social participation in water management

Final considerations

Figure 29. Schematic representation of water theme in chapter 2.

C. Establish clear procedures to collect and present data and information, verify the quality and point out limitations.

The analysis and results of the previous edition of the Environmental Profile of Guatemala published in 2004 and its advances in scientific and methodological knowledge were included; also considered was how the final reflections of the former influenced decision making and how the main environmental problems were solved two years earlier.

Throughout the process it was ensured that information would be used that had been produced by different institutions, many with responsibilities in managing these issues.

It was made explicit that, when so required, the information considered for a specific theme is limited as to time and space. For example, it is specified that "Although there is a map of vegetation and land use updated to 2003 and with more detail (scale 1:50,000) (MAGA, 2006), a new estimate cannot be made of land use intensity until a more detailed updated map of land use capacity is also available. In these circumstances and as a reference, data are kept on land use intensity presented in the previous edition of the Environmental Profile, shown in table 23 and map 4." Because it gives guidance as to which data and information need to be completed, updated, or created, this is a good practices element.

In the same vein, but alerting those responsible for decision making, it says: "Even with substantial difficulties in the ability to produce and analyse information, it is unquestionable that there is now sufficient knowledge available to lead to the conclusion that it is inappropriate to continue thinking about and acting on natural resources as if they were in unlimited supply."

It is clearly seen whether the data and information used or reflected in the final report are new or partially updated. For example, for the water theme it is shown how a specific study was included whose objective was to update the National Water Balance (Figure 30); new data were obtained on the resource's supply and demand in the country, and improvements were made to the previous report's estimates. In addition, presented are actions taken on water management by various institutional stakeholders during the period 2000-2004, highlighting those made by the water and sanitation sector.

INSERT FIGURE 30 -- MAPS

Index of annual water shortage, 2005
2 MAPS

Figure 30. Example of some ways to represent the results for the water theme. Index map of annual water shortage 2005.

Shown in most cases is how the data, indexes and indicators evolved and are presented as tables, graphs and maps, in many cases using the possibilities provided by the Geographic Information Systems (for example figure 30).

In the final document reference is made to 174 technically sound and relevant bibliographic documents that correspond to the context and objective of this report.

D. Give a precise description of and substantiate the justification for all the conclusions and recommendations.

This good practices element was supported by the fact that 90 environmental and socioeconomic indicators were selected and permitting a baseline to be established in areas related to the topics covered when analysing state and trends and to warn about risks, threats and vulnerabilities.

For example, those only linked to the main environmental components reflected that 37% had a negative performance, 18% showed improvement and 12% remained stable, although the baseline showed deterioration. New estimates were made about a 33% objective thanks to better technological possibilities, but the estimate for almost half was discouraging. Because of this the report states that intuition could unquestionably substantiate what is directly perceived or experienced: natural resources and environmental conditions are becoming increasingly depleted and their capacity to regulate essential ecological functions in different locations is, therefore, more diminished.

E. Build capacities to provide the country with more possibilities to continuously monitor and assess the environment, its causes and consequences.

The capacity to produce and administer information produced by IARNA and other URL academic units, especially the institutionalization of the environmental strategic information systems, has become the basis for the orderly and consistent analysis of the selected environmental and socioeconomic indicators, and for the systematic production of the Environmental Profile report. Institutionalization of the strategic environmental information system in IARNA-URL receives direct financial from the the URL and, in addition, has found synergy with similar initiative developed by IARNA-URL within the framework of the Integrated Environmental and Economic Accounts System Project (Count on the Environment Project) both financed by the Netherlands government through the Netherlands Organization for International Cooperation in Higher Education (Nuffic) and the Embassy in Guatemala respectively. It is also pointed out that IIA is still interested in strengthening actions included budgets in order to improve public and private financing as well as market mechanisms.

II.9. Integrated Geographic Study of Island Groups and Coastal Zones of the Cuban Archipelago for Tourism, 1992

II.9.1 Brief outline and main results

Although made at an early stage, this assessment provides interesting methodological experiences associated with the use of an ecosystem approach, the massive use of remote sensing data, the final form of expressing the results and the close policy/science/social practice link. This is an applied integrated environmental assessment directly commissioned by government authorities to support the tourism development strategy in coastal and island groups of the Cuban archipelago. This Integrated Geographic Study (IGS) and similar ones that followed it in other coastal marine areas and high mountain systems of ecological and economic interest, is based on an ecosystem approach that integrates natural, social, economic and cultural components in a geographical area defined by ecological boundaries. The IGSs are intended to provide integrated, accurate and updated information on the state of the environment, how systems function and their capacity to respond to change, the damages caused to them by human activities and natural processes, as well as defining measures to be considered before, during and after human intervention. Thus, this type of assessment serves as a proactive strategy to promote conservation and the sustainable use of ecosystems and as an organizing framework for understanding the development of human activities on ecosystems and how they respond to change. Thus, this type of assessment serves as a proactive strategy to promote conservation and the sustainable use of ecosystems and as an organizing framework for understanding the development of human activities on ecosystems and how they respond to change.

II.9.2 Good Practices

The good practices criteria identified in this assessment are as follows:

- A. Close policy / science / social practice link.
- B. Prior planning of the thematic content design, the organization of work and assuring the materials to execute the IGS.
- C. Proper design of the research content in accordance with the purpose of the assessment.
- D. Use of the ecosystem approach and the massive use of remote sensing data.
- E. Final expression of results.

A. Close policy / science / social practice link.

One of the main purposes of the integrated environmental assessments is to help decision making bodies to prepare environmental and management policies. However, public administration and management bodies sometime discover the value of these tools after an assessment has been completed. The best option is when government officials know about and request such tools to improve development policies, instruments and initiatives and become the principal stakeholders promoting the assessments.

This is the case in the following example where, at the request of the Cuban government authorities, Integrated Geographic Studies (applied integrated environmental assessments) were developed to support the tourism development strategy, a plan in which large sums have been invested to increase hotel capacity in coastal areas and the cays of the Cuban

archipelago. The objective conditions to ensure widespread development of tourism in Cuba's coastal marine areas are determined by the existence of extensive areas of high quality beaches, very scenic natural attractions and well preserved ecosystems. However, the relative fragility of the ecosystems raises the need to strike a balance between tourism development and protecting the natural resources that support livelihoods. This premise determines the need for integrated, and as complete as possible, information that will reveal the condition of the ecosystems' components, their principal natural and cultural values of interest to tourists, socioeconomic and demographic aspects, high value ecological areas to which use should be restricted, the ecosystem's vulnerabilities, the possible effects of tourism infrastructures and steps to be considered before, during and after human interventions take place.

An illustrative example of good practice in terms of politics and science is the interest of government authorities in conducting an integrated assessment of these ecosystems; to do so the scientific and academic sector was requested to quickly carry out relevant studies of these areas in close interaction with local governments, companies responsible for designing and building tourism infrastructure, productive enterprises with economic interests in the territories, and other local sectors involved in the environmental management of these ecosystems.

Figure 31 gives a schematic representation of some of the links taken into account in this IGS.

INSERT FIGURE 31



Figure 31. Policy, scientific and social practice links in an IGS

B. Prior planning of the thematic content design, the organization of work and assuring the materials to execute the IGS;

Once the mandate was received from the government department, an important step was to previously plan the integrated geographic study including designing the thematic content, organizing the work and planning to ensure availability of the material needed to execute

it. To this end, a general programme was prepared to make the assessment simultaneously in different geographic settings by using scientific-methodological concepts and normal technical-organizational principles.

The overall objective was to provide the basic indispensable information for informed decision making on managing and conserving these ecosystems. The following were suggested as specific objectives:

- a uniform level of scientific knowledge be provided for all territories in terms of content, technical concepts, how to present the results and cartographic accuracy, as a basis for assessing changes and trends in the natural environment under pressure from human intervention;
- an inventory and assessment be prepared of the island groups' major components and resources to provide information about land use planning for tourism development;
- areas of high ecological interest (shelters, breeding areas, endemic areas, endangered species, etc.) to be identified and assessed that require some level of protection, as well as the ecosystem's vulnerability, possible effects of tourism infrastructure, and measures to consider in order to mitigate adverse effects;
- the proposed functional zoning of the territories to be established by considering whether they are suitable for recreation, whether conditions are favourable for building the infrastructure, or whether there should be restrictions imposed because of their ecological importance.

As to the scope of the assessment, studies were carried out on four major coastal marine areas (from the outer edge of the continental shelf to the coastal zone of the island of Cuba) that have enormous tourism potential:

- Villa Clara province island group: Santa María, Ensenachos, Cobos, Francés and las Brujas cays.
- Ciego de Ávila province island group: Coco, Paredón Grande and Guillermo cays,
- Camagüey province island group: Cruz, Mégano Grande, Guajaba, Romano, Sabinal and Playa Santa Lucía cays.
- Isla de la Juventud municipal island group: Archipelago of Los Canarreos and south of the Isla de la Juventud.

A particular feature of this complex assessment was the participation of about 110 scientific, productive and teaching institutions, both national and provincial, as well as territorial government bodies. To carry out the assessment a plan had to be devised to properly organize the work so as to make a clear distribution of functions between the institutions involved (Box 10).

Box 10. Box 1. Distribution of functions between the institutions involved.

The general direction of the national work was the responsibility of the Ministry of Science, Technology and Environment (CITMA) and the Cuban Institute of Geodesy and Cartography (ICGC). The Geodesy, Cartography and Remote Sensing Research Centre and the ICGC territorial companies were responsible for making aero-cartography surveys, providing aero-spatial images, cartographic bases, technical advice on how to interpret the images, preparing original maps and editing the results. The executing agencies had the essential task of collecting and systematizing existing information, doing field research, making original author maps and drafting the scientific text of the corresponding chapters. The support institutions provided

the logistics: (helicopters, boats, transportation, communications media, diving equipment, etc.), especially during field expeditions.

Research in each area was carried out by multidisciplinary groups of specialists from various scientific, teaching and productive institutions, both national and provincial. Each multidisciplinary group was structured in thematic work teams to make the assessments and draft the original author maps and scientific reports. The territorial management of the IGS was the responsibility of a team with a general coordinator, a technical coordinator, a cartographic drafter and the thematic team leaders. To approve the results at different stages, in each territory a Council of Experts was established of recognized experts on different themes.

To standardize the literal and graphic information about different themes and territories, a Cartographic Editorial Board and a Literal Editorial Board were established and they gave indications about how to prepare the maps and scientific reports.

This organization of work and distribution of functions allowed the assessment of the territories studied to be prepared in a year according to steps shown in Box 11.

Box 11. *Principal work stages.*

- Preparing the scientific programme.
 - Creating the multidisciplinary groups in each territory and the thematic working groups.
 - Creating information banks.
 - Preparing photo-documents and cartographic bases.
 - Holding training seminars on interpreting images and cartographic drafting.
 - Desk work (collecting, analysing and systematizing existing information and photo interpretation).
 - Field research in joint expeditions.
 - Preparing scientific reports and original author maps.
 - Councils of Experts to analyse and discuss the results.
 - Workshops to prepare and discuss the results with the participation of government authorities and the institutions responsible for projecting and executing the territories' tourism and environmental management work.
 - Editing the scientific monographs and the series of thematic maps
-

C. Proper design of the research content in accordance with the purpose of the assessment.

A fundamental stage in the assessment was to design the research content for which a detailed analysis was made of all the thematic elements, values and conditions directly related to tourism activities. Research and mapping were carried out on scales of 1:25 000 and 1:50 000 of the components and natural resources (both of land territories and the continental shelf) related to the relief, geological engineering conditions, soil, surface water, groundwater and sea water, vegetation, flora, fauna, ecological taxa (endemic and endangered species, refuse or breeding areas), landscapes, the seabed, fisheries, socioeconomic aspects and cultural history, among others.

Using the integrated analysis of the components, a functional zoning study was carried out of tourist resources that suggested the territory's potential uses depending on the purpose for which it is to be used. For each subject, in addition to the amount of information determined by the scale, the emphasis was on assessing the principal tourist and recreational attractions, natural as well as cultural history, and identifying areas with either the potential for building tourism infrastructure, or limitations on doing so. For example,

in the case of the relief the most appropriate zones were identified and assessed where tourism infrastructure could be developed; in the case of vegetation, zones were identified with the greatest wealth of flower species, degree of endemism, level of vegetation conservation, principal flora and fauna taxa. Recommendations were made about the use of these resources for tourism and the most appropriate conservation management measures; concerning the types of continental shelf seafloors, special attention was paid to the existing areas with excellent scenery (coral formations, caves, abundance of fish) of interest to scuba divers.

D. Use of the ecosystem approach and the massive use of remote sensing data.

The implementation of the ecosystem conceptual approach used in this assessment is based on integrating the natural, social, economic and cultural components in a geographic area with similar ecological components. The practical use of this conceptual approach was characterized by the following key aspects:

- widespread use of remote sensing images that provide simultaneous multi-component information;
- participatory character by including professionals from scientific, teaching and productive institutions, public administration officials, government authorities, representatives of social organizations that encourages an interactive process to exchange knowledge and perceptions about the problems;
- multi-disciplinary character by studying a wide range of components related to different branches of the natural, social and engineering sciences;
- multi-sectorial character by analysing different sectorial interests (tourism, fisheries, forestry and others) that coincide in one space and economic and social relationships, for example the interaction of tourism development with local populations.

The extensive use of remote sensing data, given the difficult conditions of access to these territories was a distinctive feature of the assessment. The multipurpose nature of remote sensing data, determined by the possibility of simultaneously recording information on different environmental components, allowed the studies to be made with a systemic approach to the investigations and a series of compatible thematic maps to be prepared. The ecosystemic approach and the operational delivery of information (the possibility of having recent information) are essential requirements for making integrated environmental assessments. Remote sensing data as basic sources of information have specific qualities that are summarized as follows:

- Simultaneously recording aerospace information is a very important qualitative aspect of the mapping system and is almost nonexistent in traditional cartographic sources.
- The possibility of having a single photo-cartographic basis for all maps of the same series helps to match the elements and their uniform location in the cartographic representation.
- The multidisciplinary nature of aerospace information permits integrated mapping of environmental components with a specific purpose.
- Reducing the time to collect thematic information can make it quicker to carry out the assessment.

- The ability to register from time to time the state of the environment's components allows the basic trends of their dynamics and development to be set and reliable forecasts to be prepared.

Some products obtained by using these techniques are shown in figures 32 and 33.

INSERT FIGURE 32 -- TWO MAPS

Figure 32. Example of the use of remote sensing data in mapping vegetal formations in Coco Cay, Cuba. Seen is the causeway that links the cay to the Island of Cuba (1) and the airport (2). Source: ICGC ACC: Integrated Geographic Study of the Island Groups and Coastal Zones of the Cuban archipelago for tourism purposes.

INSERT FIGURE 33 -- FOUR MAPS

LEGEND:

Mangrove
 Mangrove variants
 Ciénaga grassland
 Deciduous forest
 Semideciduous forest
 Xeromorphic shrub on karst
 Savannah
 Naked karst
 Lagoons

Figure 33. Example of the use of remote sensing data in mapping the vegetal formations of in Ciénaga de Zapata. Source: ICGC ACC: Integrated Geographic Study of Ciénaga de Zapata.

E. Final expression of results.

The research results were presented in each territory as a literal graphic system consisting of a scientific monograph and a series of thematic maps with common basic scales for each area and an executive summary for decision makers. A novel feature of this type of assessment was precisely the presentation of results in thematic map series. The major advantage of these map series compared with isolated maps made at different times and by different methodologies, is that, in this case, obtained is a set of harmonized and compatible maps prepared at the same time and with the same cartographic principles and conceptions on a single photographic mapping basis (photomap or space map)..

The composition of the series of maps and the actual content of each map may vary depending on the specifics of the territory and intended use as development policy. However, in any of the variants a group of basic maps is considered (inventory of the components) that are characteristic of the state of the environment and its natural potential. The composition of the remaining maps depends essentially on the evaluative nature of the IGS.

The results of the assessment were published in four books (one for each territory) with their respective executive summaries and 82 large-scale thematic maps that received extensive national dissemination as well as among foreign investors. Moreover, in the course of the work, to the extent to which results of practical interest were obtained,

periodic reports were prepared from government bodies and the project's companies. Simultaneously with the island groups and coastal areas IGS, an IGS was made of the Ciénaga de Zapata (Zapata Swamp) the results of which were published in a monograph, 11 thematic maps and an executive summary for decision makers. Because of its social practice impact, the Integrated Geographic Study of the island groups and coastal areas of the Cuban archipelago for tourism was awarded a national prize for the geosciences by the Academy of Sciences of Cuba.

The IGS of the island groups and coastal areas of the Cuban archipelago for tourism can be considered as Illustrative examples of positive interaction between policy, science, production (companies responsible for the design and implementation of tourist infrastructure) and environmental management.

The IGS are learning tools for the different actors involved because they help to better understand the relationship between the environment and development, and improve the capacity of participants to identify new problems and evaluate the most appropriate alternatives in each case. They are especially effective in promoting informed decision making among those responsible for policy formulation, especially in the economic sectors directly linked to the exploitation of natural resources by providing knowledge about the effects of their interaction with the environment and the resulting risks and impacts.

III. CONCLUSIONS

As can be seen in Latin America and the Caribbean, there are examples of assessments from which positive elements can be taken in terms of good IEA practices. Some of them are presented in this document, because the purpose is not to make a compendium or a general analysis, but to show elements of good practices taking into consideration what Jäger (2) described concerning integrated environmental assessments to provide methodological assistance in preparing future work in this respect.

This is no minor matter since an IEA is a very complex process which, from the beginning, should be properly directed and organized if the assessment is to be considered relevant, credible and legitimate. The results of an IGS may be questioned (2) if: the analysis and results are not closely related to the needs of the identified decision making processes and of setting priorities; the interested parties are not reflected, which could happen if the process is not very transparent; or the data and analytical methods used are not guaranteed or not treated objectively, to name a few points.

In the region, most of the IEAs have been made by using the PSIR methodology, primarily with GEO processes that covered almost all LAC countries in some of their modalities: regional, sub-regional, country, city, ecosystems, and themes. There are others which, although not expressed directly, implicitly consider analysing pressures, state, impact and response. There are substantial differences in the way these assessments are conducted, among the most important of which the following may be mentioned:

- commitments established between those interested how these are kept during and after the process;
- how data and information are managed;
- the tools used for the analysis;

- how to present the results so that they reach different target publics;
- and perhaps most important, the real impact they have on decision making at different levels which, after all, is their primary *raison d'être* of the IEA.

There is an obvious growing interest in making these assessments as shown by: scientists and technologists increasingly motivated because they allow them a more direct way of expressing their knowledge, making connections and becoming more useful to society; decision-makers feeling the pressure of the urgency and complexity of the problems they face, need to have at hand reliable options for taking action at their level, but in synergy with other higher-level commitments and objectives; for example, the sectors linked to health, education, and food production, are becoming more involved; year by year civil society takes a more active part.

But there are those who believe too many assessments are made that use human, material and financial resources that could be put to better use elsewhere. To some extent they may be right, although not because the IEAs are not necessary and essential to undertake coordinated and coherent action with short- and medium-term implications but, as they were undertaken by making formal commitments with no prior preparation, they have not been focussed on core problems, or there is not enough capacity to interpret them, or to implement their results.

An assessment is not just a report that draws attention to one or more problems, as decision-makers often visualize it, and it is not an isolated process; it is, in fact, a secure, attainable tool suitable for seeking plausible solutions and with many participants but, above all, of key stakeholders. Thus, capacity must also be built to assess what happened afterwards and how attention could and should be called to what needs to be done. Then how the process is described has to be changed, and those wishing to join it must do so because they need it and have no other option; however, those who do not directly participate must know that it is being carried out but with the limitation that many of the final proposals of the assessment are not used.

The cases analysed here can be considered as general or specific patterns of good practices, or that at least comply with a set of issues vital to the success of an IEA. They highlight, for example: appropriate conceptual designs; balanced participation by stakeholders in the initial stage; correct identification of priority messages and themes; the use of coherent models and methodological tools; the provision of up-to-date, reliable and well managed information; appropriate selection of authors and editors capable of expressing ideas and the main conclusions clearly and carefully; and the correct use of graphic resources. Notwithstanding this, there are imbalances in terms of complying with the planning stages, making available and updating the data and information considered; there are gaps and differences in the use of indicators that prevent comparative analyses being made between regions and countries. Some assessments are isolated efforts, or displaced in time, without creating capacities to maintain and update data and information, to incorporate new knowledge, approaches and technologies. The actual involvement of key stakeholders is sometimes formal because, once these assessments have been made, there has not been complete or partial implementation of the response options presented. Here various factors may have an influence, some of which are outside the scope of the IEA context.

In each of the examples analysed the reader may find answers to some of the questions commonly asked at the beginning of an IEA, for example: How is it planned and

financed? When, how and by whom is it designed and who approves it? Who participates and what are their roles? What knowledge, data and information are essential, where are they available, what is their quality, and are they vouched for? What types of products can be designed, and when and in what form are they available? This work, then, was primarily done by using the reports of these assessments and other complementary inputs obtained from the Internet, which is no doubt limited when compared to the actual process from which they were taken. That is why care has been taken and no issues have been emphasized that have not been adequately explained.

It is considered useful to suggest some recommendations that UNEP and other international organizations, together with the countries of the region, might take into account to strengthen future integrated environmental assessment processes.

- Build capacities by using different preparation and participation methods to better understand and disseminate concepts of good IEA practices.
- Monitor how IEA good practices are learnt and how this knowledge has been put to use in making new assessments.
- Further strengthen regional capacities for managing good quality data and information so that the countries and the region can give effective and timely responses to key questions and commitments.
- Accelerate processes of preparing environmental and socioeconomic indicators to improve the quality of the IEAs, standardize the contents and facilitate how comparative studies are made of different countries and regions.
- Create mechanisms to monitor the impacts of the assessments made at different levels, so they can be visualized and, therefore, can be perceived as being useful when decisions are made.

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