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Interim Guinea Current Commission

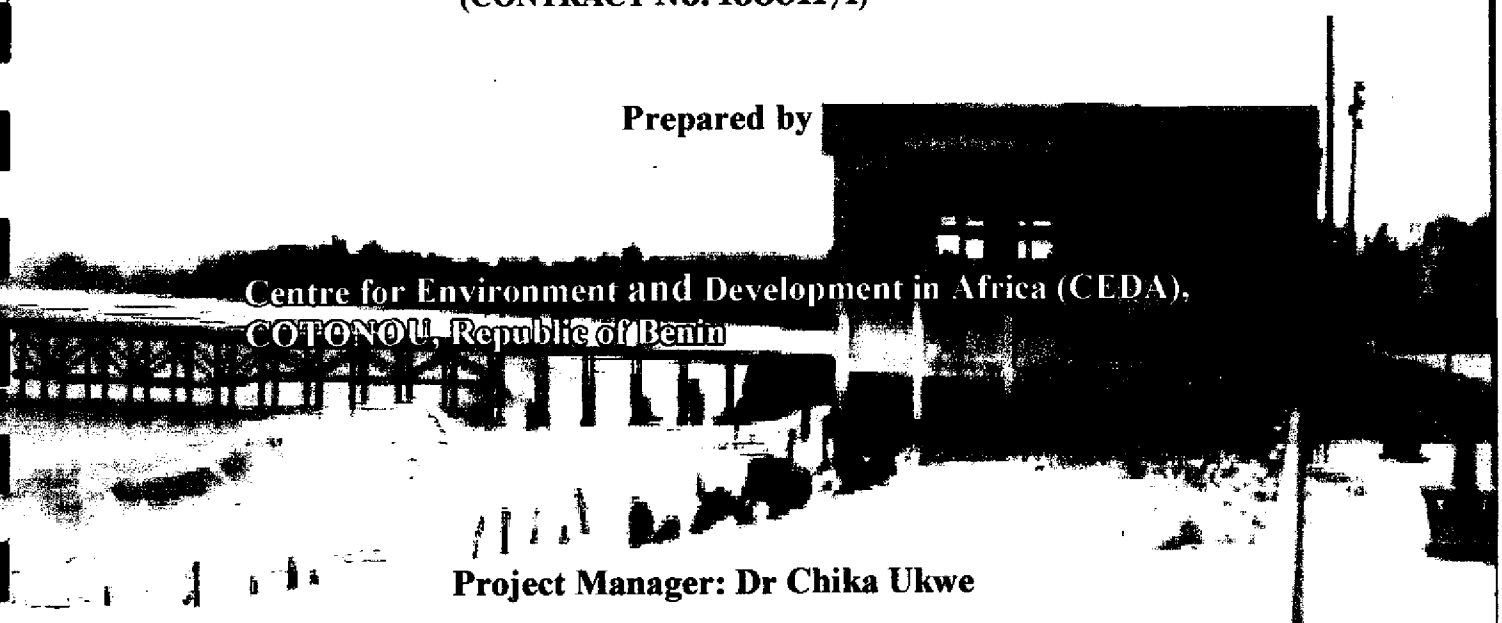
PROJECT NO: GP/RAF/04/004/21.07

FINAL REPORT

On

Development of National Programmes of Action (NPA) in five GCLME Countries for the Protection of the Marine Environment from Land-Based Activities

(CONTRACT No. 16001171)



Prepared by

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Project Manager: Dr Chika Ukwe

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United Nations Industrial Development Organizatio

A Programme of 16 Coastal Countries from Guinea Bissau to Angola, with
assistance of GEF / UNIDO / UNDP / UNEP / US-NOAA / NEPAD

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Summary

A National Programme for Action (NPA) for the protection of the marine environment from Land Based Activities is a dynamic short, medium and long-term agenda for marine protection through strategic planning, the implementation of concrete, targeted and coasted projects and for the periodic evaluation to improve performance.

Under the general direction of the Executive Secretary, Interim Guinea Current Commission/Regional Director GCLME and the direct supervision of the GCLME National Directors in the five countries (Guinea, Sierra Leone, Cameroon, Gabon and Democratic Republic of Congo), a 5 Man Team of CEDA Experts prepared notes for and organized National Workshops to introduce the process and the procedures for the development of NPA in each country as described in the NPA Manual. Following the Workshops, the Experts guided the National Experts in the formulation and refinement of their NPA documents.

Today, all the five countries (Guinea, Sierra Leone, Cameroon, Gabon and DR Congo) have validated their Coastal Profiles, and two countries, Guinea and Sierra Leone, have had their NPAs endorsed at Ministerial level. The other three countries are on a solid footing to obtaining high level endorsement of their NPA documents. The NPA of Sierra Leone

with a foreword by the Hon Minister of Fisheries and Natural Resources is annexed to this Report as an indication of a finalized NPA document.

As important as the formulation of the NPAs is, what is perhaps more crucial is their implementation. It is therefore urgent for both the Guinea Current Large Marine Ecosystem Project and the Executive Secretariat of the evolving Guinea Current Commission (IGCC) to encourage and support the countries in reaching the implementation stage of the NPA. Funding for the prescribed actions would require enormous resources oftentimes beyond the usual budgetary provisions of the countries. This calls for innovative funding mechanisms among which a National Donors Conference is a recommended option.

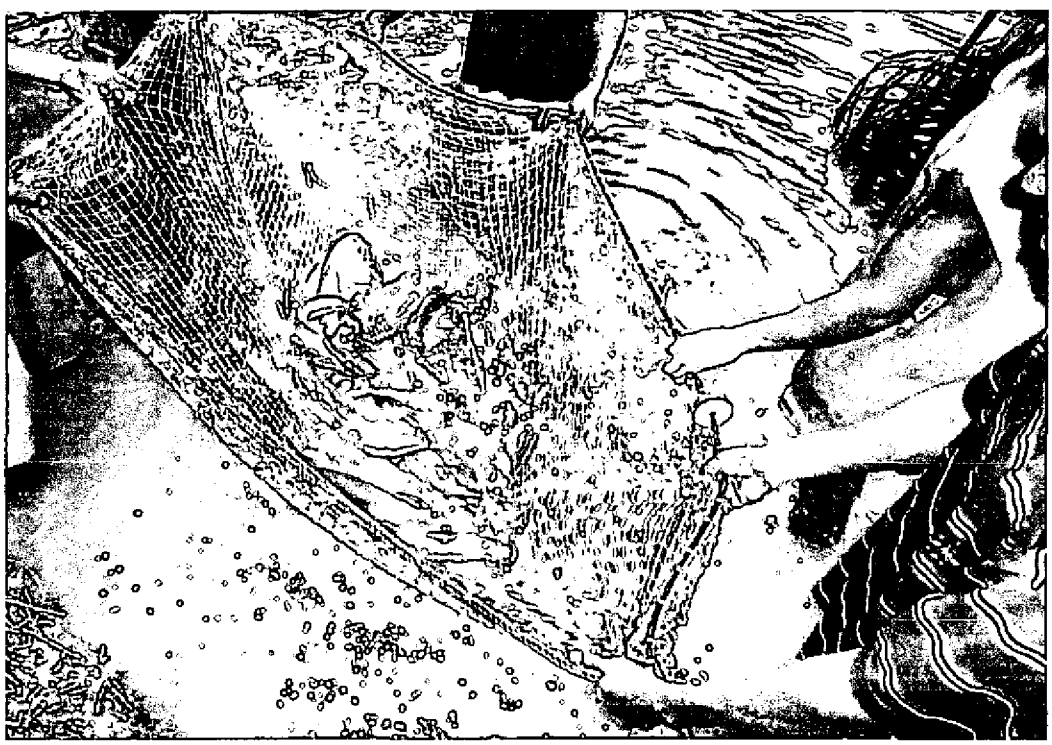


Photo 1. Fish landing in the beach in Sao Tome Fishing is an important economic activity in the region.

1. Introduction

After several decades of efforts of economic and social development that paid little or no attention to environmental protection including the conservation of the natural resource base for such development, West and Central African Nations have become conscious of the necessity of not compromising the well being of future generations of their peoples in their pursuit of economic growth., A new paradigm that considers economic and social development and environmental protection as complementary factors in their quest for sustainable development is in vogue.

For coastal nations, the sea off their coasts is a huge dynamic repository of food, energy and mineral resources. The beaches afford a vantage platform for tourism and associated leisure activities. The contiguous coastal areas contain biological diversity of global significance including some rare and threatened species. However, these environments are being degraded mostly from impacts deriving from Land Based Activities. Among the issues and problems of primary concern are the impacts of physical alterations and destruction of productive habitats, discharges of sewage, excessive nutrient loading, sediment mobilization, litter (and in particular plastics), hydrocarbons, heavy metals, radioactive substances and a host of other hazards.

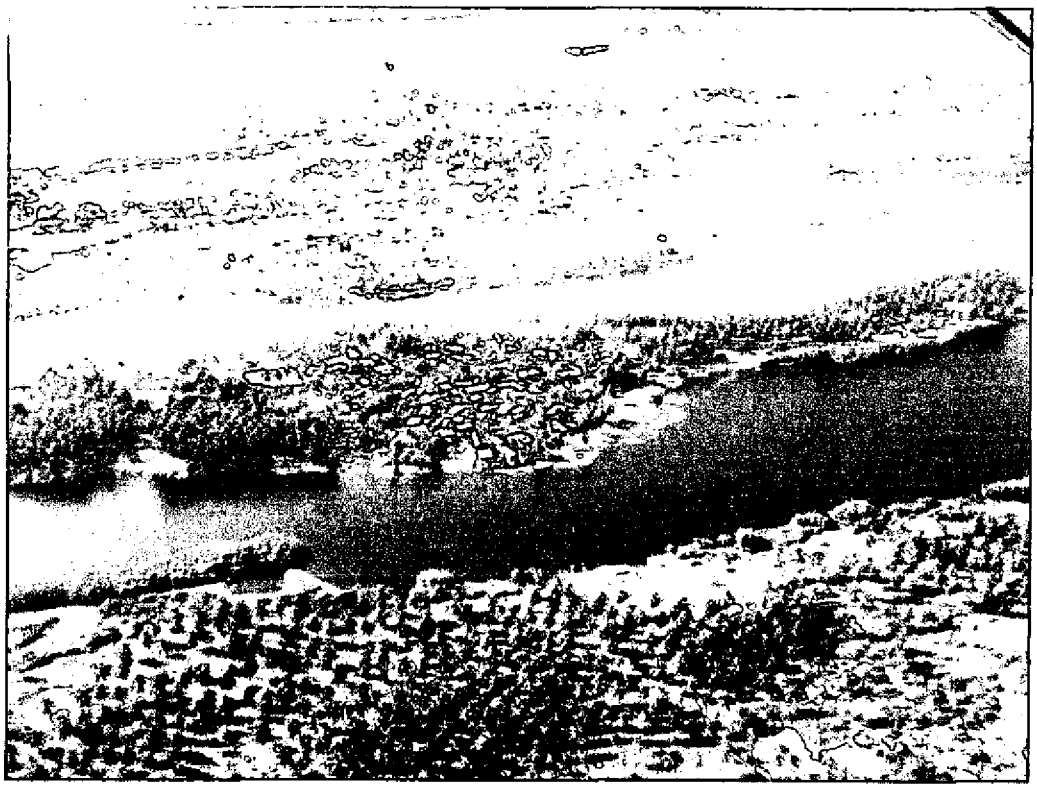


Photo 2. Overview of Coastal Zone in the GCLME region

It is therefore not surprising that the 16 countries of West and Central Africa united under the umbrella of the Guinea Current Large Marine Ecosystem (GCLME) Project made it a common goal to make changes in the ways that human activities are conducted in the different socio-economic sectors to ensure that their shared ecosystem, the Guinea Current Large Marine Ecosystem and adjoining drainage basins are saved from further deterioration and can regain their role of sustaining sustainable development in the region.

The long-term development objectives of the project are:

1. Recover and sustain depleted fisheries

2. Restore degraded habitats and conserve significant biodiversity

3. Reduce Land and ship-based pollution

4. Establish mechanisms for regional consultations and joint actions

An immediate objective of the GCLME project is "building national and regional abilities to address land-based sources of pollution through the creation of strategic programmes of action for the implementation of the Global Programme of Action (GPA) for the Protection of the Marine Environment from Land based Activities". A major mechanism of achieving this objective is the formulation by countries of National Programmes of Action (NPA).

A National Programme of Action (NPA) for the protection of the marine environment from land-based activities is envisioned as an integrated management and policy framework. It serves as a structure for forging cross-sectoral linkages, incorporating inputs from diverse stakeholders and identifying principal actions for ultimate interventions. Land-based impacts and threats to the marine and coastal environment are complex and demand long-term, cross-sectoral, multi-disciplinary and broadly participatory responses.

This Document is an interim report in fulfillment of the requirements stated in Section 2.06(b) of Contract No 16001171 on the "Development of National Programme of Action (NPA) in Five GCLME Countries for the Protection of the Marine Environment from Land-Based Activities" entered into between

the United Nations Industrial Development Organization (UNIDO), Vienna, Austria and the Centre for Environment and Development in Africa (CEDA), Cotonou, Benin.

The Report covers an account of work performed by CEDA Consultants both in the Project Area and at CEDA Home Office in Cotonou, Benin. It also includes details of the organization and outcomes of the Workshops on NPAs which brought together in each country groups of Experts on Integrated Coastal Areas Management, Pollution and Ecosystem Health, Productivity and Biodiversity, Coastal Erosion, Socio-economics and Governance convened for the purpose of formulating and validating the National Program of Action.

The National Programme of Action of Sierra-Leone duly endorsed by the Minister is attached as Annex 5 as an indication of what a completed NPA should look like.

Photo 3. "I like fish, I should wisely manage the stock". 'from D. E. MUSIBONO)

2. Approaches and methodologies adopted

Following the acceptance the Programme Outline submitted to UNIDO by CEDA detailing the constitutive elements of the process of developing the National Programme of Action a 5 man CEDA Team traveled to the Regional Coordination Unit of the GCLME Project in the week of 26

October, 2006 to consult with the Executive Secretary of the Interim Guinea Current Commission and his staff, especially Dr Jaques Abe, Environment Expert and Dr Theodore Djama, Fisheries Expert, on the detailed content of the NPA Programme (see Annex 1(a) for list of persons met)

Thereafter, and armed with the insight provided by their interactions with staff of the Interim Guinea Current Commission, the Team of CEDA Consultants retired to their Home Base in Cotonou for the preparation of the substantive sections of the Development of National Programme of Action as described in NPA Manual. A typical example of course notes prepared by the consultants based on the approved Manual for the development of NPA is attached Annex 2

As was envisaged when the CEDA Team was constituted, Prof Sikirou Kolawole Adam, Consulting Social Scientist had prepared the Stakeholder Analysis including Gender issues as well as public awareness and participatory approaches and reviewed the sections on institutional and governance issues. Prof Henri Soclo, Consulting Marine Chemist and Lead Consultant had prepared sections of the manual dealing with issues of Marine Pollution and Ecosystem Health including an analysis of land based activities that result in the degradation of the coastal and marine environment. They had assistance of Collaborators as follows:

Prof Emile Fiogbe, Consulting Biologist, was responsible for preparing sections that dealt with the natural marine resources at risk from land based

sources of pollution. It includes attention to threatened and endangered biological resources as well as an analysis for integrated living resources management.

Prof Thomas Houedete, Consulting Economist, wrote the sections on economic analysis in support of natural resource management and provided a socio-economic perspectives to the causes and effects of land based activities in relation to marine pollution and ecosystem health.

Prof Mouftaou Laleye, Consulting Public Administrator provided the sections on legislative and institutional matters as well as governance models for the coastal and marine environment

The draft of lecture elements delivered to National Experts/Directors has been drawn from the Training Manual for the Development of the National Plan of Action on the Land-Based Activities (NPA/LBA) of the Global Programme of Action (GPA).

It appears from the experience of different contributors for the Training Manual that a voluntarist policy of environmental protection is founded on concrete and practical programmes of improvement of the conditions and quality of the life in urban and rural zone and on interventions targeted, and must constitute the spearhead of such a program. Assets of this policy in the fields of the urban cleansing, of embellishment of the cities and especially of conservation of the terrestrial, marine and coastal natural resources are remarkable and tangible to safeguard the

durability of these assets through the gradual integration of the environmental concerns and actions in the activities of development as well on the sector-based level as territorial on the one hand, and to ensure, by adequate means a more equitable division of the fruits of the economic growth on the other hand, were a constant objective of all the sector-based and regional strategies of the economic and social development.

The identification of suitable means and adapted tools aiming at the improvement of the social conditions and the fight against poverty and social exclusion were the cornerstone of this voluntarist policy of economic and social development which takes care to distribute most equitably the fruits of the economic growth to the whole of the components of the GCLME Region. This approach is considered essential to situate the social climate appropriate to the encouragement of national and foreign investments in the economic sectors..

The Global Program of Action (GPA) for the Protection of the Marine Environment from Land Based Activities (along with the Washington Declaration, 1995) is a source of conceptual and practical guidance to be drawn upon by countries and / or regional authorities for developing and implementing concerted and consistent actions to prevent, reduce, control and / or eliminate the impacts from land based activities that cause marine environmental degradation.

The goal of the Program is to prevent the marine and coastal areas from pollution due to terrestrial activities and to facilitate the work of different countries to preserve and protect their marine environment. It is about a dynamic program that takes a short, medium and long term view of marine protection. In conformity with the principle of thinking globally and acting locally, the GPA aims at promoting the commitment of Countries to preserve and protect the Marine environment through the formulation and execution of National Programs of Action on Land based activities (NPA/LBA). National Programs of Action are seen as a phased approach for the conception and implementation of an integrated marine environmental and resources management including the contiguous river basins.

The GCLME project under witch auspices the NPAs were developed would enable the sixteen countries to make changes in the ways that human activities are conducted in the different socio-economic sectors to ensure that the GCLME and its multi-country drainage basins can sustainably support the socio-economic development of the region. Ultimately, the goal is to help build the capacity of the Guinea Current countries to work jointly to define and address their trans-boundary priority environmental issues within the framework of their existing responsibilities and commitments under the Abidjan Convention and its Protocol.

The five GCLME Countries selected for the Developing of a National Programme of Action (NPA) for the Protection of the Marine Environment of the GCLME from Land Based Activities in relation to the GPA based on the newly developed Manual on this subject matter are, from north to south, Guinea, Sierra Leone, Cameroon, Gabon and Democratic Republic of Congo.

The project document provides a detailed list of activities under each of the cluster, which puts much emphasis on the importance of "national and regional abilities to address land-based sources of pollution through the creation of strategic programmes of action for implementation of the GPA at the national and regional level". For addressing land-based sources of marine pollution, formulation of National Programmes of Action is recognized as an important tool within the framework of TDA/NAP/SAP process, and further to strengthen the legal basis for addressing major trans-boundary sources of pollution, the project aims to facilitate formulation and adoption of a Protocol on Land-Based Activities for the Abidjan Convention.

The natural risks in marine pollution involve more or less significant damage to the goods, interests and prosperity of the region. The principal elements are: (i) delimitation of the responsibilities for the whole of the actors in the effort including preparation and follow-up; (ii) the fixing of attributions and the tasks of the authorities and structures in

charge with the preparation to the effort, the control of the operations and their coordination; and (iii) establishment of the procedures allowing all the actors to contribute their share in a coordinated way and to mobilize quickly and effectively their resources.

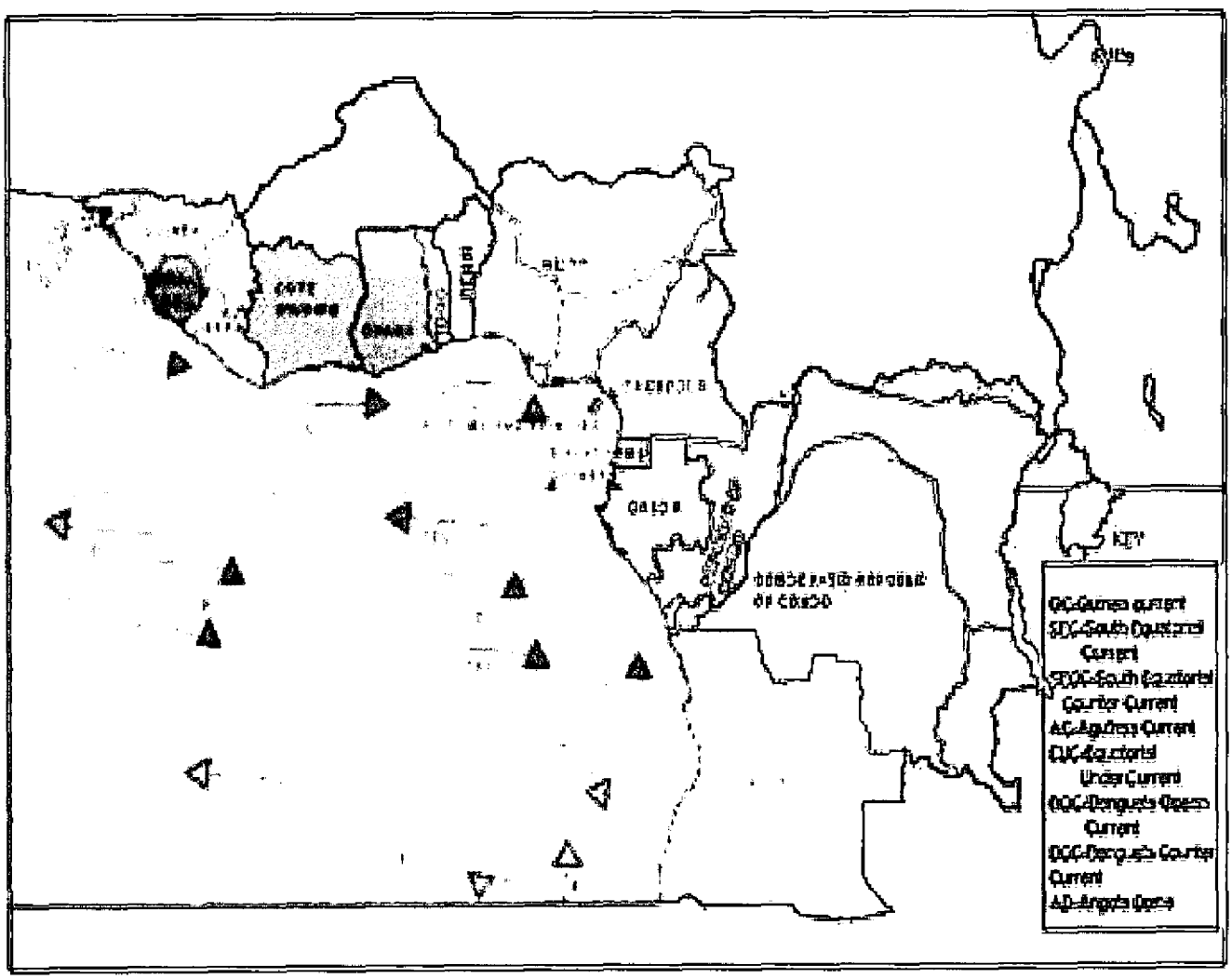


Fig. 1. Different currents and countries in GCLME Region

FIG. 4 - MAJOR INDUSTRIAL POLLUANTS IN THE WEST AND CENTRAL AFRICAN REGION

Estimated amount of municipal sewage in comparison with industrial pollution in the WACAF Region.

S	Estimated population***	Municipal sewage			Industrial pollution		
	1000*	BOD_5 t/year	%*	SS t/year	%*	BOD_5 t/year	%**	SS t/year	%**
n	17.350	62.535	21.6	88.930	21.6	15.320	24.5	18.542	20.8
	117.960	205.612	71.1	292.401	71.1	29.962	14.6	61.243	20.9
n	36.800	20.814	7.3	29.598	7.3	1.986	9.5	1.360	4.6
	172.110	288.961	100.0	410.929	100.0	47.269	16.3	81.145	19.7

ntage of the total amount of municipal sewage in the Region
entage on industrial pollution of the amount of municipal sewage in certain zones
mated population of the Region, but without Mauritania, Cape Verde and Namibia (Africa South of Sahara.
UNEP, 1984 Regional Seas Reports and Studies, n° 4

Fig. 2. **Major industrial pollutants in GCLME Region**

3. Work in Home Office:

Following the briefing at the GCLME Regional Coordination Unit in Accra Workshop in Accra, the CEDA Consultants met in their home office to allocate responsibilities and define a detailed work plan. The Consultants each prepared their lecture notes. The contents of the Training Manual for the Development of the National Programme of Action on the Land-Based Activities (NPA/LBA) of the Global Programme of Action (GPA), written for the circumstance, served as a necessary base to conceive the lecture/information notes which took account of national realities of each country, while insisting especially on the participative approach of the great number of actors. An example of the lecture notes by Prof Sikirou Kolawole Adam is attached Annex 2.

From their Home base, the Consultants also followed the evolution of the formulated NPAs towards validation offering assistance and advice as necessary.

Photo4. General aspects of the GCLME Region Beach

4. Work in the project Area

The workshops for each country and in particular the dates for their organization were discussed and agreed with the National Directors to ensure the greatest participation of Experts and the broadest spectrum of input..

Between November 2006 and March 2007, CEDA consultants traveled to the 5 countries and specifically to Conakry (Guinea), Fretown (Sierra-Leone), Kinshasha (Congo DR), Libreville (Gabon), and Yaounde (Camerron) to launch the NPA process and to intervene in specific areas of NPA formulation and sensitization of the populations to the objectives and

targets of the NPA process. Annex 1(a,b,c,d,e) show the list of participating experts in each country of the five countries.

Annex 3 is a summary of the work months provided during the assignment.

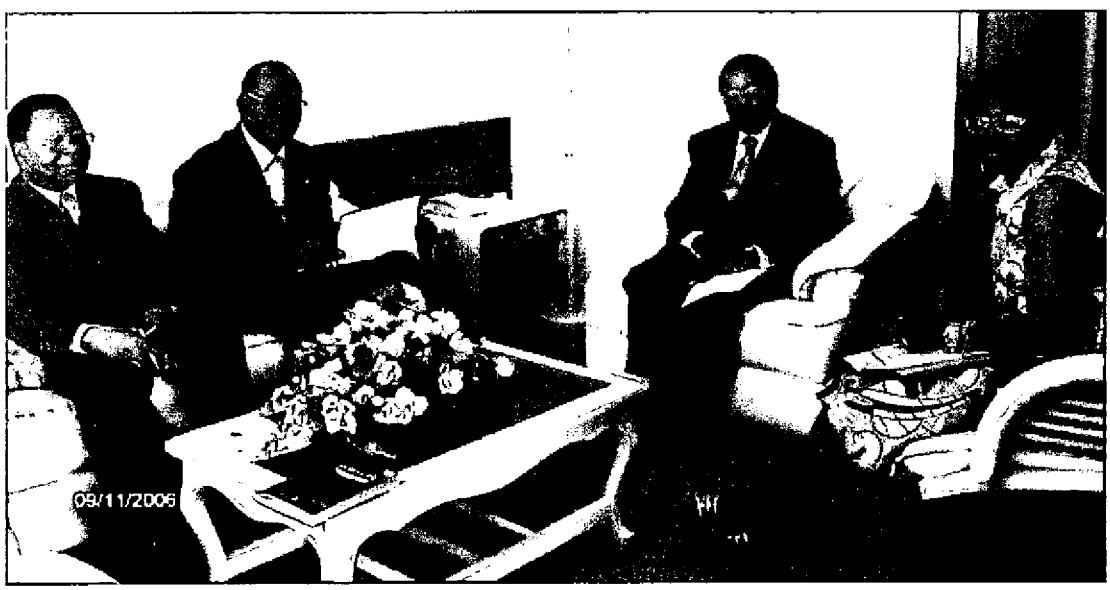


Photo5. A meeting of CEDA Consultants with the Hon. Minister in charge of Natural Hazards Assessment and Prevention in the Republic of Gabon assisted by Mrs Solange Loubamono, Technical Adviser on Environment and Sustainable Development to the Prime Minister of Gabon.

5. Main Activities and Results

The GPA framework provides a series of recommendations for action as well as criteria for their development at the national and regional levels. At the country level it provides a comprehensive framework with flexibility to assist countries in fulfilling their commitment to preserve and

protect the coastal and marine environment from land-based activities by initiating actions at the national level and cooperation at the regional level. Such actions at the national level are for protection from causes of degradation e.g. sewage, physical alteration and destruction of habitats, nutrients, sediment mobilization, marine debris/litter and contaminants such as oils, persistent organic pollutants, heavy metals and radioactive substances.

The root causes as well as the complex linkages between the sources of environmental degradation and threats implies that national action must of necessity respond to the specific circumstances and priorities of each country. Therefore each country must select the approach that best suits its geographical characteristics, legal, political and institutional frameworks, best available science and technology, current assessments, inventories and data and best management practices. National approaches to protecting and preserving the coastal and marine environment from land-based activities (National Programme of Action) will differ with respect to appearance, scope or national focus.

It's clear that a NPA is a dynamic short, medium and long-term agenda for marine protection through strategic planning, the implementation of concrete, targeted and costed projects and periodic evaluation to improve performance.

6. NPA Process

The recommended actions are further illustrated as the National Programme of Action cycle below:

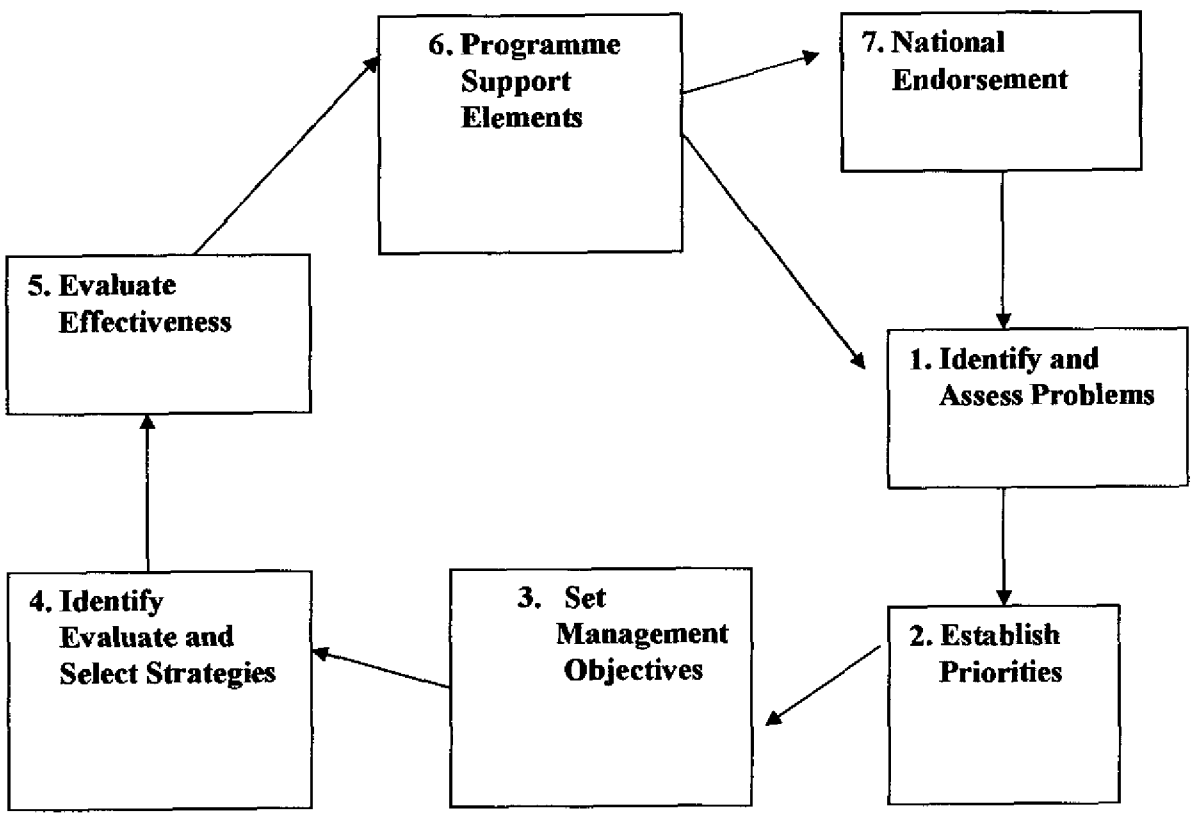


Fig. 3. NPA Process Diagram

Photo 6. The experts invited by the General Director of the Environment Mr MASSARD K MAKAGA, at the World Day of the Sea, organized by the Ministry for the Merchant Navy.

7. Workshop Orientation.

The national experts were largely informed of project GCLME through the various communications. Owing to the fact that the development of the National Programme of Action is a long process, the workshops made it possible to undertake its implementation by the identification of the major challenges of the marine environment.

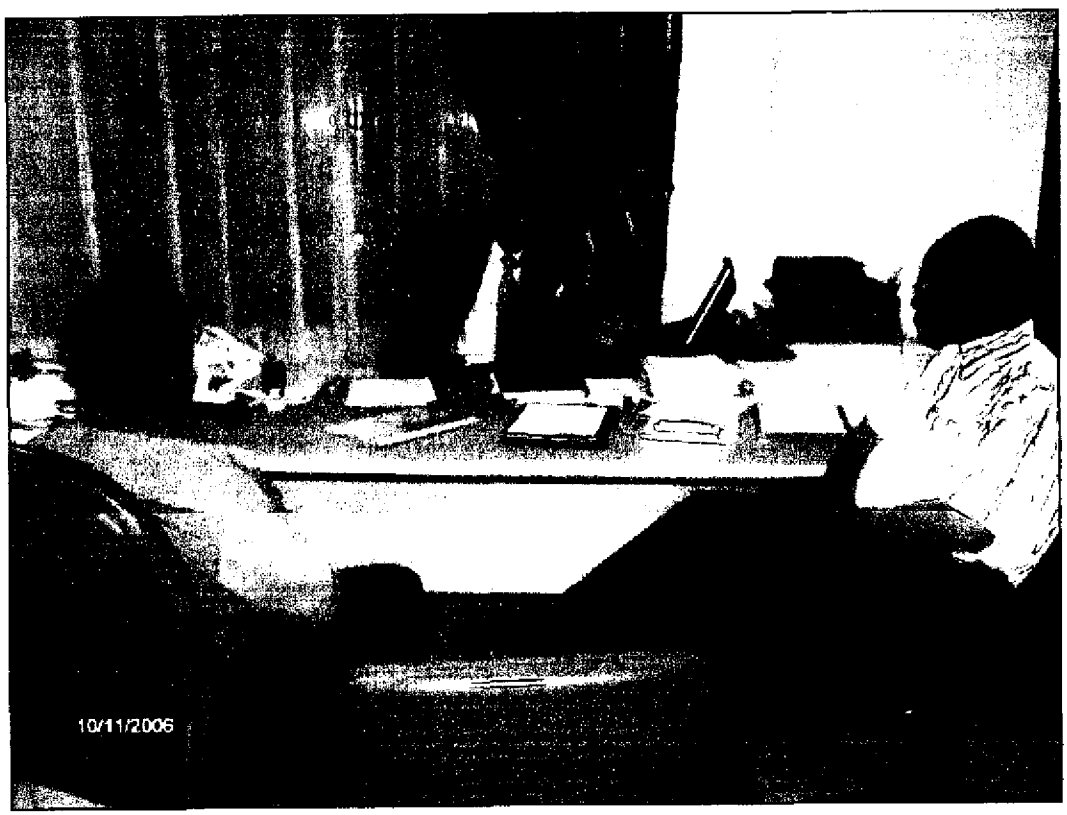


Photo 7: Lead CEDA Consultants Professor Henri Soclo and Professor Sikirou Adam meeting with the Director General of the Environment Ministry of the Republic of Gabon during a break in the National Consultations on the NPA in January, 2007.

8. General issues

For each topic or challenge, the sources were indexed and classified according to their impacts on:

- Food security;
- Public health;
- Conservation and the sustainable use of the marine resources;
- Productivity and biodiversity of the marine and coastal ecosystem;
- Degradation of the marine and coastal environment;
- Economic and social benefits;
- communication, including the sensitization of populations and the sufficient implication of the media and the local authorities;
- building capacities incorporating training schemes
- institutional,, financial and logistic support for the coordination of the activities for protecting the marine and coastal environment

9. Institutional Issues

Some elements to be addressed include:

(a) to ensure a better coordination between the various sectoral plans which relate to the coastal and the aquatic environment in general, but also between the departments and the agencies whose mandates are very often conflicting;

(b) to promote a better participation of the local communities and in particular , women, children and other vulnerable groups

(c) to reinforce the national capacities especially human resources and to develop the strategies aimed at improving the quality of life of the bordering populations of coastal areas;

(d) to integrate in the policies of management of the coastal zones the principal target groups in order to combat more effectively against different forms of pollution due to terrestrial activities;

(e) to ensure the education and the sensitization of the public by their integration in the management and campaigns for the sustainable protection of the coastal areas;

(f) to adhere to the agreements and programs (regional and international) adopted for a more effective coordination of the activities to implement within the framework of the programme of Action.

10. Principal results

In Guinea

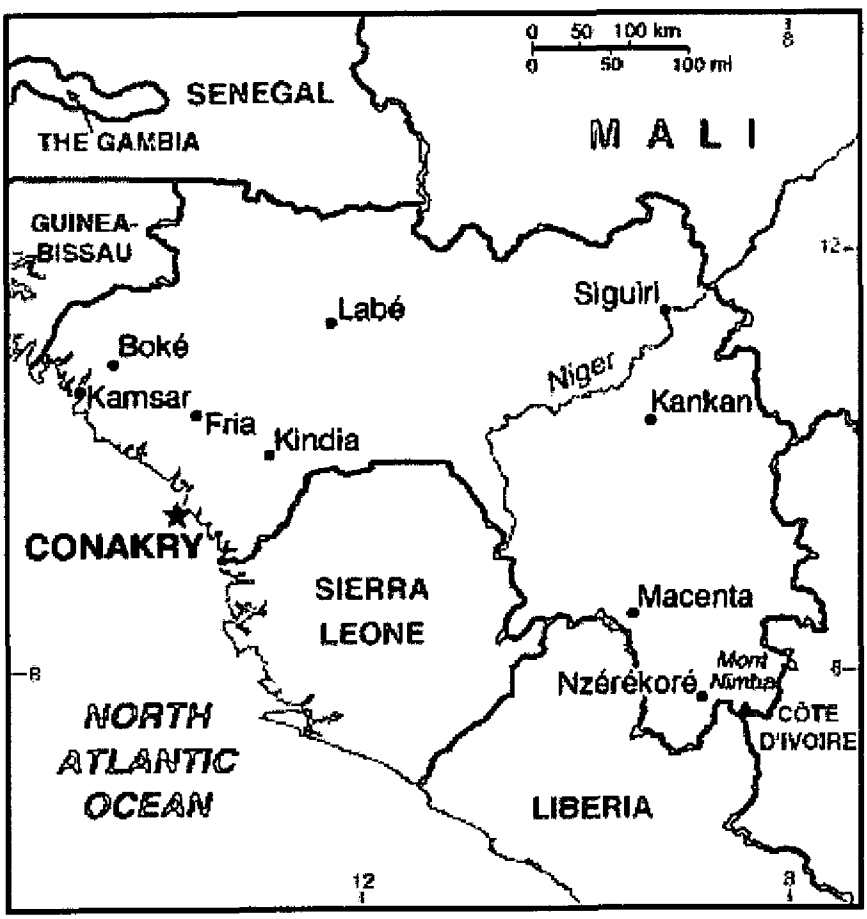


Fig . 4 Map showing the situation of Guinea

The main problems were identified as follows:

- pollution and the management of waste(industrial and mining) waste water , solid waste, hydrocarbons, air pollution;
- -physical degradation of habitats provoking severe erosion and flooding

- problems involved in the management of marine fish stocks including the non respect of existing legislation, abusive techniques of exploitation and overexploitation;
- lack of legal and institutional framework and non harmonization of the texts and the insufficient implication of the coastal populations.

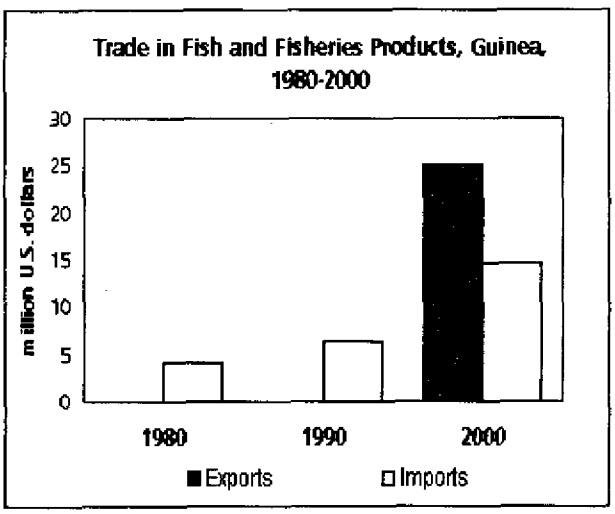


Photo 8. The Launching Workshop Participants for Gunea NPA

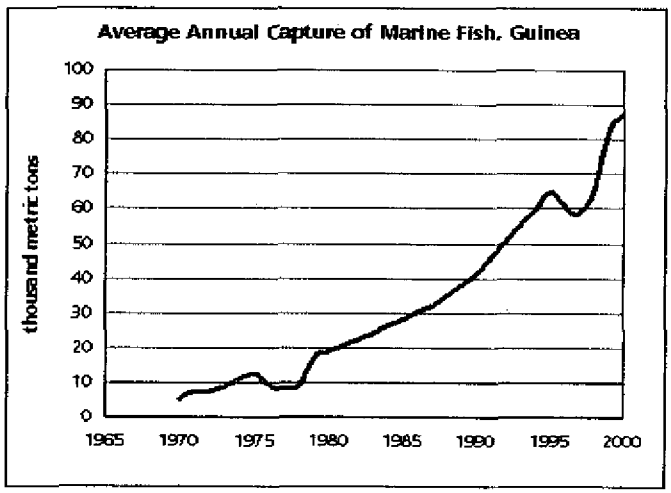
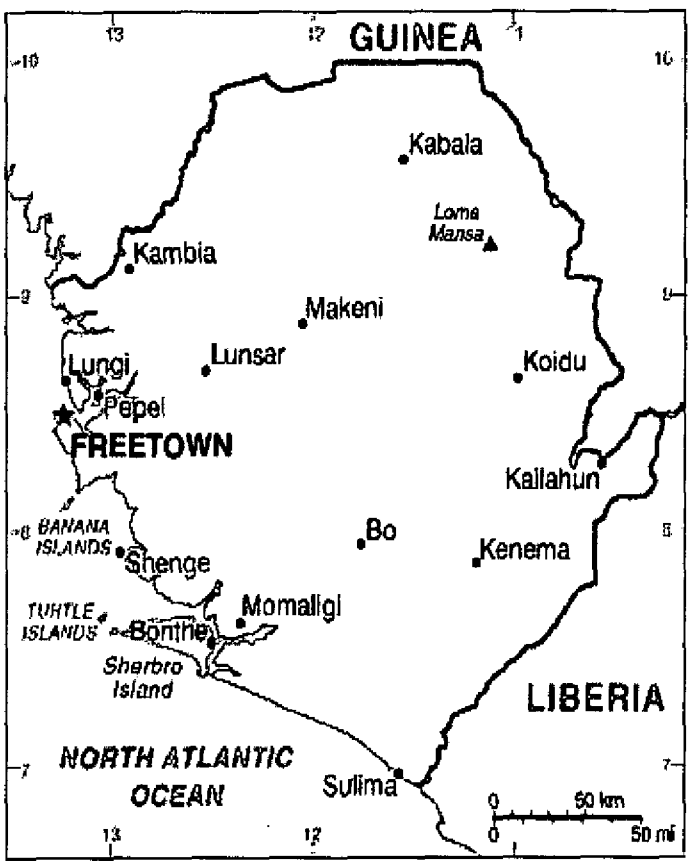


Fig 5. Fishery Diagram

In Sierra Leone



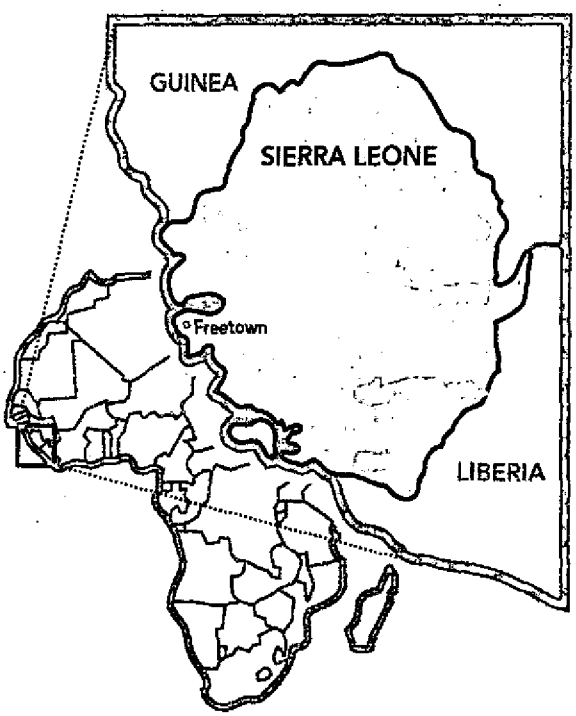


Fig 6. Map showing the. Situation of Guinea

The main challenges are:

1. Coastal Erosion Control

2. Integrated Waste Management

3. Environmental Education and Public Awareness Program for Sustainable Coastal Zone Management

4. Strengthening of Fishery Management Capacity

5. Sustainable Management of Coastal Rivers/Estuaries

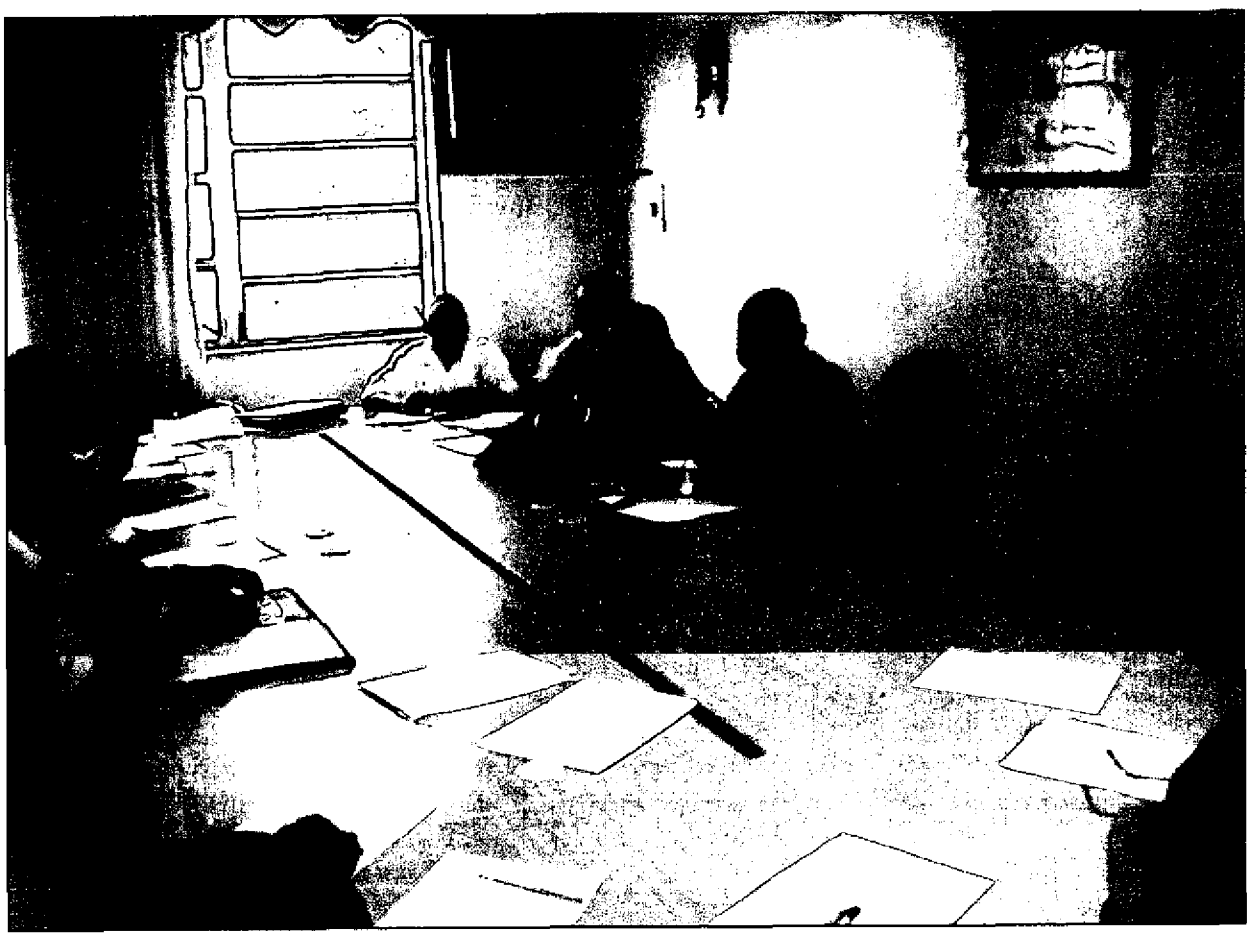


Photo 9; Meeting of National Experts in Monrovia

In Cameroon

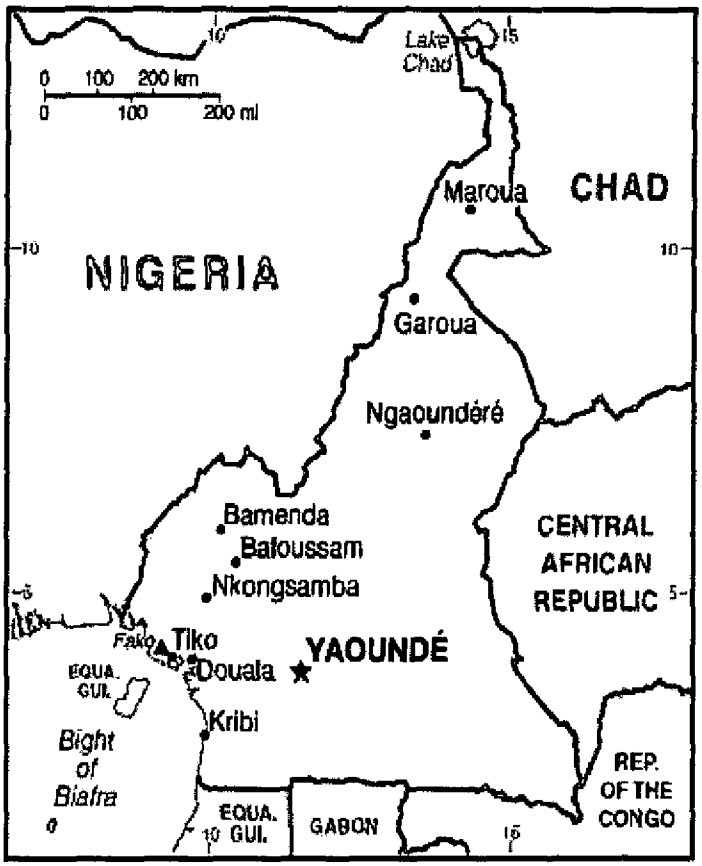


Fig. 7. Map showing the General Aspects of Cameroon

The expected outcomes from the NPA are:

- Restoration and protection of mangrove forests,
- Reduced pressure on mangrove resources,
- Rational exploitation of fisheries resources with use of appropriate fishing gears,
- Rational exploitation of coastal forest fauna,
- Reduced pressure of fisheries resources,

- Reduced pressure on coastal forest fauna,
- Delimitation and protection of fish nursery zones,
- Full Implication of local population and optimisation of indigenous knowledge in management
- Installation of monitoring and surveillance systems,
- Creation of appropriate monitoring and surveillance system.
- Revised and improved legislation
- Co-management of resources

Photo 10. A luxuriant mangrove forest I the GCLME Region

In Gabon

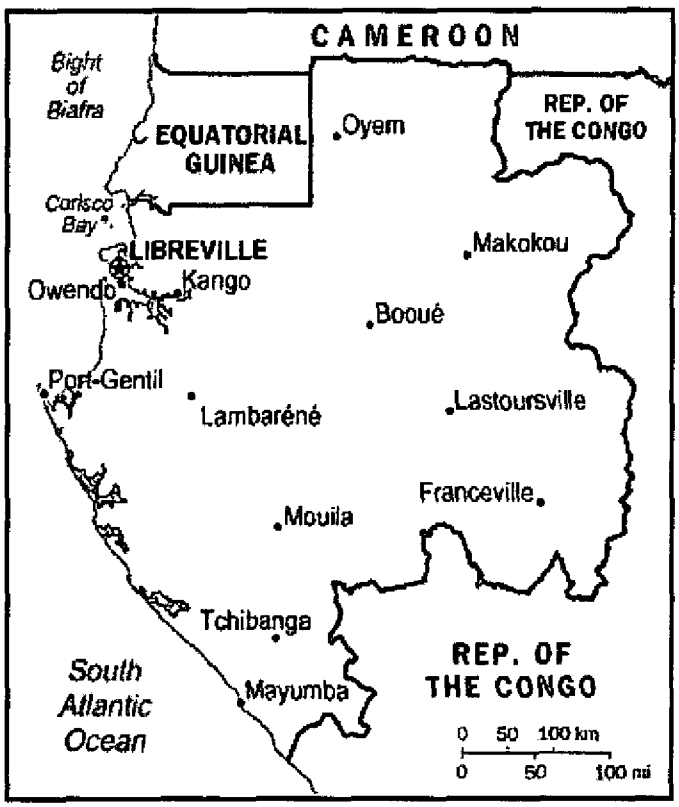


Fig. 8. Map showing the General Aspects of Gabon

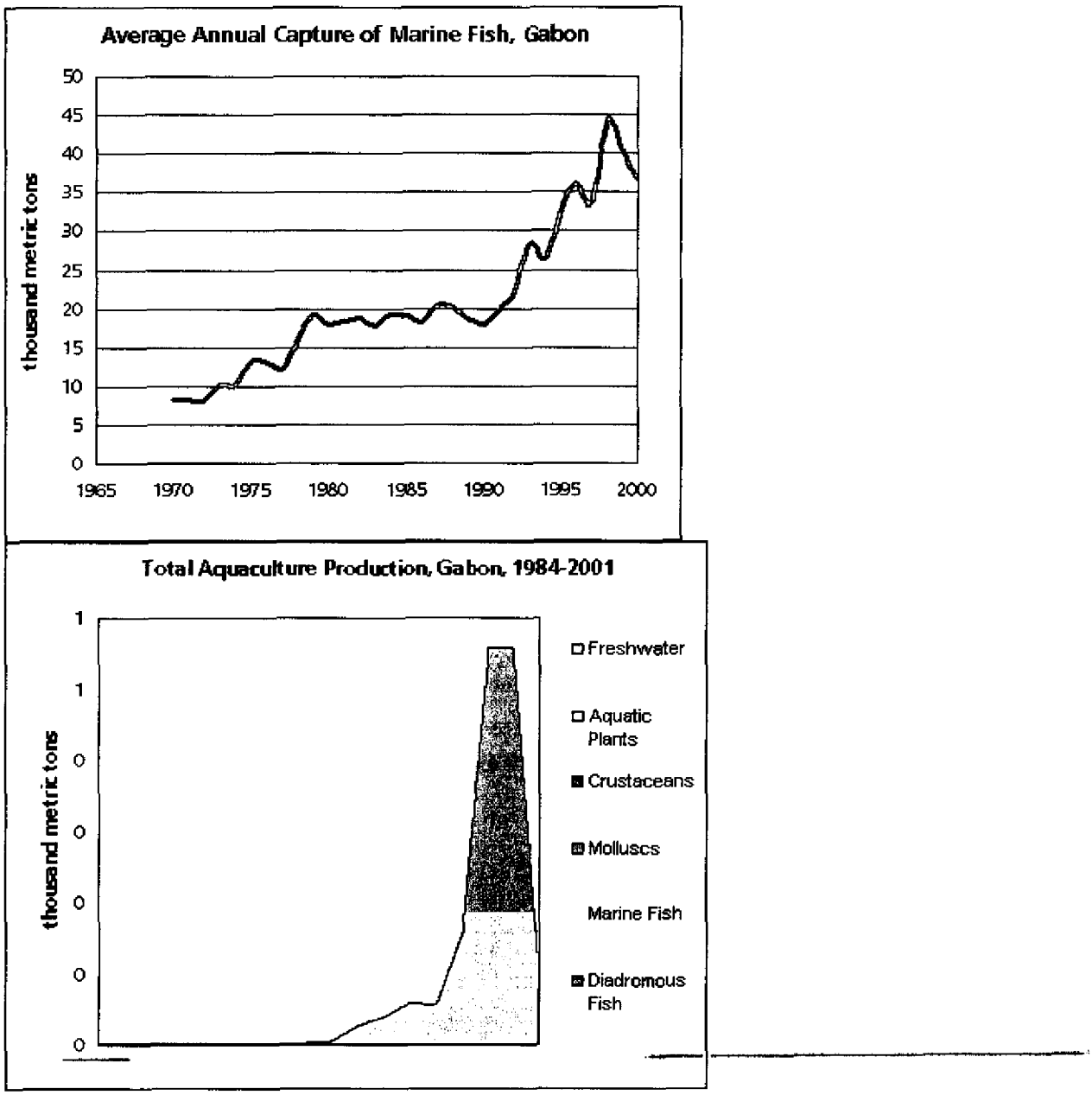


Fig. 9. Fishery Diagrams of Gabon

The main objectives of development of the NPA are:

- The re-establishment of fisheries stocks
- The re-establishment of the degraded habitats
- The reduction of pollution (domestic and industrial)
- The creation of a framework of evaluation and management of the marine ecosystem for the sustainable exploitation of these alive and non alive resources;
- Strengthening of mechanisms of national consultation and viable coordination on environmental and resource management

Photo 11. A shoreline in Gabon

Photo 12. A studious Working Group during the Gabonese PA Launching Workshop

In Democratic Republic of Congo

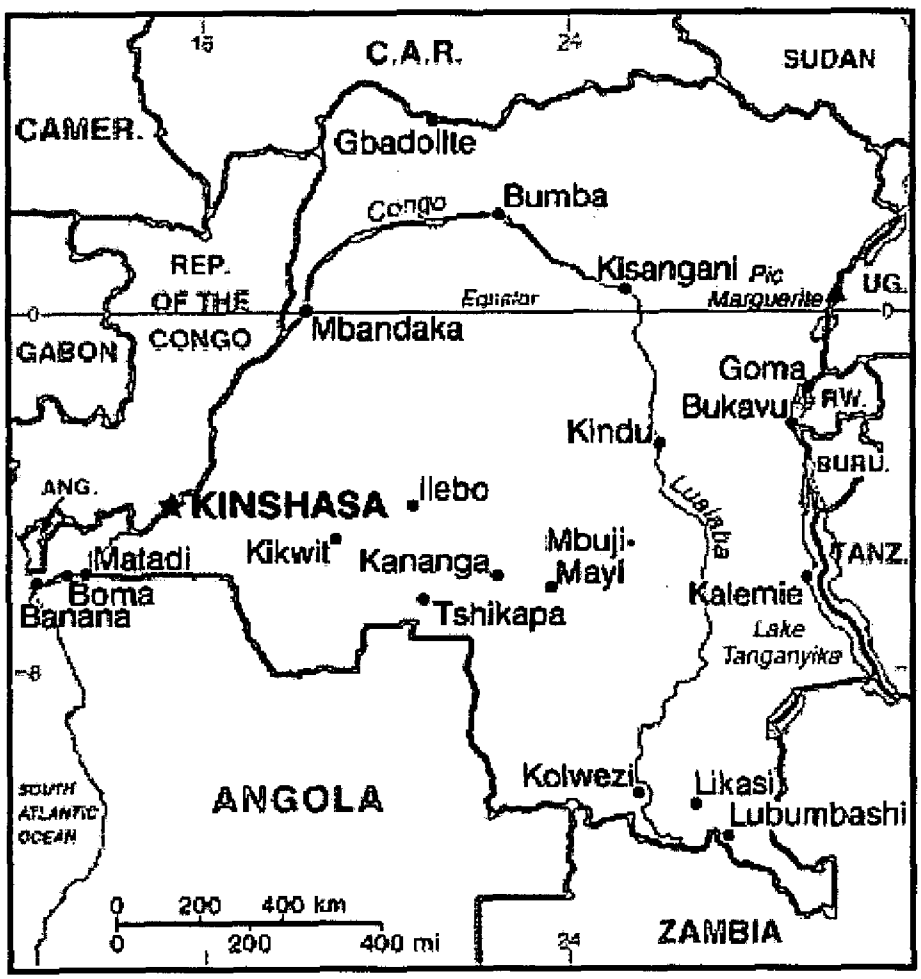


Fig. 10. Map showing the General Aspects of DR Congo

The Identified environmental challenges for the Marine Ecosystem are:

- Pollution from mines inland as well as cities/industries upstream
- Deforestation of the mangrove for building material and charcoal production (main source of domestic energy for cooking, despite the presence of the Big Inga dam upstream at about 200 km) and therefore the destruction of reproduction zones for many species

(fish, mollusk, marine turtle and mammals such as the « *lamentin in french* » *Trichechus senegalensis*).

- Erosion and siltation from sediment transport that increase the water turbidity (reducing therefore the primary production).
- Decrease in marine biodiversity Biodiversity resources have tremendously decreased due to above challenges, many marine species are threatened or endangered: These are *Trichechus senegalensis (Lamentin), Caretta caretta,Lepidochelys olivaceaa, L. kempii, Chelonia mydas and Estmochelys imbricata (marine turtles), Ostrea sp. (Oyster), Sypharma sp. , Carcharias taurus (sharks), Hyperodon ampullatus (whales).*
- Lack of capacity in marine environmental protection

Photo 13. Mangrove Destruction in DR Congo

Photo 14. The Congolese for Environment (M. D. Pembe Bokiaga), Chairing the closing session of the DRC NPA Workshop

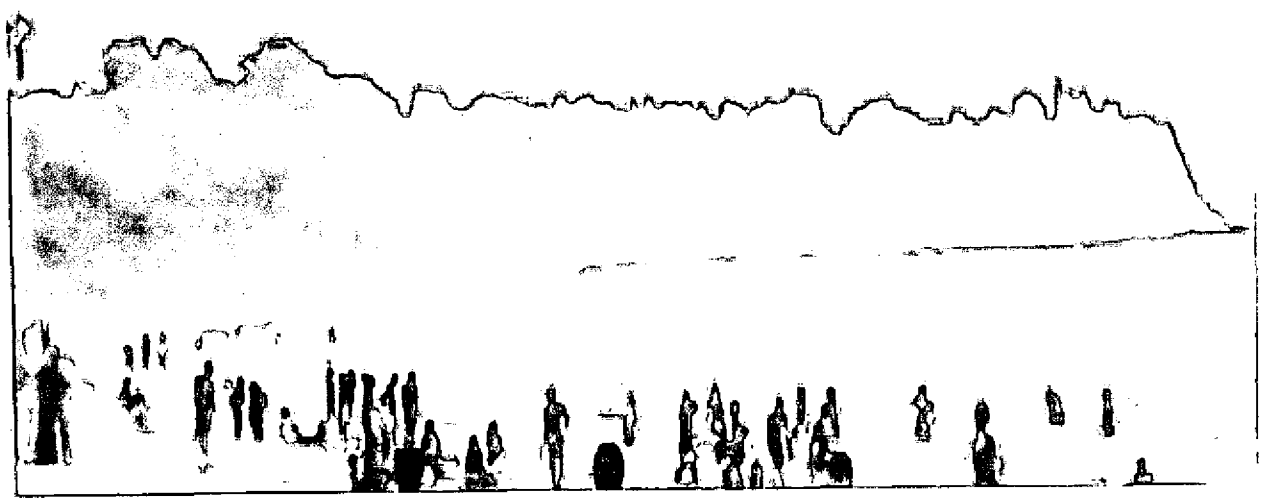


Photo 15. A Beach aspect in DR Congo

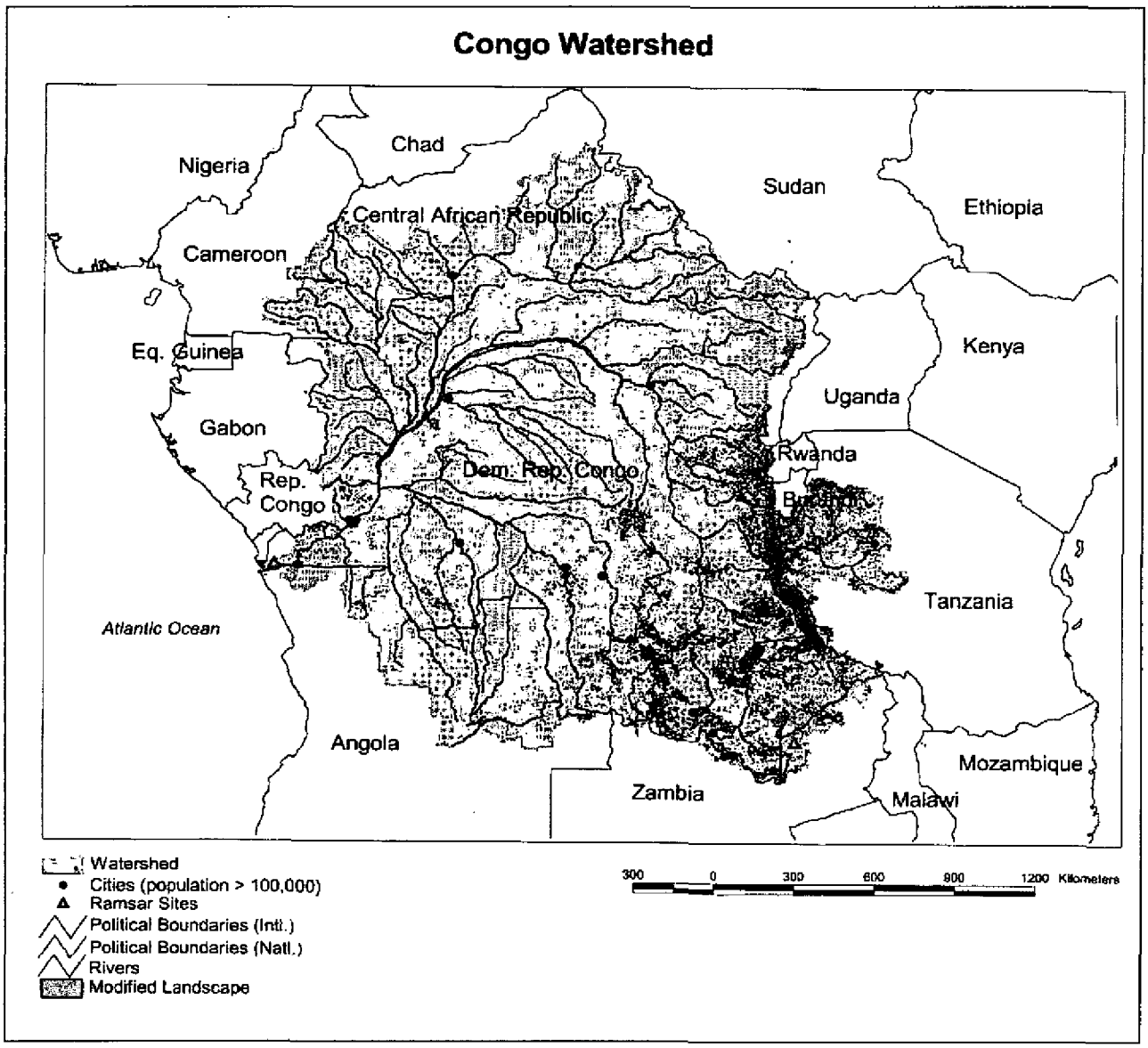


Fig. 11 Congo Watershed

11. Suggested Options for Action

At national/local level:

- To update and upgrade scientific data on the biology, ecology, population dynamics and conservation requirements of marine target species (both for big species targeted by fisheries and endemic species with high evolutionary value). This means **increasing the role of scientists and universities.**
- To set up local Biodiversity groups composed of all stakeholders (local communities, government, private sector, donor agencies such as UN agencies, EU, NGOs, Press/medias and churches) with a good gender balance.
- To select key indicators that support biodiversity sustainability (e.g. fish size, fishing season, fishing materials and techniques, promoting alternative sources of income (e.g. ecotourism, microfinance, etc) for daily/ seasonal monitoring/ evaluation and the reduction of human pressure on marine/coastal resources.
- To develop a national marine Biodiversity museum where all biodiversity elements are described and conserved.
- To initiate capacity building sessions for decision-makers, and for all stakeholders including community environmental education and awareness raising. The various Departments of Environmental

Sciences and the Fisheries Institute play an important role in this regard.

Photo16. A working session during the National Consultations on the National Programme of Action in the Democratic Republic of Congo in March, 2007.

In all the cases, various forms of regular follow-up are in progress and/or envisaged with the experts and National Directors of GCLME Project.

Photo 17. A Group portrait at the closing session with Hon. Minister for Environment

12. **Recommendations**

The strategy of sustainable development in the countries of the GCLME rests on definite orientations and sectoral choices according to the international economic situation and of current capacities and their future evolution in the countries. From the various Workshops and Consultations, certain communalities stood out in terms of the recommendations for sustainable development which will underscore the successful implementation of the NPAs. They include:

- to improve the rate of the economic growth of the country by the establishment of healthy economic equilibrium, competitive and entrepreneurial environment,
- to stimulate further the agricultural sector and activities by improving the socio-economic situation of the peasant, the stockbreeder and the fisherman; the importance attached to this sector, takes account of the mission which is entrusted to him to ensure the food safety of the country and to take an active part in the implementation of the NPA
- to offer to coastal living conditions in improvement continues on all the levels as regards health, of energy and emancipation and in particular in the underprivileged zones and with the scanty means,

- to take the indicators of improvement of the quality of the life and environmental viability as an objective of any action of development as well on a national scale as regional..
- to increase the participation of women in daily life activities while guaranteeing the cohesion of the family
- to make the future prospects more promising for young people by involving them more in the major decisions of the country and by encouraging their initiatives on all the levels,
- to develop research and the corresponding institutions for the creation of the richness to the country and to reinforce the capacity of the country to face the challenges of globalization,

Photo 18. A forest in GCLME Region

13. Conclusion:

There was a very high level of enthusiasm in the countries for the formulation of the NPAs. It will be recalled that since 1995 when the 5 countries joined other nations to adopt the Global Programme of Action for the protection of the marine environment from Land Based Activities, very little had been done towards the formulation and adoption of their respective NPAs However, from every indication gathered in the course of assisting the five countries of Cameroon, Congo DR, Gabon, Guinea, Sierrea-Leone the realization was always there that the NPA would afford a vantage platform for dealing with Land Base Activities that were the sources of pollution in the coastal and marine environment

- The cooperation of the countries was particularly heartwarming as the concerted contributions of the National Experts and the GCLME National Directors who contributed immensely to the successful conclusion of the TORs of the Consultants.
- As important as the formulation and adoption of the National Programmes of Action are, it is their implementation that will result in positive changes on the health of the caoastal and marine environment. It is therefore necessary, even urgent, for the countries to embark in the shortest time possible on implementation of the provisions of the NPA. In this regard , particular attention should be paid to the execution of the pilot projects defined in the NPAs. This

calls for the infusion of material and financial resources over and above those usually allocated to Environmental Protection Ministries/Agencies.

- One option for securing additional resources for NPA implementation is the organization of Donor Conferencies where governments gather with their Development partners to address the issues and problems identified in the NPAs.

14. Acknowledgements:

CEDA wishes to thank the Executive Secretary of Interim Guinea Current Commission and his staff for their assistance during the Team's Preliminary visit to the Executive Secretariat of the Interim Guinea Current Commission in Accra, Ghana.

The assistance of the National Project Directors and their Programme Assistants who facilitated the missions to Guinea, Sierra Leone, Cameroon, Gabon and Congo DR is also gratefully acknowledged.

Thanks to staff of UNIDO Contract's Section and the GCLME Project Manager, Dr Chika Ukwe for guidance respectively on administrative and technical matters related to this contract.

ANNEXES

ANNEX I

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Annex 1.a: List of Workshop Participants in Guinea Conakry

Annex 1.b: List of Workshop Participants in Sierra Leone

Annex 1.c: List of Workshop Participants in Cameroon

Annex 1.d: List of Workshop Participants in Gabon

Annex 1.e: List of Workshop Participants in Congo DR

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ANNEX 2: TYPICAL COURSE NOTES (BY PROF. S. K. ADAM) PREPARED BY CEDA CONSULTANTS FOR THE WORKSHOPS

Développement du Programme National d'Action sur les activités terrestres du Programme Global d'Action

par

K. S. Adam

Sommaire

Préambule : De la Déclaration de Washington au Projet GEM-CG

Né de la déclaration de Washington (12-1995),

Le Programme Global d'Action pour la protection de l'environnement marin contre des activités telluriques est une source de conseils conceptuels et pratiques à utiliser par des Autorités des pays et/ou des autorités régionales pour développer et mettre en application des actions concertées et cohérentes pour prévenir, réduire, contrôler et/ou éliminer les impacts des activités telluriques responsables de la dégradation environnementale marine.

Préambule : Penser globalement pour agir localement

Actuellement, on le pense que plus que 80% de la pollution dans l'environnement marin provient des activités humaines sur la terre.

Conformément au principe de penser globalement pour agir localement, le PGA vise à favoriser l'engagement des pays à protéger l'environnement marin par la formulation et l'exécution des Programmes Nationaux d'Action (PNA) sur les activités telluriques

Préambule: Principes Généraux des PNA

Un Programme National d'Action (PNA) pour la préservation et la protection de l'environnement marin contre des activités telluriques est envisagé comme cadre intégré de gestion et de politique.

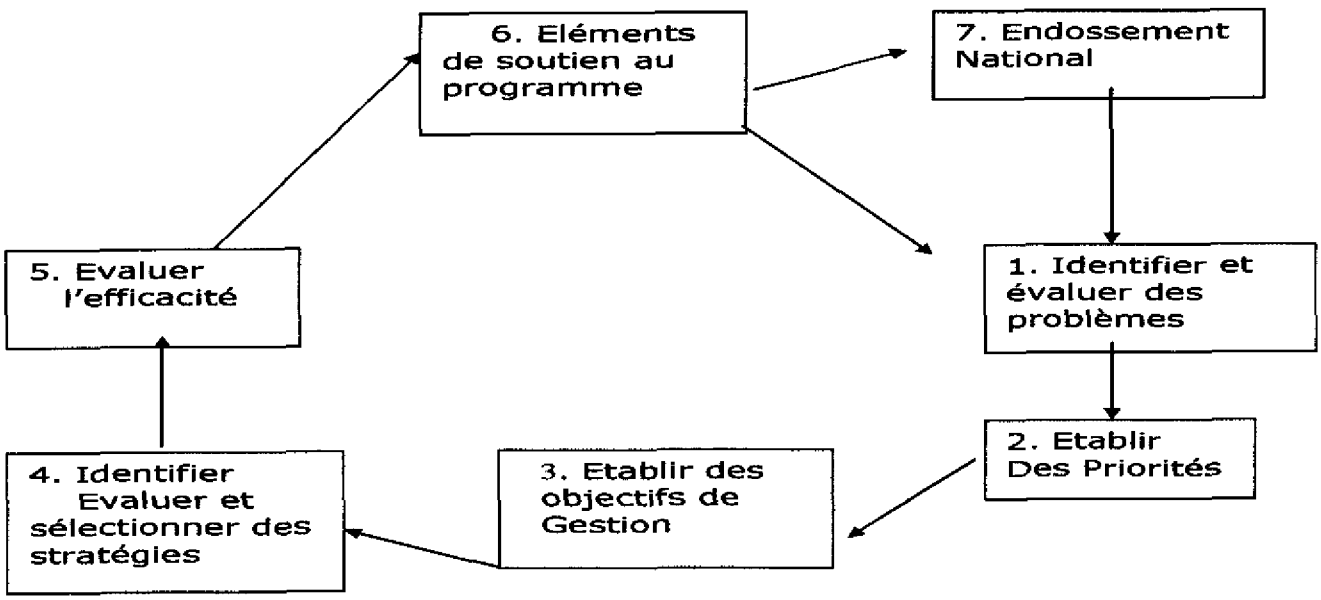
Les impacts telluriques et les menaces pour l'environnement marin et côtier sont complexes et exigent des réponses à long terme, inter - sectorielles, multidisciplinaires et largement participatives.

Le but final d'un PNA est de protéger et de préserver les environnements marins et côtiers par des actions coopératives afin d'assurer la santé et l'utilisation durable des ressources côtières et marines, par une réponse stratégique utilisant une gestion de ressources ciblées pour les processus causés par les activités humaines .

2. Formulation des PNA
Un PNA est un processus itératif qui réclame l'exécution échelonnée des priorités identifiées dans un cadre intersectoriel et participatif.

En permettant le choix des priorités à long terme, le PNA devient un processus cyclique qui permet aux acteurs d'identifier et d'évaluer, progressivement, des menaces et des impacts sur les environnements marins et côtiers.

Étapes de formulation d'un PNA



Éléments de soutien/renforcement des capacités pour le succès du processus de PNA

L'établissement ou le renforcement des éléments de soutien de programme exige que :

- **les structures administratives et de gestion nécessaires soient en place pour soutenir le programme national au-delà du long terme,**
- **compris les mécanismes légaux et financiers, les plans d'urgence et les mesures publiques de participation.**

Ceci devrait être réalisé par ce qui suit:
– (a) Indiquer une agence de développement du NPA et coordonner les activités parmi les établissements et les acteurs appropriés;
— (b) Établir un cadre institutionnel;
— (c) Évaluer l'information, les bases de données et les inventaires existants;
— (d) Évaluer la politique et les cadres juridiques et les lacunes.

Définition des objectifs prioritaires

Identification de la nature et de la sévérité des problèmes par rapport à:
Allégement de sécurité et de la pauvreté alimentaire ;
Santé humaine et publique,
Ressources et santé côtières et marines et santé de l'écosystème y compris de la biodiversité ;
Bénéfices économique et social intégrant les valeurs traditionnelles et culturelles.
Allégement de sécurité et de la pauvreté alimentaire ;

Santé humaine et publique,

Ressources et santé côtières et marines et santé de l'écosystème y compris de la biodiversité ;
Bénéfices économique et social intégrant les valeurs traditionnelles et culturelles.

Définition des objectifs prioritaires (suite)

- Le PNA identifie des problèmes, des priorités, des buts et des objectifs, des stratégies et des actions transfrontaliers nationaux et régionaux .

- Les problèmes sont identifiés et évalués pour les activités continentales qui peuvent avoir un effet sur les environnements marins et côtiers : *pêche, *qualité de l'eau douce associée, *dragage, *développement portuaire, etc.)

Identification, évaluation et choix des Stratégies

Identifications

– Mesures spécifiques de meilleure gestion et de motivation
– Arrangements institutionnels
– Besoins de collecte et de recherche de données
– Développement d'un système de contrôle et d'évaluation de la qualité de l'environnement récepteur

L'objectif principal est l'établissement des mécanismes financiers soutenus afin de s'assurer que le processus PNA évolue au-delà du moyen et du long terme.

Évaluation (Action)

Évaluer l'efficacité des stratégies et des mesures nationales

- 1. Surveillance et évaluation périodique
- 2. Déterminer si les stratégies et les mesures concordent avec les objectifs de gestion

Les indicateurs de contrôle et de l'évaluation de l'efficacité devraient être :
(a) objectivement vérifiable,
(b) clairement indiqué et
(c) assez simple pour différents groupes de partenaires, pour qu'ils participent aux activités.

Mise en réseau du PNA : Aide régionale et internationale

- Les accords, la coopération, et le partage internationaux de l'information sont critiques pour le succès de nos efforts globaux pour protéger l'environnement marin et la santé humaine, et soutenir le développement durable .

- le développement doive être soutenu par une stratégie intégrée de gestion qui soutienne l'application des meilleures techniques disponibles, des meilleures procédures de gestion et l'introduction des technologies plus propres de production.

Assistance régionale et internationale (suite)

- Les instruments régionaux appropriés et les stratégies devraient être une partie intégrale de l'action nationale
- Dans la plupart des exemples, les actions réussies pour protéger l'environnement côtier et marin contre des activités telluriques dépendent de la coopération régionale et sous-régionale
- Les bons critères de sélection sont :

– Les problèmes doivent être transfrontaliers

– Les principaux financiers : associés financiers, institutions financières, donateurs bilatéraux et organisations non gouvernementaux

Assistance régionale et internationale (suite)

Le PNA est un programme stratégique à long terme conçu pour changer le *comportement de gouvernement, de corporation et public.*
Par conséquent une des conditions principales pour son exécution réussie est l'aide financière d'approbation, institutionnelle et politique pleine des autorités appropriées de gouvernement à tous les niveaux appropriés. C'est crucial parce que: u· Le PNA adresse une gamme complexe et intersectorielle des problèmes; u· Il doit être consigné dans des cadres appropriés - politique, dispositions légales, de budget, expertise de mécanismes d'application, technique et scientifique d'information;

Assistance régionale et internationale (suite)

L'adoption officielle conférera au processus une légitimité et un soutien requis pour inclure un éventail d'acteurs (public et privé); u· Mettre en application les actions exigées rend nécessaire la participation à tous les niveaux;

Les gouvernements provinciaux, territoriaux et municipaux, l'industrie, le secteur non gouvernemental, les communautés et les gens vivant dans des secteurs côtiers devront prendre la responsabilité et la mesure; u· L'engagement et l'appui politiques augmenteront la portée de l'influence du NPA et lui permettront de se *développer en spirales à l'extérieur pendant que les résultats évidents* deviennent évidents dans l'environnement côtier et marin.

Mise en œuvre des PNA

Méthodologie

– Le PNA devrait être basé sur une approche d'efficacité et de coopération croissantes de tous les intérêts et politiques, programmes, ressources et législation existants.
– L'exécution devrait adopter une approche par étapes:

- Accroître la prise de conscience;
- Produire des idées et présenter des actions initiales;
- Focaliser sur la surveillance des actions dès qu'on les considère adéquates ;
- Renforcer les actions si on les considère comme faibles au moment où le PNA est mis en application:
- Mettre en place des objectifs de gestion additionnels, des stratégies et des actions telles qu'elles sont souhaitées;
- Intégrer les buts et les objectifs aux programmes et activités existants.

Cadre de gestion

– Cadre législatif
– Gouvernance Coordonnée
– Actions Soutenant les Priorités du PNA
– Programmes de Soutien
– Extension et éducation
– Accroissement de la prise de conscience publique
– La mobilisation des Communautés

Projet Pilote

- Les pays qui ont identifié des priorités basées sur l'évaluation des programmes de développement existants doivent répondre aux préoccupations suivantes :
- Démontrer un engagement pour l'action de terrain;
- Créer la prise de conscience, le soutien et les incitations du développement continu du PNA;
- Encourager le développement de nouvelles associations avec différents partenaires et associés;
- Contribuer au développement d'un modèle dont les leçons apprises peuvent être répétées et mises à jour.
- *Le projet initial devrait être fortement évident et avoir l'impact démontrable sur un secteur, par exemple un emplacement dégradé, le contrôle d'une industrie de pollution ou la remédiation d'un port. Ceci devrait devenir une incitation pour de futurs projets.*

Conclusion : Assurer la durabilité du Processus

La méthodologie de cadre de GPA pour développe un NPA est une approche étape par étape logique qui est très complète. Il faut :

a) développer la propriété par une participation à large spectre des parties prenantes;
b) favoriser les associations pleines;
c) développer une communication et une participation stratégique;
d) faciliter l'éducation et la conscience;
e) créer le scénario facilitateur d'investissement;
f) préparer une stratégie financière

ANNEX 3. SUMMARY OF WORK NOTES PROVIDED DURING THE WORKSHOP

Sommaire

Introduction

Le Programme Global d'Action pour la protection de l'environnement marin des activités telluriques (avec la déclaration de Washington), adopté en 1995 est une source de conseils conceptuels et pratiques à utiliser par pays et/ou des autorités régionales pour développer et mettre en application par des actions concertées et cohérentes pour prévenir, réduire, contrôler et/ou éliminer les impacts des activités telluriques responsables de la dégradation du milieu marin.

Conformément au principe de penser globalement pour agir localement, le GPA vise à promouvoir l'engagement des pays à préserver et protéger l'environnement marin par la formulation et l'exécution des programmes nationaux d'action sur les activités telluriques

Le concept de PNA

Un Programme National d'Action (PNA) pour la préservation et la protection de l'environnement marin des activités telluriques est envisagé comme cadre intégré de gestion et de politique.

Les impacts des activités telluriques et les menaces pour l'environnement marin et côtier sont complexes et exigent des réponses à long terme.

Le PNA a une approche inter-sectorielle, multidisciplinaire et largement participative.

Un PNA est un agenda dynamique à court, moyen et long terme pour la protection marine grâce à un plan stratégique, la réalisation de projets concrets, ciblés et coûteux et une évaluation périodique pour améliorer la performance.

Section préliminaire

- Organisation de l'atelier de lancement
- Préparation des notes d'information aux experts/Directeurs nationaux
- Préparation des Ateliers de lancement dans chacun des 5 pays

Principales activités et Résultats

- Organisation des Ateliers de consultation
- Contenu
- Résolutions
- Assistance à chaque équipe scientifique
- Principaux résultats

Contenu des Ateliers

- Les principaux objectifs des PNA
- Approches stratégiques
- Approbation des programmes d'action aux niveaux national, régional et local
- Assurer la durabilité des Programmes du PNA

Résolutions

1. Assurer une meilleure coordination entre les différents plans sectoriels des domaines marin, côtier et les milieux aquatiques en général, mais aussi entre les départements et les agences en charge de ces espaces;
2. Promouvoir une meilleure participation des communautés villageoises/locales, les femmes, les acteurs socio-économiques, les ONG et les scientifiques par le biais des actions de développement;
3. Renforcer les capacités nationales en matière de ressources humaines et développer les stratégies visant à améliorer le cadre de vie des populations riveraines des régions côtières;
4. Intégrer dans les politiques de gestion des zones côtières les principaux groupes cibles afin de lutter plus efficacement contre les formes de pollution due aux activités telluriques;
5. Assurer l'éducation et la sensibilisation du public par leur intégration dans les programmes de lutte et de gestion pour la protection durable des régions côtières;
6. Adhérer aux accords et programmes régionaux et internationaux appropriés en vue d'une coordination plus efficace des activités à mettre en oeuvre dans le cadre du programme d'action.

Assistance à chaque équipe scientifique

- aspects de la Pollution
- Aspects de la dégradation des habitats
- Aspects institutionnels et de Gouvernance

Principaux résultats

- En Guinée (++)
- En Sierra Leone (++)
- Au Cameroun (+)
- Au Gabon (+)
- En RDC (+)

Dans tous les cas, différentes formes de suivi régulier sont en cours ou/et prévues avec les experts et directeurs nationaux du Projet GEM-CG

Recommandations

- Stratégie nationale en communication, éducation et sensibilisation du public pour la gestion durable des ressources marine et côtière sur la zone côtière ;
- Gestion intégrée de la zone côtière ;
- Gestion durable des ressources des estuaires par la création d'aires marines transfrontalières ;
- Collecte et traitement des déchets urbains côtiers ;
- Recyclage des eaux résiduaires dans les villes côtières ;
- Renforcement des capacités humaines et institutionnelles pour la conservation de la diversité biologique et l'utilisation durable des ressources marines et côtières.

Conclusion

- Une volonté manifeste des autorités politiques des différents pays à agir efficacement
- Problèmes institutionnels intra et inter – ministériels sont encore persistants
- Forte participation communautaire est largement recommandée

ANNEX 4

ENDORSED NPA OF SIERRA LEONE

GUINEA CURRENT LARGE MARINE ECOSYSTEM PROJECT

NATIONAL PROGRAMME OF ACTION SIERRA LEONE

GUINEA CURRENT LARGE MARINE ECOSYSTEM PROJECT

NATIONAL PROGRAMME OF ACTION SIERRA LEONE

2006

Contents

List of Abbreviations & Acronyms

GCLME – Guinea Current Large Marine Ecosystem
SLMA – Sierra Leone Maritime Administration
IMBO – Institute of Marine Biology & Oceanography
FBC – Fourah Bay College
USL – University of Sierra Leone
EPD – Environment Protection Division
NACEF – National Commission for Environment & Forestry
SLPA – Sierra Leone Ports Authority
MOHS – Ministry of Health and Sanitation
MLCP – Ministry of Lands & Country Planning
MTC – Ministry of Tourism & Culture
NWSLA – Naval Wing of Sierra Leone Army
CHEHSIL – Council for Human Ecology in Sierra Leone
EFA – Environmental Foundation for Africa
CSSL – Conservation Society of Sierra Leone
NGO – Non-Governmental Organisation
CBO – Community Based Organisation
MTI – Ministry of Trade and Industry
STC – Science and Technology Council

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FOREWARD

The Guinea Current Large Marine Ecosystem (GCLME) is one of the highly productive ecosystems in the world. This ecosystem is undergoing serious degradation notwithstanding the efforts of individual states to rehabilitate/ameliorate negative impacts of the socio-economic activities within the member countries. The economies of member countries are highly dependent on this ecosystem. In the case of Sierra Leone, it is one of the biggest foreign exchange earners. Furthermore, detailed information on this ecosystem is very limited, mainly due to the lack of capabilities and cooperation among member states.

Consequently, member countries, Sierra Leone in particular, embraced the elaboration of the GCLME Project, by declaring an intention of participation in 1998. The objective of the project is to facilitate cooperation in this sector among member countries and to determine the state of the Guinea Current Large Marine Ecosystem in order to forestall fisheries depletion, habitat destruction, and coastal and marine environmental degradation. In view of the inherent benefits of Sierra Leone's coastal and marine environment, the government deemed it necessary to be part of a complimentary programme, the Abidjan Convention for Cooperation in the Protection and Development of the Marine and Coastal Environment of West and Central African Region on the 7th June, 2005.

In line with the GCLME projects objective, an initial assessment was carried out, followed by a full-scale diagnostic analysis leading to the preparation of a National Programme of Action (NPA) with total support from the GCLME/Interim Guinea Current Commission (IGCC). Sierra Leone's NPA is a road map directing the implementation of the project to meet its goal. In want of effectiveness and efficiency, the constituted National Inter-Ministerial Committee and Steering Committee are to ensure the mainstreaming of all activities in the NPA into national development programmes of member countries.

The internalization of the NPA, coupled with awareness raising programmes will positively re-orientate every stratum in government machinery to come into terms with even the latent benefits. On this note, I commend the GCLME/IGCC for their role in making this dream a reality and I urge them to continue playing such role. Moreover, Sierra Leone needs the assistance of GCLME/IGCC particularly in capacity building.

Dr. Chernor A. Jalloh
Minister of Fisheries and Marine Resources.

Introduction

Global Programme of Action (GPA)

At an inter-governmental conference held in Washington D.C. in 1995, the international community recognized that the impacts of land-based activities on the marine environment are significant and agreed on the Global Programme of Action for the Protection of Marine Environment from Land Based sources. The primary objective of the GPA is to facilitate "the realization of the duty of states to preserve and protect the marine environment. It is designed to assist states in taking actions". The coast is an area of high socio-economic activities. This is due to the fact that coastal and marine areas contain vast natural resources. Pressures arising from such activities usually result in the degradation of the area. Most of the degradation in the coastal and marine areas results from land-based activities, which are responsible for over 80% of such impacts.

Mission

Sierra Leone's coastal environment consists of rich and diverse ecosystems, natural resources, and large human populations. The National Plan of Action (NPA) will provide a comprehensive yet flexible framework, to preserve and protect the marine environment from sewage, physical alterations and destruction of habitat, nutrients, sediment mobilization, persistent organic pollutants oils, litter, heavy metals and radioactive substances. The sustainable use of coastal and ocean resources has implications to public health, food security, economic and social benefits, including cultural values and traditional livelihoods. Hence, this National Plan of Action is of high priority.

Objectives of the National Programme of Action (NPA)

National programmes of Action are iterative processes, which call for the phased implementation of priorities identified within a cross-sectoral, participatory framework. The fundamental purpose for implementing this national programme of action is to ensure the health and sustainable use of coastal and marine resources by responding in a strategic and feasible manner, using targeted, integrated and adequately resourced measures, to both sustained and short-term pressures caused by human activities on land. The basic objectives of the National Programme of Action include:

- Identification of resources and threats to the environment from land based activities.
- Provision of a flexible mechanism for identifying and addressing priority problems through partnerships and consensus amongst stakeholders.
- Strengthening public sector's ability to effectively respond to causes of environmental degradation from land based source, and to ensure the sustainability of the actions and projects undertaken to address the problems.

- Mobilization of resources and partners, including the private sector, for implementation of specific project to address the problems.
- Heightening awareness and understanding of the value, benefits and vulnerability of strategic coastal and marine environments.

Output of NPA

The National Plan of Action will result in:

- A healthier coastal and marine environment.
- Sustainable management of coastal resources.
- Strengthening and enforcing existing legislation of the coastal zone from land based sources.
- Recommend actions to prevent further degradation of the coastal zone from land based sources
- Recommendations and implementation of pilot projects to address identified problems arising from degradation of the coastal zone from land based sources.

Physical Environment

Location and Relief of Sierra Leone:

Sierra Leone has an area of 72,325 km^2 between latitudes $6^0 55'$ and $10^0 00'$ North and between longitudes $10^0 14'$ and $13^0 17'$ West. The coastal zone of Sierra Leone extends for a distance of about 465 km. The configuration of the coastline and international boundaries of Sierra Leone encloses a very compact country. Sierra Leone is bordered in the northeast by the Republic of Guinea, in the south and southeast by the Republic of Liberia and in the west by the North Atlantic Ocean (Fig.1).

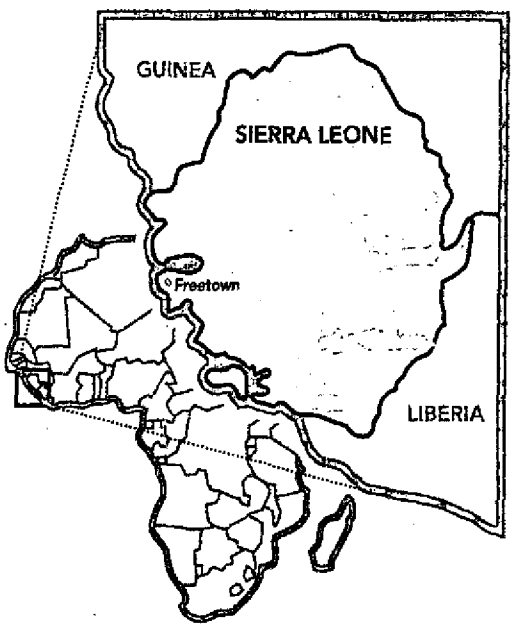


Figure 1: Location of Sierra Leone in Africa

Geomorphology of the Sierra Leone Coastal and Marine Area

The country is divided into four (4) main relief regions: coastline interior lowland plains, interior plateau and mountains. The coastline is about 560 Km long and the shelf covers an area (to 200m depth) of 30,000Km2. The drainage system consists of a series of rivers from North to south including the following: Great Scarcies, Little Scarcies, Rokel, Jong, Sewa, Moa and Mano.

The interior lowland plains extends form coastal terraces in the West to the East of Sierra Leone occupies approximately 43% of the land area. The interior plateau is made up of granite that runs from the northern part of the country to southeast. They seldom rise above 700m and are comprised of alluvial iron stone gravel in the southeastern region while the north end is comprised of weathered outcrops of granite.

The higher mountains are found in the North and East of the country, Loma Mountains and Tingi Hills respectively. The highest peak in the Loma Mountains is the Bintumani and rises to 1945m. The Sankan Biriwah of the Tingi Hills rises to 1885m. The

Freetown peninsula is made up of dissected mountainous Peaks with Sugar Loaf and Picket Hills being the highest.

Soils of the Sierra Leonean Coastal Zone

No extensive and intensive soil survey has yet been fully carried out in Sierra Leone though various efforts have been made in particularly localised areas to analyse the soil types of the country. With the exception of those in the swamps and valleys, the soils elsewhere in the coastal zone are found to be light and penetrable. They are acidic, lateritic and low in potassium content. Also characteristic of these soils is the prevalence of lateritic hard pans. Along the river hanks and flood plains and in the tidal estuaries are found deposits of rich alluvial soils very suitable for rice cultivation.

The factors responsible for the composition and formation of the soil types of the coastal zone of Sierra Leone include climatic (rainfall and temperature) and geomorphic (weathering process). Soil types identified include the following:

- Mangrove Swamp soils
- Saline sands
- Beach ridge sands
- Fresh water alluvium and levee slope soils

Mangrove Swamp Soils

The coastal swamps where basically the mangroves are found, consists of alternating banks of silt, sand, gravel and clay. Silt is predominant in the northwest. In the south, large areas of coarse sand are alternately waterlogged or very dry. The soils in the Sherbro estuary area are characterised by partly compacted, cohesive silts and clays, the clays have a good salt-fixing capacity and therefore provide an ideal base for the development of potentially acid sulphate soils (sulfaquents) and also because of the marine influence. Generally acid sulphate palacosols tend to occur in the contact zone between the tidal flats and pre-holocene non-estuarine deposits usually colonised by fresh water grasses and herbs.

Saline Sands

Saline sands contain about 75% of sand with the clay content ranging from between 4 to 29% and with an organic matter content of 0.25 to 15%. They are usually the product of erosion of sandy deposits of the older sand suite. Their colour can vary from dark grey to light brownish grey.

Beach Ridge Sands

The beach ridge sands are derived mainly from terrigenous sources as a result of chemical weathering. These sands are brought to the coastal zone of Sierra Leone by rivers such as the Scarcies, Rokel, Jong, Sewa and Waanje that discharge into the ocean. Some of these sands either settle as river mouth bars and others are distributed by waves and currents along the shoreline to build up as beach ridges. Non-acid sulphate soils are typical and sandy and/or high energy environments.

Fresh Water alluvium levee slope soils

The mouths of most rivers in Sierra Leone are deposited with rich alluvial saline-clay soils of the mangrove swamps. Along the river banks and flood plains, and in the tidal estuaries can be found deposits of rich alluvial soils suitable for rice cultivation.

Hydrography

The Sierra Leone coastal area can be divided into four main hydrological areas (Johnson & Johnson, 2004). These are the Scarcies River, Sierra Leone River, Sherbro River and the Gallinas and Mano Rivers hydrological areas.

Scarcies River

The river is tidal and during the rainy season rises about 2.7m. The wide estuary mouth has mud banks and sand bars forming Yelibuya and Kortimaw islands. Further inland, it splits into the Great and Little Scarcies rivers which are relatively narrow and lined with mangroves.

Sierra Leone River Hydrological Area

The main rivers entering this hydrological area are the Rokel, Port Loko creek and Kumrabe creek.

Sherbro River Hydrological Area

Three major river systems, the Taia, Sewa and Wange rivers enter the Sherbro River Estuary through a complex system of brackish water channels draining an extensive area behind the ancient beach ridges in the south east region. The water divides around Sherbro Island and flows west into Yawri Bay and south along Turner's Peninsula.

Gallinas and Mano rivers Hydrological Area

The Mano River divides Sierra Leone from Liberia and drains a large catchments area in the south. The strong surf and currents have formed an 8km spit between the open sea and the narrow lagoon fed by the rivers.

Climate

The mean long-term wind regime over Sierra Leone is influenced by the distribution of atmospheric pressure over the tropical zone of the Atlantic Ocean in spring. (Fig. 1.2a) and in autumn (Fig.1.2b) respectively due to two major atmospheric high-pressure systems: the St. Helena or South Atlantic Maximum and the Azores or North Atlantic Maximum. The equatorial atmospheric depression between these two high-pressure systems exerts a less prominent influence on the wind regime over Sierra Leone.

Local changes in atmospheric pressure resulting from temperature differences between land and the adjacent ocean as well as to orographic and land cover differences exert local changes in wind patterns on a diurnal and other short-term periods.

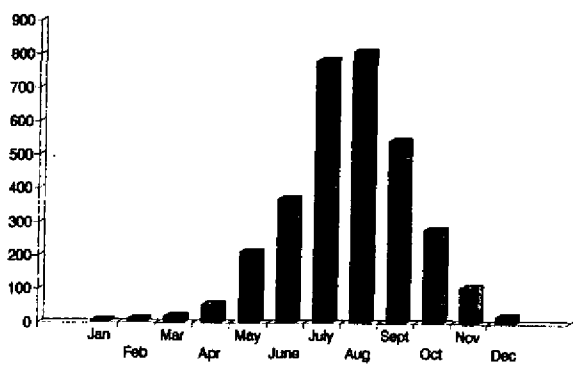
The Northeast trades otherwise known as the Harmattan are relatively cool and humid. The mean-long term wind regime. In May to November, the winds are unstable in terms of direction and from June to October Southwest monsoon winds dominate. These are the Southeast trades from the Southern hemisphere deflected at right angles as they cross the equator.

The climate is tropical and there are two well-defined seasons of wet and dry weather. The wet season generally lasts from May-November with two periods of squally weather, in March-April and May, and again in September-October.

During the rainy season, clouds of vertical development of 8-10% general prevail everyday. These are usually accompanied by rainfall. The highest observed cloudiness from the area 6-7 and are closely related to the influence of the equatorial monsoons blowing from June to November. The cloud amount decreases to 3-5 a month during the months of December to April.

The highest amount of rainfall occurs during the rainy season, which lasts from May to November. The heaviest rains occur in July and August (Fig 1.3). The mean monthly amount of rainfall reaches its maximum in July and August, when the average number of rainy days is 27.

Figure 2: Rainfall (mm) distribution at Falcon Bridge (1958-1981), Freetown Sierra Leone



The mean long-term air temperature regime shows an average monthly temperature of between 26-28^{0}C from June to October, with a maximum temperature of 32^{0}C. Temperatures of up to 36^{0}C have also been recorded especially during the month of March. A minimum temperature of 20^{0}C has also been recorded.

Air humidity according to monthly means can be as high as 80-90% during dry season and decreased to 70-80% during the rest of the year. The mean monthly occurrence of mist is approximately 1%. The visibility is obstructed by haze, the frequency of occurrence of which increases from 25% to 40% during the period from December to May. Its frequency from June to September is 3-5%. From December to February (Northern Winter), mist occurrence in the area increase to almost 2% a month.

Coastal district

Kambia District

The coastal strip of Kambia District stretches from the Guinean border in the north to the northern shores of the Scarcies estuarine system. The coastal strip is broken up by the Scarcies Estuary.

The development of land in Kambia District has been spontaneous and unplanned residential shapes in the coastal towns reflect the influence of both physical and human factors. Swamps and rivers have been avoided rather than drained and channelled, resulting in villages and towns with poor shapes. A number of primary schools, a health center, fishing settlements and commercial centers are found near the Scarcies or Kolente River. There are about four towns along the coastal strip of the Kambia District with about 8,000 inhabitants.

The natural resources within this strip of coastline include salt and mangrove swamps and the land use practices include agriculture, salt production and fish smoking.

Salt is collected from the land west of the area between the villages of Yeligban Makumpan. Salt making takes place during the months of March and April and involves collecting top soil of cleared mangrove bush and leaching the soil with salt water. The solution produced is boiled until all the water is evaporated leaving a salt residue. Only mangrove areas of low fuel wood productivity (Rhizophora shrub of poor form) are used for salt making. Salt currently fetches Le 1,800/50kg. In the local market.

In 1990, the fish culturing station at Makali, which was started in 1978, had 8 ponds with a total area of 0.3 hectares. These ponds were meant to breed fingerlings for farmers. Presently, this facility is in a state of disrepair partly due to unsustainable project management and the war.

Port Loko District

The coastal strip of Port Loko District runs from the Southern bank of the Scarcies Estuarine System to the Northern bank of the Sierra Leone River Estuary. This section of coast (as the Kambia District) is indented by the Sierra Leone River Estuary. This estuary extends inland fringed with mangroves and mud flats and water logged swamps.
Residential development is the main land development activity in the District. Community development projects have helped the District in providing essential services such as water, toilet facilities, etc.

Agriculture is again one of the main landuse practices, as well as sand extraction for building and construction. There are no industries in the District. Along the coast a number of primary schools can be found.

Western Area and The Freetown Peninsula

The coastal strip of the Western Area stretches from Goderich village to Wellington beyond the southern bank of the Sierra Leone River Estuary and contains almost all the main manufacturing industries in the country.
Residential development is also proceeding at a rapid rate along parts of the Atlantic stretch of coastline. Infrastructural facilities here include the harbour, hospitals, fishing company complexes, tourism and oil company facilities..Development projects include shelter construction, sanitation and health f,, transport and communication utilities and recreational facilities.
Along the coastline of the Freetown Peninsula which stretches from Lakka to Kent and then to Russell along the northern shores of Yawri bay on the Atlantic stretch of the Sierra Leone coast (fig.) has been little infrastructural development, probably due to the poor communications network viz poor roads, lack of electricity and inadequate transport and water supply facilities.

Moyamba District

The coastal strip of Moyamba District can be sub-divided into four sections/portions bordering the four chiefdoms of the District. The strip along the Ribbi Chiefdom up to the Bumpe Creek has been poorly developed with few rural settlements.

The portion along Kagboro Chiefdom is a major fishing center. Villages such as Shenge and Tisana are centers of operation of fisheries community develoment projects. With its large extent of mangrove cover, the main activity has been fish smoking and drying.

The sector of the Timdel Chiefdom up to the Sherbro Estuary has not been developed. Apart from few scattered villages, there are no facilities for urban or industrial development.

Bonthe and Pujehun Districts

The coastal strip can be divided into two strips, the strip of Sherbro Island and the strip from Mano to Sulima on the mainland. Along these strips of coastline are found a number of fishing village as well as the Turtle Islands. The villages on the Island are inaccessible by road as the coastline in intersected by numerous creeks and waterways. A boat launch service used to operate between these villages. Apart from jetties and spillways at Bonthe, there is no industrial or urban development in the area.

The coastline from the tip of Turner's Peninsula to Sulima is characterized by an almost unbroken sandy beach ridge behind which are a number of fishing villages. Residential and industrial development has not been embarked upon in this area either.

OCEANOGRAPHY

Sea Temperature

The average temperature of the sea surface waters off the Sierra Leonean coast is generally greater than 26°C (Fig). Mean annual cycle of sea surface temperature off Sierra Leone (7°N to 9°N and 11°W to 14°W), derived from COADS 195° to 1990 show that between February and May, sea surface temperatures range from 27°C and 28.5°C between May and August temperatures drop from 28.5°C to around 26.8°C and between August and November the temperatures again rose from 26.8°C to 27.0°C and the average water temperature in December is around 28.5°C and around 27.8°C in January (Fig.).

The peaks in May and December are associated with seasonal cycles and closely related to the solar heights.

Mean temperature profiles up to 500m depth in the area of the continental shelf show the development of a sharp thermocline line below the warm surface waters. The gradient of temperature here sometimes exceeds 3°C/10m. Below the thermocline temperatures continue to fall gradually with depth.

Sea Salinity

The average salinity of the sea surface waters off the Sierra Leonean coast is generally less than 35.5. The salinity is influenced by fresh water run-off from land and rainfall especially during the rainy season. Mean salinity profiles ion the shallow areas close to the coast are characterised by low salinities at the surface, which result from the inflow of fresh water. The limits of the salinity homogeneous layer correspond to the upper limits of the thermocline showing that the salinity and thermal structures are similar in the surface layer. Below the surface a sub-surface salinity maximum (S=35.7°) exists between 60 – 70m depth. Below the maximum, salinity gradually decreases to a minimum around 500 m depth

Current system

Currents are dynamic features of coastal waters of Sierra Leone and affect the coastal zone in a number of ways. It consists of Ocean currents, Long shore currents, Tidal currents and Rip currents.

General Circulation

The general water circulation along the Atlantic coast of Sierra Leone is shown in fig. The surface currents are significantly influenced by the Southeast and Northeast trade winds. During the spring in the Northern Hemisphere when the Southeast Trades noticeably weakens, the Northeast trades are full developed. During this period the Canary currents intensifies bringing cool water to the coast of Sierra Leone. This current generally flows in a southeasterly direction at the surface in the near-shelf regions. The canary current is mainly southward from August to April. When this current approaches

the equator, it turns westward as the North equatorial current. The monsoon period generally lasts from July to August; during the Northern Hemisphere summer. During this period, the equatorial counter current is strongly developed and is the source of much water joining the Guinea current. In the winter months (December to February) however, the equatorial counter current ceases to be of importance and the canary current is the main source of water joining the Guinea current. In the autumn the southeast trades strengthens reaching maximum strength in August. During the May – July period, the canary current lows temporarily northward carrying low salinity Liberian surface waters to the north as far as Senegal (Berrit, 1969).

Coastal currents

Along the Sierra Leone coast, coastal currents accompany large swell waves breaking obliquely to the coastline. These currents flow in a northeast direction along the northern shores causing a fairly serious erosion of the northern parts of the coastline around Yelibuya Island and Konakridee. In the south, similar south-easterly flowing currents carry sediments from the coastal beaches of the Freetown Peninsular and all along the southern part of the Sierra Leone coastline to the Liberian border enhancing beach erosion.

The waves, which generate these currents, are themselves generated by wind force of 3-4 beanfort, which are strongest during the harmattan (Northeast trades) months of December and February and August to October during the monsoon winds from mainly the Southwest. Longshore current velocities along the Freetown Peninsular can range from 0.20m/sec to 1.5m/sec.

Tides and Tidal Currents

The astronomical tide manifest itself as a periodical rising and falling of the sea level which results from the attracting forces of the celestial bodies, mainly those exercised by the sun and moon on the adjacent water masses. Off the Sierra Leone coast, the tides is mainly semi-diurnal, with two daily maximums and minimums, the mean height of the tide or mean tidal range is between 18m to 2.6m. The tidal currents are generally of moderate velocities of between 0.1mls to 0.2mls.

Rip Currents

These are localised out flowing currents through occasional depressions or 'lows' in offshore bars resulting from the outflow of water that would otherwise accumulate inside the zone of breakers after wave breaking.

Rip currents may sometimes appear as long lanes of foamy or turbid water stretching out to sea. They weaken and gradually die out further out to sea. These currents have not been reported along the coast of Sierra Leone.

Upwelling system

The Sierra Leone coastal zone lies at the Southern most extension of the up welling system which occurs along the entire northwest African coast Dakar – Freetown region. According to Coutin (1998), a strong upwelling occurs each year along the coast of

North-west African between December and April and especially between October and February for the Dakar – Freetown region during the Harmattan.
These harmattan winds cause aerobic upwelling along the entire northwest African coast. Longhurst (1968) indicated that the continental shelf waters of Sierra Leone are influenced by the Cape Verde divergence to the north and the convergence at the northern margin of the Equatorial Counter Current (ECC) further south of the equator. Upwelling is characteristic of the former whilst down welling is a feature of the latter.

Analysis of limited hydrographic data suggests that upwelling off the Sierra Leone coast is characterised by a shallower thermocline and nutrient enrichment below the surface at 20m depth (Johnson & Johnson, 1996). However, apart from generalisations based on physical, dynamic and biological indicators e.g. circulation patterns, wind regime and nutrient enrichment. Upwelling phenomenon has not been studied in detail with regards to causes, timing, persistence and impacts climate and productivity of the Sierra Leonean coastal zone.

According to FAO, 1986, in Sierra Leone continental shelf is isolated from the seasonal coastal upwelling areas of North-West Africa and central Gulf of Guinea by a complex of shoals (submerged sand banks) that comprises the Bissagos Archipelago, off Guinea-Bissau in the North and the shoals of Saint Ann to the South. The area of the continental shelf up to a depth of 200 m is about 27 500 km2. The western tip of Sherbro Island delimits two contrasting coastal waters. The narrow southern shelf has limited fish resources and is influenced by the eastward flowing Guinea current. The northern Sierra Leonean coast on the other hand constitutes the productive shelf of Sierra Leone. Therefore, most of the artisanal fishing activities in Sierra Leone occur in the North. Here, there are three major estuaries: the Scarcies River, the Sierra Leone River and the Sherbro River, as well as the Yawri Bay. The continental shelf has good yield potential for demersal and pelagic fish as well as shrimps.

Sediment Transport Dynamics

Longshore drift current is the main mechanism by which sediments are transported along the Sierra Leone coast. The sediment transport takes place mainly within the 1-10m water depth. Three main longshore drift current directions can be recognised along the Sierra Leone coastline. These currents flow in a northeastern direction causing erosion of the northern coastline around Yelliboya Island and Konakridee. Similar south easterly flowing currents in the south carry sediments from the Freetown Peninsular beaches and along the entire southern coastline of Sierra Leone.
Tidal currents also influence the sediment transport dynamics particularly those of very fine sand and mud mainly at the entrances of bays and estuaries.

SOCIO ECONOMIC DEVELOPMENT

Economic Performance

With a population of approximately 5 millions, Sierra Leone's economy has suffered prolonged deterioration due to political instability and an accompanying low standard of living despite its significant resource endowments. The average annual growth rate of real GDP per caput of US$155.Gross Domestic Product per capita declined from US$380 in 1980 to US$237 in 1990, and to about US$142 in 2000. The annual growth rate of real GDP from 1964 to 2000 is shown in figure 3 (below).

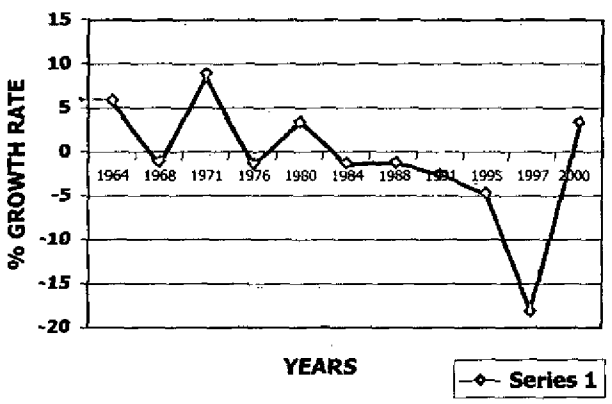


Figure 2: Average Annual Growth Rate of Real GDP

The dominant sector of the economy is agriculture, which sustains about two-thirds of the population, mostly at a bare subsistence level. Agriculture accounts for about 40 percent of GDP on average.

The next largest productive resource is the mining sector, providing about 20 percent of GDP. Mining contributes more significantly to export earnings than does agriculture. The mining sector's great potential has not brought the benefits that it could produce, due to improper policies for exploiting and utilizing sector resources. At independence the economy's prosperity was based on mining of diamonds and iron ore. While these exports grew, the economy prospered; when they began their seemingly irreversible decline, prosperity changed to stagnation, and then to continuous decline. The general inflation in primary product prices during the 1970s disguised the fall in the volume of mineral exports. In the same period, import prices rose significantly, leading to a decline in the net terms of trade. Overall, the stagnation of the mining sector generated a profoundly depressing effect on the economy.

The manufacturing sector is small with mostly import-substituting industries that employ about 2 percent of the labour force. The service sector accounts on average for about 40 percent of GDP. This sector comprises mainly transport, communications, insurance, finance and government services.

Demography

The population of Sierra Leone according to the 1985 National Population Census was 3.5 million and in mid 1995 it was estimated to be about 4.5 million. The birth rate per 1000 of population is around 46 and the national growth rate is estimated at 2.5% per year. There is an overall density of approximately 58 persons per km^2.
Quite a large percentage of the population is found in the coastal area of Sierra Leone may be up to 55% and make substantial use of the coastal resources. As the coastal population continue to grow, these resources correspondingly experience an increasing stress. However, the degree of coastal resources exploitation is to a large extent influenced by the population of the entire country in general and by the coastal population in particular.

The coastal population is not uniformly distributed. In the north, around the Scarcies River and Lungi areas, the population is around 80,000 whilst in the Freetown Peninsula areas it is about 1,250,000. In the south around Shenge, the population is close to 9,000 inhabitants and is around 8,000 in the Bonthe Sherbro area. The population of the coastal area is therefore approximately 1,347.000 persons. With an annual growth rate of about 2.5% it is important that a sound policy for the national exploitation of the coastal resources be pursued with the parallel development of appropriate institutional framework.

Social Structure

The social structure of the districts where the coastal resources are located are similar except for the Western Area. In the districts, there are chiefdoms each of which is ruled locally by chiefs representing the various tribes in the chiefdom. A paramount chief is the overall local head of the chiefdom. Chiefdom councils made up of tribal authorities (chiefdom councillors) are set up to administer the chiefdoms and to advice the paramount chiefs which in turn coordinate with district councils etc. The villages are headed by headmen and village area committees administer the villages. The lowest level is the household level. For the development of proper management strategies of the coastal resources, it is necessary to take cognisance of the influence of social structures on coastal resources utilisation. In the Western Area, the administration is under the supervision of the Freetown City Council, which in turn coordinates with the various village area committees, tribal headman and district councils.

Tradition and Culture of Coastal Communities

Sierra Leone is a country where religious (as well as non-religious and within the context of tribal based traditional societies) traditions and customs are widely observed.

Boat Building

Boat building is one of the pre-occupations of the coastal dwellers. Various types of boats are built ranging in length from 4m – 8m. Some of the canoes are either dug-out or made with planks of wood. These boats are used to transport the mangrove wood

from the sites where felling has taking place to the market areas. The main uses of these boats are for fishing and transportation.

Handicrafts

Handicraft is practical using local plants and other natural resources. Items produced are mainly for household purposes and include roofing materials, mats, bags, baskets, trays, etc. using traditional designs and patterns.

Fishing

The most common methods of fishing involve the use of cast and ringnets, and hook and line. Since the common method of catch preservation is drying, fuel wood is widely used, the main source of which is the mangroves. Different kinds of fish drying kilns are used but the traditional 'bandas' are the most popular.

Wildlife Hunting

Wild life hunting is a common tradition in the coastal area of Sierra Leone. The coastal forest is a home to monkeys, birds, antelopes, daikas etc. these animals are often hunted as a supplementary meat source to the more formal and expensive cow, goat, sheep or pig meat found in the market. This so called bush meat hunting particularly in border towns in some of the coastal areas have graduated from a subsistence activity to a commercially oriented activity.

Forest Resources Exploitation

Forest resources in the coastal zone are exploited for a variety of uses. Prominent amongst these is the fuel wood trade in mangrove forest wood as well as poles for building and other purposes. As already mentioned coastal forests are exploited for boat building and handicraft.

Oyster Farming

Oyster farming from mangroves and other hard sub-strata is another activity of coastal dwellers: Oysters are harvested for both commercial and subsistence purposes.

Agriculture

Peri-urban agricultural practices are common in Sierra Leone and are a usual feature of the coastal area. Swamp rice is one of the main crops cultivated in the coastal area. In some areas notably in the Kambia district, rice has been cultivated in areas previously occupied by mangroves. Infrastructural development

Industrial development

The manufacturing sector in Sierra Leone is small and accounts for about 6-7% of the Gross Domestic Product (GDP) in the country. These industries of mainly small-scale import substitution manufacturing ones are located on or near the coast. They include, food, cement, paint, nails, detergents, pulp, mineral water, beer, matches etc.

Tourism development

Tourism activity in Sierra Leone is fairly low despite the fact that the country is endowed with sandy beaches and other coastal and marine ecosystems of value to tourism and recreation.

There is limited hotel accommodation in Freetown for overseas tourists and beachfront development although gradually increasing in density is still appreciably low.

Development of urban settlements

Construction of housing units, industry, roads, health centres, security posts, schools etc. is on the increase in the coastal area of Sierra Leone particularly in the Freetown area due to government's attempt to implement the Freetown Structure Plan. As a result a number of quarrying industries located close to the coast have emerged as well as settlements.

Transport

In Sierra Leone the transportation systems of land, air and sea are somewhat heavily linked with the coastal areas. Freetown for instance has the main seaport, while the international airport is located on the Lungi landmass, which is a coastal landmass.

Road Network

The major road transportation networks go through coastal areas. Apart from roads constructed for the exploitation of natural resources, there is a general correlation between road and population densities. Roads have been built by central government to ease administration, by private companies (mining, lumber), or the Marketing Agencies e.g. Boards (oil palm, cocoa, coffee), by technical departments (Agriculture and Forestry) to exploit resources, by politicians to gain votes and by local communities to reduce isolation.

The character of the coastlands (fairly high population and recent economic growth) has encouraged road development along the coast, and at the same time permitting considerable transportation by coastal and inland waterways. Such coastal areas as are served by road and linked eastward, along watersheds, to an incomplete transverse axis of roads extending some 30 miles (km) inland from north of Kambia via Ribi Ferry, Moyamba, Mattru and Pujehun to Zimi.

On the Freetown Peninsular the Peninsular villages on the Atlantic coast are linked by carriageway running close to the beach in most areas.

Air transport

There is very little flow of air traffic between the main airports within the country. Internationally, there is even fewer flights to and from Sierra Leone.

Water transportation

The Freetown harbour is the best natural harbour along the West African coast. International commercial vessel traffic to and from Sierra Leone has however been low over the past years since the rebel war started in 1991.

Traders and other business class of people travel by sea to neighbouring countries (Guinea and Liberia) mainly by medium size boats, ferries and Katermerans. This limits the amount of goods they transport.

Inland water transport

Inland water transport is mainly by small engine boats or canoes and ferries. The rural people mainly depend on this form of transportation as a means of communicating between and remote towns and villages where possible. It is also an important means of transporting goods to and from Freetown to landing sites in the north and south of the country. Two other ports, point Sam and Nitty mainly serve the mining industry.

Coastal resources

Wildlife distribution in the Sierra Leone Coastal Zone has not been widely published. However, it has reported that the mangrove ecological system along the coast is the home of a variety of wading birds, monkeys, otteis, squirrel crocodiles and reptiles (cheng manatees have been observed in.

Philipson (1978) listed 102 large and small mammals of which 21 species were antelopes, gazelles and buffaloes (Bovidae), 7 (seven) species of large cats (Felidae) and 18 species of primates (monkeys, chimps and gorillas). A more recent survey by Stuart and Adams (1990) gave Sierra Leone a total of 178 species of animals of which 15 were primates and 18 species were in the interlope class. The sand survey recorded 614 species of birds in Sierra Leone. Lebbie (2002) listed 25 species of amphibians and 17 species of reptiles.

Wildlife hunting is an important activity in the Sierra Leone Coastal area. Professional hunters move from one community to another as well as from one ecological system to another hunting for dephants, antelopes, grass cutters, manatees and bush pigs.

Coastal Forest Resources (see biodiversity and Karim Johnson & Johnson
The level of deforestation in the Sierra Leone Coastal area is high. Forests are cleared for various purposes, which include agriculture, fish drying, commercial logging, building, construction and urbanisation. Deforestation is severe in the watersheds of the Scarcies, Rokel, Ribbi and Sherbro rivers as well as in the areas of Yawri bay and Bunce river environs.

Fishery Resources

The Fisheries sector plays a pivotal role in the economy of Sierra Leone as it contributes about 9.4% to the GDP. It generates revenue and foreign exchange for Government, provides employments and serves as the largest single source of cheap animal protein for majority of Sierra Leoneans. The fisheries are being exploited by artisanal fishery and industrial fishery sub-sectors with about 80% of the total production coming from the artisanal sector.

The Sierra Leone Territorial waters is richly endowed in biodiversity with abundant multispecies that are characteristic of marine tropical finfish, molluscs and crustaceans. About 200 species of fish have been identified in the country's EEZ. However, about 80 species of fish have been found to be relatively common, with commercial and scientific importance. A list of the commercially exploited fish species in Sierra Leone is presented in Table 2. The total biomass of the fisheries was estimated to be *415,200mt - 718,400mt* and the potential yield as *116500-193000mt* (From USSR and FAO surveys, 1982-1991). In 2000, the Institute of Marine Biology and Oceanography (IMBO) also gave a total biomass estimate as *450,000mt* and a potential yield estimated to be 180000 metric tonnes.

Marine fisheries resources

The marine fisheries resources are categorized into pelagic and demersal resources, which are further classified into inshore and offshore assemblages based on their distribution patterns.

Table 1 List of commercially exploited fish species

Scientific name	Common name	Family
Priacanthus arenatus	Big eye	Priacanthidae
Rachycentron canadium	Bonito	Rachycentronidae
Gerres melanopterus	Butterfish	Gerridae
Arius latiscutatus	Catfish	Ariidae
Arius heudeloti	Catfish	"
Sphyraena afra	Couta/kinni	Sphyraenidae
Brachydeuterus auritus	Caima	Haemulidae
Pomadasys jubelini	Crocus	"
Pomadasys rogerii	Crocus	"
Plectorhynchus	Hognose	"
macrolepis	Grouper	"
Lutjanus spp.	Record	Serranidae
Epinephenus goreensis	Gwangwa	Sciaenidae
Pseudotolithus elongates	Black gwangwa	"
P. epipercus	Whiting	"
P. Brachygnathus	Lady longneck	"
P. typus	Lady	"
P. senegalensis	Butterfish	"
Pteroscion peli	Bonga (large)	Clupeidae
Ethmalosa fimbriata	Awefu (Juv.)	"
E. fimbriata	Flat herring	"
Sardinella maderensis	Mina (juv.)	"
Sardinella spp.	Round herring	"
S. aurita	Lati	"
Illisha africana	Langa mina	Engraulidae
Anchoviella guianensis	Anchovy	"
Engraulis encrasicolus	Mackerel	Scombridae
Scomberomorous tritor	Mackerel	"
Scomber japonicus	Little atlantic tuna	"
Euthynnus alleteratus	Skipjack tuna	"
Katsuwonus pelamis	Yellowfin tuna	"
Thunnus albacares	Albacore tuna	"
Thunnus alalunga	Big eye tuna	"
Thunnus obesus	Frigate tuna	"
Auxis thazard	Bullet tuna	"
Auxis rocheris	Mollit (jumbo)	Mullidae
Mugil cephalus	Rogie	"
Pseudupeneus prayensis	Joefish	Carangidae
Trachinotus spp.	Pollock	"
Decapterus spp.	Pollock	"
Trachurus spp.	Pomp	"
Alectis alexandrinus	Pomp	"
Selene setapinnis	Cowreh	"
Caranx spp.	Cutmoney	"
Chloroscombrus chysurus		
Raja miraletus	Ray	Rajiidae
Balistes spp.	Seafowl	Balistidae
Istiophorus albicans	Sailfish	Istiophoridae
Drepane africana	Sheephead	Drepanidae

Galeiodes decadactylus	Shinenose	Polynemidae
Polydactylus quadrifilis	Spanish	"
Pentanemus quinquarius	Bearbear fish	"
Rhinobatos rhinobatos	Shovelnose	Rhinobatidae
Trichiurus lepturus	Silverfish	Trichiuridae
Dasyatis margarita	Skate	Dasyatidae
Torpedo torpedo	Skate	Torpidnidae
Lethrinus atlanticus	Black snapper	Lethrinidae
Pagellus spp.	Red snapper	Sparidae
Dentex spp.	Red snapper	"
Pagrus spp.	Red snapper	"
Cynoglossus spp.	Sole	Cynoglossidae.
Psettodes belcheri	Dogsole	Psettodidae
Albula vulpes	Tenny	Albulidae
Conger conger	Congo eels	Congridae
Crustacea		
Penaeus notialis	Pink shrimp	Penaeidae
Penaeus kerathurus	Tiger shrimp	"
Parapenaeopsis atlantica	Small white shrimp	"
Parapenaeus longirostris	Deep water rose shrimp	"
Callinectes spp	Crab	Portunidae
Panulirus spp	Spiny lobster	Portunidae
Cephalopod		
Sepia spp	Cuttlefish	Sepiidae
Illex coindeti	Squid	Sepiidae
Octopus vulgaris	Octopus	Octopodidae
Molluscs		
Gasrtopod		
Cybium spp		
	Snail	Voluditae
Sharks		
Sphyrna spp	Hammerhead shark	Sphyrnidae
Mustelus spp	Shark	Triakidae
Squalus spp	Shark	Squalidae
Rhizoprionodon	Basking shark	Rhiniodontidae
Rhinicodon typus	Whale shark	Rhiniodontidae

Inshore Pelagic Fisheries

The inshore ecosystem maintains rich assemblages of pelagic species especially small pelagics. The most dominant and commercially targeted species include the Clupeids (Ethmalosa fimbriata, Sardinella maderensis, Sardinella aurita and Illisha africana), the Carangids (Chloroscrombrus chysurus, Caranx spp, and Trachurus spp) and the Scombrids (Scomberomorous tritor, Scomber japonicus). This category of fish species is exposed to environmental fluxes typical of the estuaries and near-shore. The potential yield for small pelagics was estimated to be 70,000-120,000mt (USSR and FAO surveys, 1982-1991).

Offshore Pelagic Fisheries

The offshore ecosystem supports a considerable stock of large pelagic species which is characterized largely by the scrombrids especially the tuna fish (Katsuwonus pelamis, Thunnus albacares, and Euthynnus alleteratus), the mackerels and barracuda, etc. The estimated annual potential yield for the large pelagics is *15,000mt* (USSR and FAO surveys, 1982-1991).

Inshore demersal fisheries

Given the nutrient-enriched nature of the inshore ecosystem, important species such as the Sciaenid (especially Pseudotolithus senegalensis, Pseudotolithus elongatus), the Arius spp, Drepane africana, Galeiodes decadactylus, Pentanemus quinquarius and the haemulids (especially Pomadassys jubelini) are commonly found. Most of these species are reported to make periodic migration up stream/river during their breeding season.

Offshore demersal fisheries

Apart from the rich assemblage of inshore fish species, the fisheries also support an important off-shore demersal species which are characterized by the Sparid community (Pagrus ehenbergi, Dentex congoensis). It also includes other families such as the Triglidae, the Platycephalidae, etc. The deep water ecosystem also supports a distinct snapper community (Lutjanus goreensis, L. agennes and others) which are found especially over submerged reefs. The estimated potential yield is *18,000-45,000mt* (USSR and FAO surveys, 1982-1991).

Shellfish

The crustacea and moluse consist of the shrimps, cuttlefish and squid. Of the six (6) shrimp species of commercial importance Penaeus notialis accounts for about 96% of the landings and occurs of the Freetown peninsula especially around Bana Island. Penaeus kerathurtus occurs in the southern part of the coast. Both species inhabit the mangrove swamps, estuaries and inner continental shelf to a depth of 55m. Other species occur in deeper waters of 40-70m and above the continental slope.

The two species of cattle fish, sepia officinalia and sepia berthelott are found in the north and south of the EEZ on coarse ground at depths of 17-18m. There are four squid species; Thysanoteuthis rhombus and Toderopsis eblanae are demersal below 1000m. depth.

Mollusis such as bivalves are commercially important shell fish resources for the coastal communities. Mangrove oyster (crassostrea gasar) can be found on the roots of mangrove trees in coastal swamps and estuaries where they are harvested for subsistence as well as for commercial purposes. Other bivalves exploited include clams such as Senilia Senilis, Anadara Senegalensis, cockles and periwinkles (Tympanotonus spp.)

Landings in Sierra Leone, catches by species

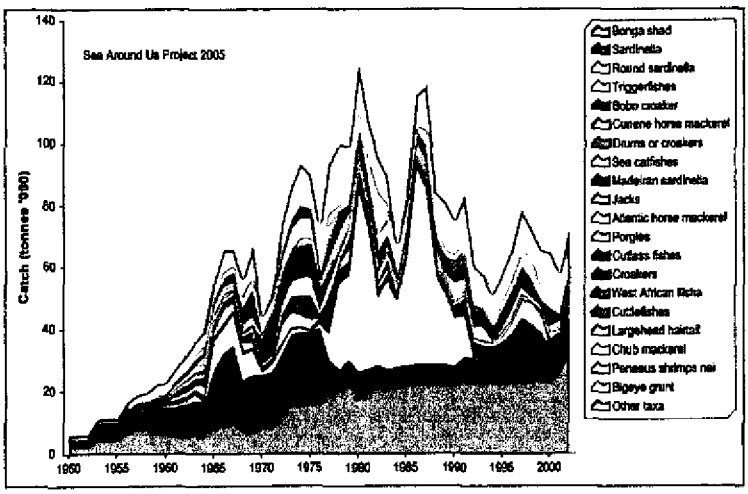


Figure 3: Landing in Sierra Leone, catches by species

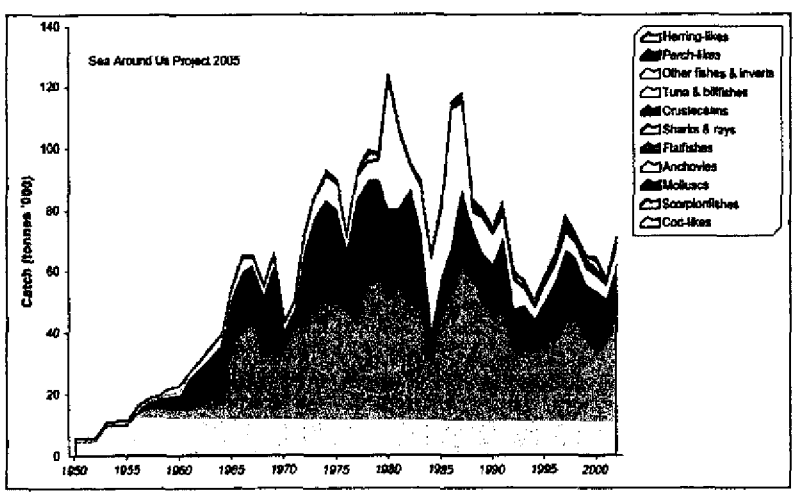


Figure 4: Landings in Sierra Leone, catches by higher groups

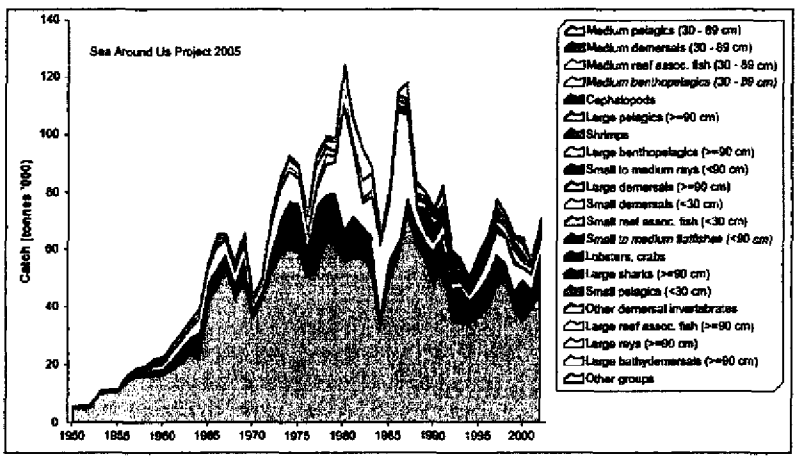


Figure 5: Landings in Sierra Leone, catches by functional groups

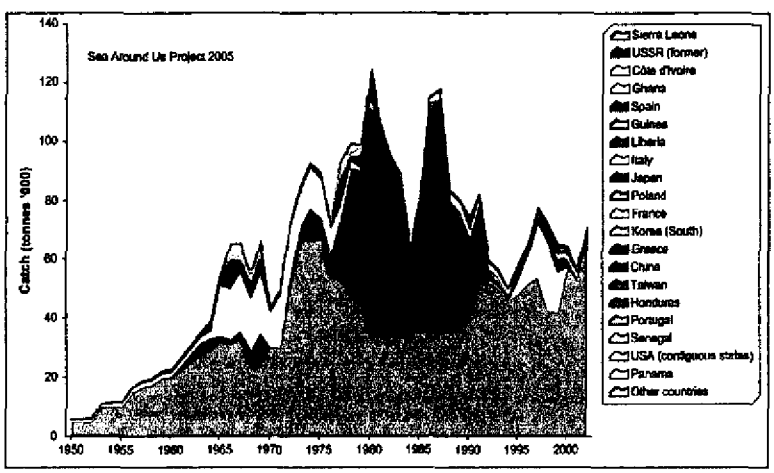


Figure 6: Landings in Sierra Leone, country fishing

Environmental problems

Introduction

The impact of development activities on the coastal zone of Sierra Leone involves three natural time scales, namely (a) the short term period of the up to one year, (b) the medium – term with several decades; and (c) the long term scales of hundred, thousand or even million of ears. The impacts created by development activities in the coastal zone of Sierra Leone on the short and medium term scales play a more important role in creating awareness on the part of government and people of the country for the need to examine these impacts than do the long-term scales.

The negative impacts of development activities on the coastal zone of Sierra Leone involving the short and medium term periods result from resources use and exploitation on the hand and provision of socio-economic facilities and services on the other with attendant loss or degradation of coastal land and water which in turn is closely linked to the related coastal ecosystems and biodiversity. The human activities related to resource exploitation include; mangrove exploitation beach sand extraction and dredging, mineral resource exploitation, oil and gas exploitation, agriculture, fishing and production.

The developmental activities related to the provision of socio-economic facilities, goods and services include, development of ports and harbours, development of tourism and its attendant shoreline facilities, manufacturing industries, irrigation and flood control, construction of coastal defence and upstream dam construction. The various development activities which are normally on short and medium term scales have caused so much damage in the coastal zone of Sierra Leone, that there is growing awareness of the negative consequences of these activities in the country. It therefore follows, that the nature of the problem of impact analysis of development activities in the country must consider the negative impacts of various sectoral activities in the coastal zone of the region.

Coastal resources exploitation

Mangroves

The coastline of Sierra Leone is in most places covered by mangrove swamp forest. Mangroves are halophytic, woody seed-bearing plants. Many of these plants have unique adaptation features such as viviparous propagules, prop roots, pneumatophores and lenticels, which contribute in one-way or another to their survival in their relatively stressful environment.

The mangrove forest in Sierra Leone are being cleared for fuel wood production, agriculture, salt making, boat making, tanning leather, poles for transmission of electric energy, fish and oyster traps etc.

In most parts of the country, the development of mangrove swamp rice has been going on for several centuries and plays an important role in the rice economics of the

country. In Sierra Leone the extraction of salt from the mangrove swamps as well as other anthropogenic activities are leading to the decimation of the mangrove ecosystem.

Figure 7: Red mangrove

Environmental significance

These forest form a protective barrier to wave by reducing coastal erosion and stabilizing estuarine flood plains, provide detritus and nutrients which from the food base of many marine and fresh water organisms; these in turn support estuaries and near – shore fisheries. The mangrove swamp being consolidate by the plant roots are know to retail land based pollutant heading for coastal water.

Table 2: Estimated Mangrove areas of Sierra Leone

District	Location	Mangrove area (ha)	Mangrove Area (ha) under rice cultivation
Kambia	**Scarcies River**	**13007**	**6098**
Port Loko	**Scarcies River, Sierra Leone River_**	**27095**	**4973**
Western Area	**Sierra Leone River**	**34234**	**NA**
Moyamba	**Yawri Bay**	**24505**	**5483**
Bonthe	**Sherbro River**	**99854**	**5872**

Source: Various; NA: Not Available

The nature of exploitation of the mangrove resources for development results in the degradation of the costal zone of Sierra Leone. Decline of fisheries and even extinction of some species are but some of the responses to environmental changes in the coastal zone of Sierra Leone resulting from habitat loss e.g. indiscriminate clearing of mangrove

for the purposes outlined earlier. Erosion often follows the removal of mangroves posing threats to waterways from situation. The main port harbour in the country in Freetown has been periodically dredged. Pollution of near shore waters by suspended sediments also invariable follows the clearing of mangroves, as surface runoff from inland areas are no longer Filtered. Intrusion of salt water into Agricultural areas and reduction min quality of coastal fresh water supply is common in some parts of Sierra Leone. Salt-water intrusion in enhance by the fairly high tidal range along the country's coast, which is between 1.0 and 3.5m. Low river discharge during the dry season and during spring tide also favours upstream salt-water intrusion. In addition, the coastal zone looses its exotic site and serious loss in biodiversity may result from over- exploitation of the mangroves. The total mangrove area and mangrove area under rice cultivation in Sierra Leone is given in Table 1.

Beaches

Sand beaches are important coastal resource of Sierra Leone. They occur all along the coastal to the south. The beaches are interrupted in some areas by a few rocky headlands, bays, estuaries and creeks.

The beaches serve as a natural barrier for the shoreline from coastal erosion and flooding from the centre eastern Atlantic. Within the country, the beaches are used mainly as a source of sand for building and construction, recreation and landing sites for artisanal fishermen. The development of tourism has however to a great extent influenced the traditional use of the beaches in many areas with in the region.

Environmental Concern of Sand Resources Exploitation

Sand extraction is perhaps the single main development activity responsible for the degradation of the coastal beach environment. In different areas in the country, beach sand exploitation has been and still is haphazard with ultimate undesirable environmental consequences. Coastal erosion is a common Problem in the countries (Johnson & Johnson) Data on sand extraction activities are however scanty within the country (table2).

One of the worst recorded effect of sand extraction in the country is at Lakka and Hamilton where erosion is still taking place, similar effects are being encountered at Lumley in the west end of Freetown. As well as in areas of the north (Konakridee, Yelliboya) and south of the country (Bonthe Sherbro). There is no formal data collection exercise on the quantity of sand mined by a designated institution. The estimates are based on surveys conducted by the authors.

Dredging

The entrance to the port in Freetown is frequently subjected to sanding up requiring consequent dredging of the entrance channel to maintain the navigation of a fixed maximum draught. Sediments dredging and discharge outside the port are reworked by the littoral drift. Information describing the impact of dredging and mining of sand in Sierra Leone is difficult to obtain (UNEP, 1985). An impressive tonnage of sand dredged

in Sierra Leone on the Freetown peninsula has induced destructive coastal erosion (James, pers, comm.).

Dredging in river mouth does not only induce erosion in the proximity of the dredged areas, but also disturbs its ecological balance.

Mineral Resources

The variety of mineral resource found and extracted from the coastal zone of Sierra Leone is limited. The major producing mines in the country are shown in table 3. Along the Sierra Leone coastal, apart from clay, the major extractive industries are based on deposits of sand, which are used for construction (both civil and military) and brick-earth clays for brick making.

Environmental Concerns of Coastal Mineral Resource Exploitation

In Sierra Leone, illicit mining of diamond have result in increased sediment loads of stream and rivers and rivers drainages has been impeded, In the country in general, environmental problems exist with general all the export- oriented minerals mined on a large scale. The major impact of this development activity is on the coastal waters. The main water pollutants from processing plant /smelters are heavy metal like copper, zinc, lead iron manganese and mercury (in the case of gold processing). Other identifiable pollutants include high levels of dissolved solids (soluble salts) and /or suspended solids. Also siltation and mine tailings from mining areas inland also pose a threat to the mangrove ecosystem and nearby coastal marine environment.

Other Non-Living Resources Exploitation

Coarse Aggregates

Alluvial gravel deposits in coastal zones of the country have not been assessed and no data is available regarding its exploitation in areas within and outside the and outside the coastal zone.

Fine Aggregates

In the past and presently, much of the fill materials for construction was and is still being extracted directly from beaches. Beach sand is extracted from beaches along the entire coastal line. In all these areas, the removal of sand has led to the lowering of the level of the beach and made them liable to flooding during storm conditions. These areas experience similar consequences of the increase erosion with increased sediment load of the coastal water and deficiency in the supply of sand available for long shore drift.

Clay

Clay soil is being extracted near beach areas in most part of the country. However, data on the quantity extracted is unavailable. Traditionally, the clay soil is used for brick and ceramic- making.

The result of uncontrolled clay mining is the changes in land use to non- vegetable open areas are vulnerable to erosion and gullies. If the extraction site is located near a river of sea, the runoff affects water quality and bottom sediment composition during and after heavy rains. In terms of scale, this activity is less significant compared with sand extraction

Silica sands

Information on deposits white quarts sands of glass- making quality in the country is scarce. There are no glass manufacturing plant in the country, but if in the future this resource should be developed, the environment implications for such a development will need to be studied.

Coal

Information on deposits and extraction of coal in the country is hard to come by. Apparently economically viable deposits have not been located in the country. The result of few exploratory programs suggest that moderate amounts of the resource may be found in the country

Hard Rock

Hard rock has been mined mainly as a source of construction material for the development of road networks. No information is available regarding the quantity extracted annually in the different part of the country.

Oil and Gas

There is currently no refinery in the country. The safe disposal of oil sludges containing tetranaethyl lead produce as waste may constitute perhaps a significant solid waste control problem for the country's coastal area environmental. If the only refinery in the country is rehabilitated.

The potential for oil and gas discoveries and production in the country exists. The potential impact of offshore oil and gas development and processing on the country's coastal zone is however complex but suffice it to say, that they could create environmentally significant degradation, if they are improperly planned and managed.

Agriculture

Agricultural activities from the basis if almost all the lives of the people in Sierra Leone. However, mechanized farming has not been employed to any appreciable extent in the country mainly perhaps existing mechanized farming equipment are not adapted to the condition in the country. These machines are more suitable for deep ploughing, bringing up poorer soils and loosening the ground as opposed to the hoe cultivation which works on the top richer soil.

Environmental Concerns of Coastal Agricultural Practices

The dominant food crop in Sierra Leone is rice, which is grown both in the upland and swamp areas in the country. In most parts of country, mangrove swamps have been converted to rice fields. The coastal environmental concerns of Agricultural practice are associated with overuse of fertilizers pesticides resulting in eutrophication of coastal water bodies and pollution, as they are washed down to these coastal waters by runoff from land. The scope for the use of manufactured chemical fertilizers in the country is tremendous, since farmyard and green manures are not produced in quantities which are large enough to provide adequate and constant applications.

Mangrove conversion destroys not only the potential value of the mangrove but also fish and shrimp breeding grounds and other functions which the mangroves used to play. As a result of the mangrove destruction, water quality in coastal streams and estuaries is likely to deteriorate; the shoreline will become less stable and prone to erosion amongst others

Fisheries

Along the Sierra Leone coastline one finds fishing villages interspersed with tourist recreational sites. Aritisanal fishing accounts for more than 30% of fish production in the country. The coastal environmental of the country serves as an important feeding and spawning round for a variety of fish species. A number of economically important species such as Sardinella, Bonga and others are found to be closely associated with areas of rich plankton production and upwelling. Many species breed in the inshore water where their larvae and eggs are found in large concentration (e.g. Sardinella, Anchovies, Bonga etc). A number of others such as Alosa and ilisha are reported to make periodic migration up the river/ streams for purposes of breeding. The inshore waters of the country are inhabited by shrimps the bulk of which is represented by a common species *Penaeus duorarum*. Other crustaceans harvested from near shore water include the spring lobster.

In Sierra Leone, a substantial number of edible molluscs are harvested annually, which include oysters, bivalves, such as perna perna and many others. These species are mainly confined to the intertidal zone and are highly susceptible to effluent of land-based origin. Fishermen exploit the fish resources by using mobile techniques as well as fixed plant forms, nets and even explosives.

Environmental concerns of coastal fishing Activities

The environmental concern of fishing are associated with the methods of fishing and preservation (drying) in particular each of which vary in degree of destructiveness; method of waste product disposal; provision of landing facilities (jetties, etc.); boat building and the means of propulsion employed.

Salt Production

Salt ponding is rather popular along the Sierra Leone coast. It is carried out all along the coast with varying intensities and scales. In the north for example, it is carried out at along approximately 0.5km of shoreline. In some instances, salt ponding may result directly from the conversion of mangrove forest, in others it is generally seem during the later phases of evolution of mangrove forests after the development of fish ponding.

Environmental Concerns of Salt Production

Information regarding the quantity produced and rate of production is unavailable. Also the area /length of coastal line affected is also poorly documented. However, salt extraction in mangrove areas sensible affect coastal process as it results in a large-scale destruction of vegetal cover.

Ports and Harbours

The coastal area, is one in the country where access by sea is hampered by the prevalence of long shore bars, silted river channels and the heavy movement of sand, Along the coast, there is one major and two minor ports.. Building of jetties and dredging of approach/entrance channels are often associated with ports and harbours.

The growth of traffic at ports in the country continues to rise and with the increased search for petroleum reserved off the Sierra Leone coast, the environmental problems associated with ports and harbour development will become more complex.

Environmental Concerns

Problems of Environmental Management arise as a result of the interaction of diverse Socio-economic activities that are drawn together by the very provision of ports and harbours. Building and dredging of channels often interrupt the beach drift and create (in case of jetties) a sedimentation area upstream of the structure and an erosion zone down stream. This is the case of Lumley beach area (Pens. Comm. 1992). In case of natural ports like Freetown, Sierra Leone construction of jetties and dredging operation are not likely to change the beach drift to any considerable degree. The greatest concern is however generation of waste products. No data is available regarding the quantity of waste products generated at the port in the country. However, oil pollution of coastal waters and beaches are facts to content with. Therefore, land use planning for the development of ports and harbour facilities in Sierra Leone must consider the various features which such development induces with regards to environmental management.

Tourism and Manufacturing Industries.

The beaches along the Freetown Peninsula are favorite sites for tourists. There are various hotels, beach bars, entertainment centers and interesting landscape which offer tourists a relaxing and enjoyable atmosphere.

There are several sandy beaches along the Sierra Leone coast most of which are made up of fine white sand. However, there is comparatively limited hotel accommodation in the country for overseas tourists and low-density beach from development.

Environmental Concerns

Pollution from these hotels mainly sewage, herbage, chemicals (chlorine caustic soda and others) and detergents (containing phosphate) find their way into the nearby coastal marine environment leading to toxic pollution and eutrophication.

The manufacturing sector in the country is mainly restricted to small-scale import manufacturing industries. Most of these industries are located close to the coast in the capital Freetown. These industries produce and discharge their wastes directly into the coastal environment. Industrial emission are not measured or recorded and most of the industries lack contingency plans.

Apart from Inadequate domestic waste disposal facilities, in most parts of the city, the sewer systems are often small and are confined mainly to the central business and industrial areas, The sewers discharge the raw sewage directly in to the sea or nearby estuarine areas, causing off- site environmental problems.

Irrigation and flood control canals

There is an increased demand for Agricultural land in the country and therefore canalization is becoming very important at all levels for the development of rice fields and to reduce flooding in areas vulnerable to inundation like swamp, tidal and fluvial plains and low beach ridges.

The environmental concern association with this activity is that canalization will distribute the surface waters in to wider areas and hence reduce the natural flow. As a result, sediments brought from the rivers to the sea are decreasing to such

an extent that the sedimentation pattern around the river mouths is reducing causing erosion in former areas of accretion.

Shore Protection

Only a small portion of the country's coastline is being protected by defence works (table 9). These include revetment along Lumley beach. Jetties can be found in most parts of the country's coastline.

Table 2: Coastal defence structures along the Sierra Leone Coastline

Coastal Stripe	Location	Erosion Status	Defence Structures	Impact
Kambia District	Yeliboya	Severe		NA
Port Loko District	Lungi	Moderate	None	NA
Freetown Peninsula	Lumley	Severe	Gabion revetments	NA
-do-	Lakka	"	None	NA
-do-	Hamilton	"	"	NA
Moyamba	Yawri Bay	Moderate	None	NA
Bonthe	MaBap	Severe	None	NA

Source: Johnson & Johnson, 2003; NA = Not Assessed

Upstream Dam Construction, Energy Production

Some of the country's rivers have been dammed for both Agricultural development and for energy production as the main source of electrical energy. The environmental concern associated with this activity is the reduction of sediments to the coast and hence accelerated coastal erosion.

Reclamation

Reclamation activities association with extension of ports and harbours have been embarked upon in Sierra Leone, The environmental problem associated with this activity has been accelerated coastal erosion.

Banking of Bays and Creeks

Slum development is another activity that poses a threat to the aesthetic beauty and quality of the coastal environment. Along parts of Freetown Peninsular (Western Area), slums have been established. These slums have been erected along the banks of bays and creeks on land reclaimed from the sea. In other instances, bays and creeks have been banked using material from adjacent cliffs which have been cut. This has rendered the cliffs vulnerable to erosion and threatens the safety of institutions on the cliff tops, for example, at Kingtom.

Sewage Disposal

Generally, the capital of Sierra Leone is situated around the major port in the coastal area. The disposal of domestic and industrial waste therefore poses a threat to the coastal areas as most of the country does not have proper sewage discharge and treatment systems.

Institutional framework and relevant legislation

Introduction

Regarding national maritime legislation, Sierra Leone has a number of acts namely the Fisheries Management and Development Act (1988), which provides the framework for the regulation of fishing activities. The Environmental Protection Act (2000) makes reference to the coastal environment. An Environment Impact Assessment (E.I.A.) is mandatory for any scheduled development project falling within a certain category. However, these Acts do not contain specific sections on coastal zone management to deal with urgent problems of the zone.

The Fisheries Management and Development Act provides for the management and development of both coastal and marine fisheries. The Forestry Act provides for the management and development of all forest resources including coastal forests e.g. mangroves. The Wildlife Conservation Act (1992) sets a legal framework for the protection of wildlife and creation of protected areas in the country, providing definitions and management objectives for strict nature reserves, national parks, game reserves and sanctuaries, controlled hunting areas and non-hunting forest reserves. The Mining Act controls all mining activities including coastal, but falls short of marine mining activities.

Coastal and Marine Policy issues

The coastal and marine environment policy issues as contained in the Draft Environmental Policy can be broadly presented as follows:

Policy Goals

To maintain and improve the environmental quality of coastal and marine ecosystems and to ensure the conservation and development of their ecosystems resources so that the viability of all aspects of these ecosystems are secured.

Policy Objective

a) Expand environmental monitoring and assessment programmes so as to maintain ecological diversity and productivity in the coastal and marine areas.

b) Strengthen programmes for the identification and study of flora, fauna and economic resources of the coastal and marine ecosystems.

c) Maintain ecological stability in the marine environment by ensuring the exploitation of coastal and marine fisheries resources on a sustained yield basis.

d) Promote a multi-sectoral approach to the management of coastal and marine environments.

Government Organisation

At present the following ministries are in one way or another associated with management issues pertaining to the coastal environment of Sierra Leone:-

- Ministry of Lands, Country Planning and Environment
- Ministry of Transport and Communications
- Ministry of Mineral Resources
- Ministry of Agriculture, Forestry and Food Security
- Ministry of Tourism and Culture
- Ministry of Works, Housing and Technical Maintenance
- Ministry of Energy and Power
- Ministry of Marine Resources

At times, jurisdictional rights of these ministries, overlaps. Thus attempts should be made to harmonise laws to simplify enforcement.

NGO, Civil society international organisations

There are a number of non governmental organisations involved with aspects of environmental protection in the Sierra Leone coastal zone. They include; The Sierra Leone Conservation Society, Council For Human Ecology in Sierra Leone, Friends Of the Earth, Environmental Foundation for Africa etc.
Some of their activities include;

1. The promotion of public awareness and action on environmental degradation in the coastal zone,
2. Promotion of public interest in conservation and the protection of biological diversity in the coastal zone,
3. Provision of expertise and guidance on matters affecting the coastal environment,
4. Assistance in the development and implementation of local conservation policies and support of local conservation activities on the sustainable use of resources in the coastal zone.
5. Research and Training

The Institute of Marine Biology and Oceanography (IMBO) has the mandate to conduct research in the living and non-living resources and the physical characteristics of the Sierra Leonean territorial waters and high seas beyond. IMBO through it's research units of physical/chemical oceanography, fisheries, marine geoogy and geophysics, collects and analyses data on coastal resources, environmental degradation, pollution, oceanographic parameters and sea level rise. Other Departments /institutions involved in research activities concerning other aspects of the coastal zone include the

department of Geography Fourah Bay College, University of Sierra Leone, and Njala University. For the international organisations, the country has multinational links with UNDP, IMO,IOC,IUCN WWF,UNEP, etc.

Problems affecting policy implementation

The maintenance of ecological stability in the coastal and marine environment is vital to the fisheries. A systematic study of coastal economic resources and coastal marine flora and fauna has not been undertaken on a national basis. Here also, apart from haphazard research undertaken by interested scientists there are no permanent and independent programmes. It is worth noting that such a situation will continue until a National Science and Technology coordinating and advisory body is fully in place in Sierra Leone.

Research activities especially in fish stock assessment and systematic monitoring of environmental parameters also show inadequacies. Copies of environmental information collected by commercial fishing vessel if any are not requested by government. The Institute of Marine Biology and Oceanography is the recognised institution for Coastal and Marine Research. IMBO is however constrained by the lack of a research vessel and to date equipment. It is expected that the GCLME will help improve the institute's capabilities.

In addressing coastal and marine environmental problems, a critical underlying consideration is the cost of intervention both in terms of financial costs and human resource and management costs. Gaps between policy and implementation often occur as a result of lack of weak implementation capacity, weak institutions, weaknesses in the policies and legislations, absence of meaningful local participation, poor environmental information system, inadequate public education amongst others.

Apart from the foregoing uncertainties weak institutional capacity has undermined governments efforts to implement policies effectively. According to the report prepared for the United National Conference on Environment and Development (UNCED), the institutions are not effective for various reasons, including low staff morale, lack of financing and logistical support and lack of expertise in environmental planning and management. Other reasons include inadequate or lack of private sector and community involvement. Weaknesses in policies also contribute to creating or widening gaps between policy and implementation by either containing unnecessary provisions or contain provisions that are contrary to the objective of the legislation, the Forestry Act (1988) contains special protection and production provisions. This Act classified three types of forest reserves; national production forests for production of forest resources, national protection forests, for the protection of soil, water, flora and fauna, and community forest, for the supply of forest products and or protection of forest ecosystems and resources at community level.

Provisions in the mining act are very broad although demonstrate a significant awareness that mining activities adversely affect the environment and recognises the need for mitigation actions to combat degradation causing mining. Detailed, comprehensive regulations need to be formulated in areas such as coastal and marine mining, land rehabilitation; pollution (land and water including marine). Provisions requiring EIA should be incorporated more generally into the Act.

There is also the problem of the plans and policies being formulated by many public and private actors most of which also make investments in projects related to resource exploitation and development.

Local participation in environmental management can help make it more effective Mechanisms should be developed to enable a greater participation of NGO's, members of the University and other groups in the formulation, monitoring and implementation of policies.

A poor environmental information system is another gap between policy and implementation. In Sierra Leone, there is a poor environmental information database, apart from that, environmental information is widely dispersed among many sectoral agencies and is not easily accessible.

The restrictions to data and reluctance of sectoral agencies to part with information are due to a number of reasons. The first is perhaps the sensitivity of the information. The second and most common is that bureaucrats to not like giving data which they consider the source of their influence. The third is the non-acceptance of data generated by one agency for the use of others as a result of differences in data formats, classification, precision etc. or the ultimate purpose the data is designed to serve.

The fourth which is not often obvious is that in requesting such data financial inducements or even bribes are often expected from the acquiring agents as the donor often wrongly suspect that projects are associated with the data being sought. In consequence of poor salaries and working conditions, government institutions responsible for producing resource and environmental information are often not maintained.

One sixth of the land surface of Sierra Leone is classified as coastal zone (FAO, 1980). Nevertheless there is no plan to develop information on coastal resources.

Inadequate public education on environmental issues and policies relating to the coastal zone also seek to widen the gap between policy and implementation. Private sector groups, NGOs and educational institutions can play a more vigorous role in environmental education. Environmental themes can be included or incorporated into school curriculum and more work can be done to develop informal educational programmes through workshops and nature/clubs.

Measures taken for the protection of the Coastal Zone

There is no overall legal framework for the protection of the coastal and marine environment although there are sectoral frameworks.

The coastal resources therefore fall under the jurisdiction of more than one institution. Some measures have been taken over the past few years to protect the coastal and marine environment. These steps were geared towards the maintainance of sustained fishery development and coastal marine environmental quality for other socio-economic uses. The measures include restrictions on beach sand extraction, banning of

environmentally unfriendly fishing methods, mangrove reafforestation programmes, establishment of reserves and restrictions on beach face constructions.

National Programme of Action

Introduction

The Sierra Leone National Plan of Action is based on stakeholder consultations as well as national developments such as poverty reduction strategy paper, vision 2025, national plan of action etc. As a result of these programmes the problems of the Sierra leone coastal area have been identified and fall under the following broad categories.

Land Degradation and deforestation

Principal causes of Land Degradation

- Subsistence farming
- Deforestation (Fire wood collection, Logging, shelter construction etc.)
- Mining
- Urbanization
- Coastal and River erosion or Sedimentation
- Road Construction

Threats to Wetlands

- Developmental activities (construction, uncontrolled tourism);
- Population, deforestation, mining, agriculture, peat harvesting;
- Creation of dams for hydro electric power generation;
- Massive removal of mangrove wood.

Deforestation and Biodiversity loss

- In 1979, the FAO supported Land Resources Survey Project published that the rain forest had shrunk to 5%. There are about 3.8 million hectares of forest regrowth, with 26,000 hectares of secondary forests (UNDP/FAO 1970). The situation is worse today.

Several factors account for deforestation. In each case vegetal cover has to be stripped to make way for man's development or economic aspirations. Some of the major development and economic activities include the following: ***Subsistence farming, Road construction, Fuel wood collection, Mining, Shelter construction, Logging, Charcoal burning, and Bushfires***. Forests are the habitats of most of the fauna and flora in the country. As they dwindle so do the populations of living organisms. The farming system practiced in Sierra Leone is the "Slash and Burn or the Rotational method". In 1960, nearly 60% of the land area of the country was lush tropical rain forest with its full complement of biodiversity MAFFS). This has been systematically reduced to secondary forests through various life-sustaining economic activities. From recent surveys conducted (2004), an estimated 22mil. M3 (twenty two million metres cubed) of biomass is harvested every year for firewood.

Mining

- Sierra Leone is endowed with several types of economic minerals. And their extraction is usually by open cast mining. This method of extraction literally converts large tracts of hitherto arable life-sustaining land into wasteland. It leaves behind pits ranging in dimension from 2m x 2m to 200m x 600m. These are soon filled with water, with the unsavory implications for vector propagated diseases. The districts where open cast has occurred or is ongoing include: Bo, Bonthe, Kenema, Kono, Moyamba, Port Loko, Pujehun, and Tonkolili, constituting nearly 60% of the land area of the country.

Roads, Erosion, Sedimentation and Urbanisation

- The construction and periodic maintenance of roads and shelter necessitate the removal of vegetal cover and the exposure of land to the elements. It sets into motion a series of activities, which result in the lateritisation of otherwise arable land. First of all with the vegetation goes the humic layer, which normally supports plant life. The soil is then dissected by erosion upon exposure to runoff water. Coastal and Riverine erosion and sedimentation cause environmental catastrophes and pose problems in marine transportation. It is not uncommon that coastal settlements get swept away by tidal waves. As human populations keep increasing forests are constantly cleared to construct shelter.

Urban Degradation and Pollution

- The poor in urban areas tend to be concentrated in congested areas or marginal landscapes such as steep hillslopes or depressed river valleys. They lack access to vital services such as water and sanitation, road network, electricity, educational and health facilities as well as municipal waste collection services. These communities have to literally coexist with their own excrement. The urban poor often have to use local streams for the multiple purposes of washing, bathing, and refuse and faecal waste disposal. All categories of waste are dumped without sorting. These include heavy toxic metals such as Lead, Mercury and, asbestos as well as pathogens.

Actions to Address Problems

Ministry of Lands, Town and Country Planning and the Environment

This Ministry is charged with the responsibility of protecting and managing the environment Recently this responsibility was recently transferred to a Commission on the a Environment and Forestry which at present lacks legislative support.
The Ministry was also designated the role of making recommendations which concern land acquisition and transfer, land ownership and use and national development in a planning capacity and to provide advisory services to the public on land matters.

Ministry of Transport, Communications

This ministry is mandated to deal with issues related to transport on land, air and sea as well as local and international communication.

Ministry of Mineral Resources (MMR)

This ministry is charged with the responsibility to supervise mining operations in the country. It issues licences for all mining operations, enforces laws and provisions contained in the Mining Act and its amendments. It is responsible for enforcing provisions in the new mining act relating to the rehabilitation of mined out areas. The main institutional conflicts are:

6. the extent to which the Ministry has jurisdiction over marine areas with respect to marine based mineral resources, offshore dredging and its impact on marine resources and
7. the overlap of water quality monitoring with the interests of the Ministry of Marine Resources.

Ministry of Agriculture, Forestry and Food Security

This ministry is mandated to preserve and conserve, as well as through managed commercial exploitation to provide for sustainable and permanent regenerating forest reserves. It is responsible for issuing licences to exploit and maintain all forests types on public lands and to monitor their harvesting so that they are sustainable and ecologically stable. It supervises and promotes all agricultural activities and is also responsible for food security.

Ministry of Marine Resources

This ministry is responsible for the management of fisheries resources and related habitats in a manner, which would maximise benefit in terms of fish catch now and in the future. It is expected to develop fisheries resources and to devise methods of enhancing current production e.g. by means of aquaculture and more effective exploitation. The ministry issues licences for offshore trawling and monitors small-scale inshore and offshore large-scale fishing. It is also responsible for enforcing laws on fishing activities and concerns itself with pollution and other environmental problems, which affect water quality and fisheries resources.

Ministry of Tourism and Culture

The responsibility to promote and develop the country's tourist industry lies with the ministry of tourism and culture. It is also charged with the duty of protecting the country's heritage, monuments, and cultural and historical sites.

Ministry of Works, Housing and Technical Maintenance

The duty of road construction and maintenance as well as public buildings lies with this ministry. It enhances the improvement of road networks by securing bilateral and multi-lateral agreements with donors. It is also responsible for making recommendations, which concern housing problems, housing conditions and other housing matters.

Ministry of Energy and Power

The development of the energy sector water supply and generation of electricity are all functions of the above ministry. It is expected to develop the energy resources and enhance current production to meet and satisfy the needs of the community as well as provide adequate water supply to the nation. It enhances the improvement of water supply and delivery facilities and maintenance of existing ones.

Table 2: Summary table of selected statistics and areas under protection (Gateway to Land and Water Information,2004)

Coastal Statistics, 2000	**Sierra Leone**	**Sub-Saharan Africa**	**World**
Length of coastline {a} (km)	1677	63124	1634701
Percent of population within 100 km of the coast	55 %	X	39 %
Area of continental shelf (km2) {b}	23165	987021	24285959
Territorial sea (up to 12 nautical miles) (km2)	11224	871895	18816919
Claimed Exclusive Economic Zone (km2)	X	7866074	102108403
Coastal Biodiversity and Protected Areas Data, 1990s			
Area of Mangrove Forests (km2)	1758	38013	169452
Percent of Mangrove forests protected	1 %	1 %	13 %
Number of Mangrove Species	6	17	70
Number of Seagrass Species	1	15	58
Number of Scleractinia Coral Genera {c}	1	68	X
International Legal Net Trade in Live Coral, 1997 (number of pieces) {d}	X	-202	X
Number of Marine or Littoral Protected Extent (km2), 2000	X 2950	150 143481	3636 730116

(Source: World Resources Institute, 2004)

Biodiversity and Protected Areas-Sierra Leone

	Sierra Leone	**Sub-Saharan Africa**	**World**
Total Land Area (000 ha)	7174	2429241	13328979
Protected Areas			
Extent of Protected Areas by IUCN Category (000 ha), 2003:			
Nature Reserves, Wilderness Areas, and National Parks (categories I and II)	144	78828	438448

Natural Monuments, Species Management				
	Seascapes (categories III, IV, and V)	1	63482	326503
Areas Managed for Sustainable Use and				
	Unclassified Areas (category VI & "other")	180	122080	692723
Total Area Protected (all categories)		324	264390	1457674
Marine and Littoral Protected Areas {a}		X	X	417970
Protected Areas as a Percent of Total Land				
	Area, 2003 {b}	4.5 %	10.9 %	10.6 %
Number of Protected Areas, 2003		55	6867	98400
Number of Areas >1 00,000 ha, 2003		X	425	2091
Number of Areas > 1 million ha, 2003		X	*50*	243
Wetlands of International Importance (Ramsar Sites), 2002:				
	Number of Sites	1	X	1179
	Total Area (000 ha)	295	X	102283
Biosphere Reserves, 2002:				
	Number of Sites	X	46	408
	Total Area (000 ha)	X	X	439000
Number and Status of Species				
Higher Plants				
	Total known species (number), 1992-2002	2090	X	X
	Number of threatened species, 2002	43	X	5714
Mammals				
	Total known species (number), 1992-2002	147	X	X
	Number of threatened species, 2002	12	X	1137
Breeding Birds				
	Total known species (number), 1992-2002	172	X	X
	Number of threatened species, 2002	10	X	1192
Reptiles				
	Total known species (number), 1992-2003	67	X	X
	Number of threatened species, 2002	3	X	293
Amphibians				
	Total known species (number), 1992-2003	35	X	X
	Number of threatened species, 2002	X	X	157
Fish				
	Total known species (number), 1992-2003	99	X	X
	Number of threatened species, 1992-2002	X	X	742
Legal Trade in Selected Wildlife and CITES {c} Status				
Year CITES Ratified		X		
Net International Legal Trade Reported by CITES, 2000 (number) {d}				
	Live Lizards	X	-150281	
	Live Snakes	X	-148644	
	Live Primates	X	-12677	
	Live Parrots	-1108	-201235	

	Lizard Skins	X	-270275		
	Snake Skins	X	-24245		
	Crocodile Skins	-75	-104282		
	Wild Cat Skins	X	-754		

Wetlands of International Importance,

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Annex: Pilot projects

Introduction

The project proposals presented in this report were collated from inputs from an interministerial Task Team. Several project proposals were received from participating ministries in the GCLME project, Nongovernmental organizations, Universities, research Institutes and others. Virtually all the projects have common themes with those from portfolio of project arising from the African process.
The yardsticks used for the projects are enumerated below:

Sustainability:

Financial;
In terms of the generation of benefits for stakeholders, taking into account social and cultural values; and,
In terms of its effectiveness for delivering expected outcomes.

Feasibility:
Financial;
In terms of political support and commitment;
In terms of stakeholder sense of ownership and involvement; and,
Possibilities for implementation taking into consideration the operating environment and the institutional and management capacity of responsible agents.

Consequently, the following priority areas have been identified:

Pollution

Capacity building for oil spill management and technical acquisition
Industrial and agricultural effluents
Inadequate management of sewage and soil wastes

Ecosystems modification

Flooding and erosion mitigation
Invasive and exotic species/mangrove Restoration
Alternative livelihood for coastal communities

Global Climate change and sea level rise
Reduction in CFC gases

Project I: Title: SUSTAINABLE MANAGEMENT OF COASTAL ESTUARIES

Location: Freetown (Sierra Leone River Estuary),

Project Background& Justification

Estuaries in West Africa especially the Sierra Leonean estuaries are multiple-usage amenities for fishing, transportation, source of mineral and waste disposal, These can be vitiated by pollution, environmental degradation, bio-diversity loss and unwanted modifications if the systems are not managed within a sustainable framework.

Objective

To evaluate the present status of the physical, chemical and biological characteristics of the coastal estuary as area benchmark for sustainable management especially in terms of fisheries, bio-diversity issues, environment quality and potential health/livelihood impacts.

Project components/Activities and Expected Results

Collection of existing data on the health of the estuaries. Sampling/studies to fill gaps in information. Plan of action for the cleaning up of the estuaries. Development of long term plans for sustainable management of the estuaries
Including particular focus on their socio-economic importance.

Risks and Sustainability

Possible constraints may arise from the poor co-ordination and liaison between appropriate government and non-governmental organ. Also for sustainability, extant *institutional and legal instrument must be examined for adequacy while necessary* enforcement strategies should be put in place. Furthermore, appropriate human capacity development for sustainability.

Stakeholder Participation

Local fishermen, Local communities, Water transportation operation operator, State Environmental Protection Commission.

Demonstrative Value

This project can be replicated in other estuaries in the country because these estuaries are actually component parts of a large sub-regional systems. Sustainable management will result in cleaner systems, promote a more vibrant fishery and generally give better opportunities for improved health and livelihoods of the local inhabitants.

Project Sustainability

Once the project is completed the government will be able to sustain the project in collaboration with other stakeholders. The human capacity development components

and the improved economic climate that the project will encourage shall also facilitate sustainability.

Project financing & duration

$2,000,000.3 years

Monitoring and Evaluation

NACEF can monitor and ensure effective implementation.
IMBO or other competent corporate or individual consultants could also monitor to ensure successful implementation.

Project II: Tittle. Integration Waste Management in Freetown

Potential scope: Freetown

Project background and justification.

Today, Freetown is one of the fastest growing towns in Sierra Leone. This rate of growth is well understood in view of the strategic location of the town . Freetown has many hotels, restaurants and other socio-economic facilities to cope up with the growing population. .

Justification:

The natural consequences of population growth, industrialization, heavy traffic, etc. Carries with it waste generation and accumulation. Since Freetown came into existence, there has not been any planned and scientific approach to waste management in contemporary terms. The waste management adopted by the Local Government and town dwellers is that of a fire brigade approach which is at variance with expected modern methods, which should be integrated waste management.

Objectives:-

To ensure the management of waste from series to the sinks in an environmentally-friendly and scientific manner.
To ensure optimum care of the equipment and machines required for integrated waste management.
To ensure the safety and health of the personnel during waste management operations.
To protect surface and underground water through leachate.
To monitor and introduce research components into the exercise to ensure sustainability

Project components/activities:

Awareness creation
Road cleaning and drains maintenance.
Waste collection, sorting, composting, recycling and disposal.
Dumping site maintenance
Monitoring, Evaluation and supervision
Research imperatives
Equipment, compliance and Enforcement.

Expected result:

Proper and effective management of our wastes in Freetown.
Monitoring backed up by research to determine the effectiveness of the operation.
Clean and healthy environment.

Risk and sustainability:

The following risks have been identified, namely:

Health hazard to the waste personnel in-charge of evacuation the waste.
Accidents (motor) likely to occur during the movement of the waste and evacuation of the waste.

Spread of disease vectors during the transportation of the waste to dumpsite.
Possible outbreak of epidemic from the dump site if not properly maintained.

Sustainability

The project can be sustained if all the above is taken care of or minimized by appropriate measures. In addition, waste tariff will be imposed for sustainability.

Stakeholders participation:

The following stakeholders will be involved:
Freetown City Council
National Petroleum Unit
The Division of Environment, FCC.
NGOs & CBOs
These stakeholders will exhibit their cooperation and technical expertise in the programme.

Demonstrative value:

Demonstrative value will include
All the stated objectives.
Cleanliness of the environment

Project sustainability:

The project will be sustainable if sustainability criteria above is adhered to plus-polluter-pay principle (PPP) and political will. Again, for sustainability, the FCC and the relevant associations must cooperate and live up to their responsibility.

Project financing and duration:

Public Environmental Awareness
Equipment
Waste collection, Evaluation and Disposal
Dumpsite maintenance
Cleaning of roads and maintenance of streets
Monitoring
Research

Duration: Three years

Monitoring and evaluation:

Monitoring will be done by a selected group from the stakeholders with definite guidelines. They will be changed every six months so as not to make them too familiar with the workers. This ensure conformity and reproductively of the monitoring data.

Secondly, the monitoring team will be given motorcycles and vehicles to facilitate their movement. Law Enforcement Officers may also be involved.

Evaluation

This will be done by a composite team to evaluate the success or otherwise of the pilot project. The evaluation indices will include:
The effectiveness of the programme.
Control measure needed to ensure sustainability.
The funds needed and in what quantity.
Periodic evaluation of the personnel needed/training for them.

Project III: Title. COASTAL EROSION CONTROL

Priority Hot Spot or Sensitive Areas of Reference: Lakka, Lumley, Godrich and Hamilton Beaches.

Project background & Justification

Coastal erosion is major environmental problem facing the vulnerable coastal areas of Sierra Leone particularly human induced (sand extraction) west and eastern African sub-region. Erosion has caused loss of land and highly priced properties, disruption of socio-economic activities. Intervention will assist in the protection and effective management of valuable socio-economic infrastructure along the coast while reducing ecological damage.

Project Components/Activities and Expected Results

This project will also include conducting an assessment of erosion and flooding problems including socio-economic needs and option, public enlightenment campaign, remediation and mitigating along the Freetown peninsula coast. Construction of protective structures afforestation and raising of river canal banks. Expected results also include a stemming of present erosion trends and the evolution of appropriate control and management options

Risks and Sustainability

Poor data base and inadequate human capacity may retard the pace of appropriate interventions. Also lack of awareness by local people on the need for planned and judicious Land use practices may pose a threat to the success to any erosion control measure.

Stakeholders Participation

Sierra Leone Roads Authority (SLRA), Ministry of Tourism and Culture, coastal communities, Local Governments, Relevant Research Institutes.

Demonstrative Value

Obviation of threat to prime assets on the beach-front, restoration of modified or lost ecosystems. Use of low technology gabion revetments and groins to combat erosion along low energy coast ,bays and creeks along the Freetown peninsula coastline. Ease of project duplication in the entire sub-region.

Project Sustainability
Restorations will promote the landed property and tourist businesses that should then be enthused to support projects. Acquisition of appropriate human capacity should also promote project sustainability

Project Financing & duration-$3.5m (3 years)

Monitoring and Evaluation

IMBO and or other consultants to could be contracted to monitor the performance of the project

Project IV: Title Strengthening of Fisheries Management Capacity

Potential scope:

Strengthening of fisheries management especially the placement of adequate rules and regulations and enhanced monitoring.

Background and justification:

Unsustainable exploitation has resulted largely from attempts to offset the difference between demand and supply of living resources. The increase effort which this situation has engendered has resulted in exploitation beyond the sustainable yields of the resources concerned. Furthermore, existing regulations even when adequate are not rigorously enforced while the use of inappropriate fishing methods and environmental degradation (including nursery and breeding grounds for fish) have also contributed to the problem.

Root cause analysis has revealed that a lot the problem is managerial and related to inadequate monitoring, policing and surveillance capabilities; bringing to the fore, problems associated with ineffective implementation of extant fisheries management, surveillance and control.

Objectives:

To build the capacity for fisheries management
Promote surveillance and monitoring capabilities
Promote the FAO Code of conduct for responsible fishing
Promote aquaculture to relieve pressure on capture fisheries
Encourage value addition to otherwise less valuable products

Expected Results:

Management of living resources within a sustainable framework
Increase production of fisheries resources

Project financing and duration:
Funding support requested: $ 4.6million
Duration: 4years

Project V: Title. Ballast water Management and control in the Sierra Leone Marine Environment

Project background and Justification:

Uncontrolled ballast water disposal in Sierra Leone's coastal environment can pose a threat to its ecological stability and diversity. During such uncontrolled disposal activity, introduction of alien species may occur which may cause unpredicted changes to the bio diversity of the coastal/marine water bodies. There is also the risk of other types of pollution occurring from such activities. Eliminating the risk of introduction of alien species and also to improve the capacity of the country, to monitor changes in the coastal marine environment and to deal adequately with the issue of ballast water management and control is the prime reason for the conception of this project.

Objectives:

This project feeds into the current Sierra Leone Maritime Administration's mandate to supervise all maritime activities in Sierra Leone.

Its broad objectives include:

To evaluate the present status of the physical, chemical and biological characteristics of coastal harbour water for sustainable management and control of ballast water disposal in the port of Sierra Leone. Develop management options for the Sierra Leone ports authority.
To provide long-term and short-term training and retaining programmes for relevant personnel to implement the management options.

Project components/activities/expected results:

This project will include conducting an assessment of the health status of our coastal waters (particularly) within the Freetown Harbour, Compilation of historical data on the characteristics of relevant environment, evaluation of the adequacy and scope of the legal and institutional instrument. Application of appropriate cleanup and restorative measures. Development of relevant human capacity. Harmonization of approaches with other countries in the region in order to facilitate co-operation.
Expected Results include management options for control of ballast water disposal in Sierra Leone and assurance of better marine environmental management.

Risks and Sustainability:

Poor database and inadequate human capacity may retard the pace of appropriate interventions. The objectives and outcome of the project are well understood by the project formulators. Unforeseen outcomes and risks will be mitigated through trading and capacity building for stake holders and through built-in monitoring mechanism.

Stakeholders Participation:

Petroleum product producers, petroleum unit of the Geological Surveys of Sierra Leone, relevant research institute/universities, environmental protection

departments/commission, coastal communities, SLPA, Marine Police, Naval Wing SLA, Fishing Industry, GCLME Project and environmental NGO's.

Demonstrative value:
Management and control of ballast waters will ameliorate the adverse ecological and socio-economic effects around the hot spot.

Project sustainability:

From the unset, the programme will be planned and coordinated with the involvement of all stakeholders who will also take over ownership at the end. The executing Agency will provide yearly budgetary provisions to ensure the sustainability of the project when the donor aid comes to an end, in addition to other stakeholders contribution.

Project financing and duration:

$4,000,000, 4 years

Monitoring and Evaluation:

This could be done by competent consultant under the supervision of the Sierra Leone Maritime Administration.

Project VI: Title. Environmental Education and Public Awareness Programme for Sustainable Coastal Zone management in Sierra Leone

Project background and Justification:

The coastal of Sierra Leone has been greatly modified by a combination of natural and anthropogenic factors. These include pollution of its water by shipping and oil es, uncontrolled disposal of industrial and domestic waste, biotic displacement of mangroves deforestation of coastal rain forest, coastal erosion, destruction of ecologically sensitive sites etc. Environmental Education and public Awareness has been recognized as instrument "par excellence" for the change from environment-hostile to environment –friendly attitudes, eradicating environmental ignorance thereby empowering the people to be environmentally responsible. In the long run, billions of Leones required for the clean-up, remediation and restoration programmes will be saved by investing a fraction of it in an environmental education and public awareness programme.

Objectives:

This project feeds in the current Government's Environment policy affecting the coastal and marine environment.
Its broad objectives include: To have update topographic map information on the coastal areas of Sierra Leone
Develop environmental education curriculum for implementation in ten (10) selected secondary schools (one each from the 10 coastal District)
To capture the peculiar coastal environmental problems and assets in the region as target for mitigation, prevention and conservation campaign.
Identify specific target groups for public enlightenment programme
Design suitable public awareness strategies for identified target groups
Energized exchange of ideas and retraining among the various target groups.
To provide long-term and short-term training and retaining programmes for relevant personnel to implement coastal zone management programmes

Project components/activities/expected results:

Development of a national plan to net up a hydrographic bureau
Train the trainer's workshops and seminars

Monitoring and Evaluation:

Outputs include baseline report; 4 No workshop, environmentally enlightened children and citizenry.

Risks and Sustainability:

The objective and outcome of the project are well understood by the project formulators. Any unforeseen outcomes or risks will be mitigated through training and capacity building for stakeholders and through built-in monitoring mechanism.

Stakeholders Participation:
In addition to partner institutions identified above, other stakeholders include:GOSLte Ministries of Agriculture and food security; Rural Development, Women Affairs; community Development Committees in affected communities, Petroleum oil companies and manufacturing industries, maritime operators, and NGOs and CBOs in the affected region.

Demonstrative value:

There is virtually no formal Environmental Education in our schools curriculum and no coordinated public awareness programme for sustainable coastal zone management throughout the coastal and maritime zone of Sierra Leone. Therefore this project is a pilot attempt with potential for replication in other parts of the world.

Project sustainability:

From the unset, the programme will be planned and coordinated with the involvement of all stakeholders who will also take over ownership at the end. The executing Agency will provide yearly budgetary provisions to ensure the sustainability of the project when the donor aid comes to an end, in addition to other stakeholders contribution.

Project financing and duration:

Research 850,000.00

Duration: 3 Years

Monitoring and evaluation:

An independent periodic monitoring by the agency responsible for the productions of mapsin conjunction with the donor agencies. An end of term evaluation will be undertaken by the agency in conjunction with the donor and independent consultant.

Project VII: Title. Establishment of a Coastal Zone Information System in Sierra Leone

Project background and Justification

Data bases are urgently needed to identify the types, estimate extent and economic significance, of the major coastal resources of Sierra Leone. These resources are the mangroves, estuarine mudflats, and bars, open water, artificial habitats, beaches, mineral resources, cliffs, sea grasses.

Current and potential sources of environmental threats need to be identified, hence, providing basis for mitigatory measures. Presently, in Sierra Leone, the legislative and institutional framework governing environmental management of the coastal zone have not yet been defined, and numerous data gaps exits (Johnson and Johnson, 1997) There are gaps in the assessment of fish and shrimps stocks, role of mangrove in inshore fisheries sustenance, rate of coastal erosion, socio-economic valuation of coastal resources amongst others. The existing databases are inadequate for the preparation of a Coastal Zone Management (CZM) plan framework.

Project: VIII. Title. Socio-economic valuation of coastal Sand resources.

Project Objective

It is necessary to know the extent to which coastal populations depend on natural resources for the development of rational management strategies such as designating areas for conservation.

Objectives:

Its broad objectives include:

Project components/activities/expected results:
Community Outreach/Awareness

Monitoring and Evaluation:
Outputs include baseline report;

Risks and Sustainability:

The objective and outcome of the project are well understood by the project formulators. Any unforeseen outcomes or risks will be mitigated through training and capacity building for stakeholders and through built-in monitoring mechanism.

Stakeholders Participation:

In addition to partner institutions identified above, other stakeholders include:GOSL Ministries of Industry and Tourism; Rural Development,
in other parts of the world.

Project sustainability:

From the unset, the programme will be planned and coordinated with the involvement of all stakeholders who will also take over ownership at the end. The executing Agency will provide yearly budgetary provisions to ensure the sustainability of the project when the donor aid comes to an end, in addition to other stakeholders contribution.

Project financing and duration:

Research 850,000.00

Development of Environmental Education Curriculum ..1,500,000.00
Development of public Awareness Master plan...1,500,000.00
2No. workshops and seminars3,000,000.00
Community outreach/Awareness programme1,200,000.00
Curriculum Implementation 1,500,000.00
Monitoring and Evaluation (including project vehicles and Maintenance)..2,500,000.00
Total =

Duration: 3 Years

Monitoring and evaluation:

Monitoring will be undertaken at three levels namely:
There will be monthly process monitoring at the community level by an NGO, grassroots Empowerment Network, in contact with participating schools, communities and industries. An independent periodic monitoring by the agency responsible for the Environment in conjunction with the donor agencies. An end of term evaluation will be undertaken by the agency in conjunction with the donor and independent consultant.

Project IX: Title. Water quality.

Project Objective

Water quality studies should be carried out continuously in order to generate data and information, which will be useful for nature comparisons as well as formulate a management scheme for water quality.

- Identification of data gaps and research needs necessary for periodic environmental assessment.
- Provision of facilities and financial resources for data collection, formatting and archiving.

Organisation and conduction of surveys of critical areas and presentation of data in GIS format e.g. Auto Cad, Arch Info data format etc.

Objectives:

Its broad objectives include:
Project components/activities/expected results:

Monitoring and Evaluation:

Outputs include baseline report; **Risks and Sustainability:**
The objective and outcome of the project are well understood by the project formulators. Any unforeseen outcomes or risks will be mitigated through training and capacity building for stakeholders and through built-in monitoring mechanism.

Project sustainability:

From the unset, the programme will be planned and coordinated with the involvement of all stakeholders who will also take over ownership at the end. The executing Agency will provide yearly budgetary provisions to ensure the sustainability of the project when the donor aid comes to an end, in addition to other stakeholders contribution.

Project financing and duration:

Research 850,000.00

Duration: 3 Years

Monitoring and evaluation:

An independent periodic monitoring by the agency responsible for the Environment in conjunction with the donor agencies. An end of term evaluation will be undertaken by the agency in conjunction with the donor and independent consultant.

Project X: Title. Updating of topographic map information on the coastal areas of Sierra Leone

Project Background and Justification:

A series of topographical maps at a scale of 1:50,000 were produced by the directorate of overseas surveys (DOS) from aerial photographs flown between the 50s and 60s at a scale of 1:40,000 and provide information on different categories of road network, settlements, buildings etc. as well as the different vegetation types e.g. forests, savannah, swamp grassland, some cultivated areas and hydrological features. Todate such maps have not been updated and hence their usefulness has been greatly diminished. It is against this background that this project is conceptualised.

Objectives:

To set up a hydrographic bureau of Sierra Leone
To train cartographers in map making

Its broad objectives include: To have an updated topographic map information on the coastal area of Sierra Leone

Project components/activities/expected results:

Development of national plan to set up a hydrographic bureau
Train the trainer's workshops and seminars

Monitoring and Evaluation:
Outputs include baseline report;

Risks and Sustainability:
The objective and outcome of the project are well understood by the project formulators. Any unforeseen outcomes or risks will be mitigated through training and capacity building for stakeholders and through built-in monitoring mechanism.

Stakeholders Participation:

In addition to partner institutions identified above, other stakeholders include:GOSL Ministries of Agriculture and Forestry, and Food Security Development,
in other parts of the world.

Project sustainability:

From the unset, the program will be planned and coordinated with the involvement of all stakeholders who will also take over ownership at the end. The executing Agency will provide yearly budgetary provisions to ensure the sustainability of the project when the donor aid comes to an end, in addition to other stakeholders contribution.

Project financing and duration:

Research 850,000.00

Development of Environmental Education Curriculum ..1,500,000.00
Development of public Awareness Master plan...1,500,000.00
2No. workshops and seminars3,000,000.00
Community outreach/Awareness programme1,200,000.00
Curriculum Implementation 1,500,000.00
Monitoring and Evaluation (including project vehicles and Maintenance)..2,500,000.00
Total =

Duration: 3 Years

Monitoring and evaluation:

Monitoring will be undertaken at three levels namely:
There will be monthly process monitoring at the community level by an NGO, grassroots Empowerment Network, in contact with participating schools, communities and industries. An independent periodic monitoring by the agency responsible for the Environment in conjunction with the donor agencies. An end of term evaluation will be undertaken by the agency in conjunction with the donor and independent consultant.

Pilot project XI: Title. Conception and Installation of settled or simplified sewerage in the local communities of Freetown (One pilot project location per community

Settled sewage

Is the means of conveying domestic sewage which has been settled in a septic thank (sometimes referred to, in this context, as a solid interceptor tank) (Figure 1). It was developed in Northern Rhodesia (now Zambia) in 1960 by Mr. L.J. Vincent, Manager of the then African Housing Board of Northern Rhodesia (now the Zambian National Housing Authority), to remove the settled wastewater from aqua-privy thanks. The settle sewerage is now most common in Australia and the United States.

Construction

Given that existing septic thanks are at the rear of properties, the settled sewer can be laid there, rather than in the road (as in normal with conventional sewerage), and this will result in considerable cost savings (and is in fact analogous to the backyard or condominal variant of simplified sewerage). Manholes are not required at every junction or change of direction; simple cleanouts suffice. Lift stations are only required in every flat areas, but these are simple structures with a water pump, rather than a more expensive sewage pump since there are no solids to be pumped.

Operation and maintenance

The implementing authority or the community organization has to ensure that only connections from septic tanks are made to the settled sewer, and it is also has to be responsible for desludging the septic tanks. Thus at the start of the scheme the sewerage authority should desludge and, if necessary, renovate the existing septic tanks, and then annually or biennially, as required, arrange for them to be desludged. Desludging costs can be recovered from the householders through the existing billing arrangement. Given that settled sewerage is likely to be installed in small rural villages, treatment can be achieved by a simple natural, but land intensive, technology such as waste stabilization ponds. Since around 40 percent of the BOD is removed in the septic tanks, the pond area requirements can be reduced accordingly.

Simplified sewage

Simplified sewerage collects all household wastewaters (WC wastes and sludge) in small-diameter pipes laid at fairly flat gradients for example, a 100 mm diameter sewer laid at a gradient of 1 in 200 (0.5 percent) will serve around 200 households of 5 people with a wastewater flow of 80 litters per person per day. The sewers are often laid inside the housing block, or in the front garden or under the pavement (sidewalk), rather than in the centre of the road as with conventional sewerage. It is suitable for existing unplanned low-income areas and new housing estates with a more regular layout. Simplified sewerage is most widely used in Brazil. It has also been used in other South American countries and some Asian countries.

Costs

Settled sewerage construction costs are typically 20-50 percent less than those of conventional sewerage. Since this system is to installed in a small community of less that 100 household costs should be less that 5, 000.00 per household.