GLOBAL ENVIRONMENT FACILITY

Regional

Water Pollution Control and Biodiversity Conservation in the Gulf of Guinea Large Marine Ecosystem (LME)

Project Document

ABBREVIATIONS

CIAPOL	Centre Ivoirien anti-pollution
CPR	Continuous plankton recorder
CRO	Centre de recherches océanologiques
FEPA	Federal Environmental Protection Agency
FRUB	Fisheries Research and Utilization Branch (Ghana)
GEF	Global Environment Facility
GIS	Geographic Information System
IAB	Institute of Aquatic Biology (Ghana)
IOC	Intergovernmental Oceanographic Commission
IUCN	World Conservation Union (formerly the International Union for the Conservation of Nature and Natural Resources)
LME	Large Marine Ecosystem
NFPA	National Focal Point Agency
NFPI	National Focal Point Institute
NIOMR	Nigerian Institute of Oceanography and Marine Research
NOAA	National Oceanic and Atmospheric Administration (of the United States Department of Commerce)
OCA\PAC	Oceans and Coastal Areas Programme Activity Centre
UNIDO	United Nations Industrial Development Organization
UNDP	United Nations Development Programme
UOR	Undulating oceanographic recorder
WHO	World Health Organization

CONTENTS

UNITED NATIONS DEVELOPMENT PROGRAMME

GLOBAL ENVIRONMENT FACILITY

Project of the Governments of Benin, Cameroon, Côte d'Ivoire, Ghana and Nigeria

Title:	Water Pollution Control and Biodiversity Conservation in the Gulf of Guinea Large Marine Ecosystem (LME)
Number:	EG/RAF/92/G34/Rev.C
Duration:	Four years
Project Site:	Gulf of Guinea region (Benin, Cameroon, Côte d'Ivoire, Ghana and Nigeria)
UNDP Sector:	Environment
Subsector:	Environmental assessment and monitoring Environmental enhancement and management
Government Implementing Agencies:	Various
Executing Agency:	United Nations Industrial Development Organization (UNIDO)
Cooperating Agency:	United Nations Environment Programme (UNEP)
UNDP Approval:	October 1993
Estimated Starting Date:	January 1994
Government Inputs:	In kind, in varying amounts for the different countries
GEF/UNDP Inputs:	US$ 6 million (including AOS reimbursement) An additional US$ 512,700 will be contributed by the National Oceanic and Atmospheric Administration (NOAA) of the United States Department of Commerce Total: US$ 6,512,700

Brief Description:

An effective regional approach will be developed to prevent pollution of the Gulf of Guinea and conserve biodiversity in its Large Marine Ecosystem. The project will formulate a programme for pollution control, develop mechanisms to promote the health of the ecosystem, and set up

demonstration sites. It will also provide institutional strengthening, training, and water quality and ecological monitoring.

A. CONTEXT

1. Environment

The Gulf of Guinea is a Large Marine Ecosystem (LME) extending from Guinea-Bissau to Gabon.[1] A broad indentation between Ghana and the Niger Delta forms the Bight of Benin. From the Delta the coast curves east and then south. The corner of the Gulf includes a line of volcanic islands. Between these islands and the coast eastward lies the Bay of Bonny. Extensive mangroves, primarily *Rhizophora spp.*, occur along the coast and constitute critical habitat for many crustaceans, mollusc, fish and birds. Approximately 1.2 million hectares of mangrove forest exist off the coasts of Nigeria, Benin, Ghana and Côte d'Ivoire. Almost 99 percent of this is off the Nigerian coast. Even though mangroves provide critical spawning ground for numerous species of fish, including many important commercial species, Africa has few conservation reserves to protect its mangroves. *The Global Status of Mangrove Ecosystems*, published in 1983, lists only one mangrove reserve in Sub-Saharan Africa (in Mozambique).

The warm Guinea current flowing eastward near the coast swings round in the Bay of Bonny and joins the westward-moving south equatorial current, composed mainly of cooler water from the Benguela current moving up from the south. Thus a marked contrast in direction and temperature exists between surface currents along the northern and southern margins of the Gulf. These currents affect the composition of fish populations, movements of pollution along the coast, and the characteristics of the entire LME.

Most of the major cities in the countries bordering the Gulf of Guinea are located along the coast. Numerous industries also operate in this area. As the Guinea current flows from west to east, high amounts of organic material discharged from urban centres and food industries, as well as toxic wastes and other polluting substances (chromium, alkaline wastes, dyes, zinc, copper, nickel and oil) discharged from textile mills, tanneries, and electroplating industries, are transported along the coast from one country to another, thereby creating an international water pollution problem.

The Gulf of Guinea is rich in living marine resources and well endowed with commercially valuable fish species (deep sea and coastal). It is estimated that some 1 million metric tons of fish are caught annually, of which about a third is exported. According to the Food and Agriculture Organization of the United Nations (FAO), harvests of living resources in the western part of the Gulf of Guinea during the past two decades have been characterized by variability in species composition and in fisheries landings.

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[1]   Large Marine Ecosystems (LMEs) are defined as regions of marine coastal space that are characterized by distinct bathymetry, hydrography, productivity, and trophic linkages. The Marine Catchment Basin (MCB) adjacent to an LME is the area most affected by the impacts of human activities. It is considered important that the LME and Marine Catchment Basin be managed as a single interdependent ecosystem.

The pelagic resources are represented mainly by two species of sardinellas, of which *Sardinella aurita* was the major species caught until the 1970s, after which the catches of *Balistes carolinensis* increased considerably. However, during the 1980s, catches of *Sardinella aurita* reached unprecedented levels. The abundance of the two species of sardinellas has increased over the last few years, with the stocks being shared between Côte d'Ivoire, Ghana and Togo. The fisheries concerned are both artisanal and industrial. Unlike the sardinellas, anchovy and chub-mackerel are heavily fished by Ghana alone; little information is available on the sizes of their stocks.

Significant variations in the abundance of demersal fish and shrimp resources of the region have recently been recorded. In Côte d'Ivoire, the stock of shrimp collapsed in 1980. A recent increase in the abundance of cuttlefish and puffers (*Lagocephalus*) reflects some change in the coastal ecosystem. But the nature and causes of such changes remain unknown, reflecting a poor understanding of the LME.

Many of the important commercial and artisanal fish species in the Gulf of Guinea use the coastal waters, lagoons, and mangroves for essential life cycle functions such as spawning, and as nursery grounds. Maintaining the quality of these important ecosystems is essential in order to ensure the continued productivity of the region's fisheries.

In many places along the southern West African coast, a strong longshore drift gives rise to the formation of sand bars backed by lagoons. These lagoons possess unique elements of biodiversity. Industrial and urban discharges into the lagoons can cause serious environmental problems, especially since the flow from these waterbodies to the ocean is sometimes obstructed by the sand bars, preventing the dilution of polluted water with ocean water. Mangroves, fish, and other natural resources of economic importance in these areas can thus be affected very adversely.

2. Demographic background

The countries bordering the Gulf of Guinea are Côte d'Ivoire, Ghana, Togo, Benin, Nigeria, Cameroon, Equatorial Guinea, Gabon, and Sao Tome and the Principe, which is an island in the Gulf of Guinea. Together, these countries account for about a third of the total population of Sub-Saharan Africa. Nigeria, for example, has a population of 88.5 million people, which is projected to reach 338 million by the year 2025. Ghana has the second largest population, estimated at about 15 million, and projected to reach 47 million in the year 2025. In Benin, the population of Cotonou and Porto Novo has grown to 533,212 and 177,660, respectively, and neighboring cities are experiencing a growth rate of 5 percent. The population of Cameroon and Côte d'Ivoire is currently estimated at about 11 million and 12.5 million, projected to increase to about 28 million and 30 million respectively, in the year 2000.

In each country, there has been a remarkable increase in the population along coastal cities and towns. In Côte d'Ivoire, it is estimated that approximately 2 million people live in the urban metropolitan area of Abidjan alone. With an urban growth rate of 5 percent, the population of this metropolitan area is expected to be about 8 million by the year 2025. In Nigeria, the population of Lagos, which is in the coastal zone of the Gulf of Guinea, is about 7 million. In Cameroon, Douala, which is situated on the Wouri estuary, is the largest city with a population of about 1.4 million.

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In Ghana, the Accra metropolitan area has a population of about 1.6 million, expected to increase to about 4.7 million by the year 2025. Such increases in urban populations in the coastal zones are bound to result in corresponding increases in sewage effluents, most of which are currently discharged into the Gulf of Guinea without adequate treatment, thus endangering human health, the environment, and industries such as tourism and fisheries.

3.   Industry

In common with other developing countries in the African continent, the countries bordering the Gulf attempted to diversify their economies in the 1960s by establishing some basic industries to produce consumer goods to replace imports. The period 1963-1973 was a period of unprecedented, continuous, and impressive industrial growth in most of these countries. Industrialization was regarded as the main engine of growth, an instrument for reducing the excessive dependence on exports of agriculture and mineral raw materials for foreign exchange earnings. These African countries set about diversifying their economies with a view to accelerating economic growth, generating employment, alleviating poverty, and raising the standard of living.

Both import substitution and export-oriented industries were promoted by the governments through a variety of measures. Industries established include, inter alia, industries producing beer, textiles, edible oils, fertilizers, leather and leather goods, aluminum, and oil refineries. The contribution of industry to the gross domestic product (GDP) rose from between 8 percent to 14 percent in 1960 in most of these countries, to approximately 14 percent to 20 percent by 1970, and to 17 percent to 25 percent by 1977. Some of these countries therefore achieved rapid expansion and prosperity in the industrial sector.

In the case of Nigeria, which is the largest country bordering the Gulf of Guinea, the growth in the manufacturing sector was rapid as a result of the oil boom. To promote industrialization during that period, the government allocated 25 percent of its public investment programme to manufacturing, mainly for heavy goods industries, such as steel, petrochemicals, nitrogenous fertilizers, and pulp/paper. Examples of major investment programmes were the "direct reduction" steel plants at Aladja in Delta State, and plants of the Delta Steel Company. In the first half of the 1980s, a similar emphasis was put on rapid industrialization and increased industrial efficiency, with particular reference to the promotion of resource-based industries and private sector development.

The rapid growth of the industrial sector in the subregion also led to an increase in the volume and diversity of industrial wastes that are discharged without treatment into rivers, lagoons and coastal waters, thereby threatening the marine environment and human health. It has been estimated that over 60 percent of the existing industries are in the coastal cities and towns. Apart from the manufacturing industries, mining along the coastal zones is also a major cause for water pollution and ecological degradation.

Until very recently, little or no consideration was given to the environmental implications of industrialization and of highly populated cities and towns. Although efforts are being made by these countries to introduce and implement environmental protection and conservation policies, they still lack the capacity and corresponding capability to monitor pollution control and deal with environmental problems.

4.   National and subregional policies, objectives and strategies

The first African Ministerial Conference on the Environment was held in Cairo in December 1985. It adopted the approach of the United Nations Environment Programme (UNEP) to environmentally sound management of inland waters (EMINWA) based on priority regional activities, that is now part of the Cairo programme for African cooperation. The UNEP report on environmental perspectives up to and beyond the year 2000, as well as the report of the World Commission on Environment and Development, highlighted water as a priority area of concern. This was taken up by African nations at the first African Regional Conference on Environment and Sustainable Development held in Kampala, Uganda, in June 1989.

The Kampala declaration set a goal of improving African water quantity and quality through efficient, equitable use and distribution of nationally and internationally shared water resources. The conference adopted UNEP's EMINWA report with a view to implementing programmes to improve drinking water and sanitation facilities, and install industrial waste water treatment.

The United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in June 1992, recognized that national, subregional, and global efforts to arrest the rapid degradation of coastal and marine areas and resources have not always proved capable of achieving sustainable development. To this end, the following objectives were adopted:

- To prevent, reduce, and control degradation of the marine environment so as to maintain and improve its life-support and productive capacities

- To develop and increase the potential of marine living resources to meet human nutritional needs, as well as social, economic and development goals

- To promote the integrated management and sustainable development of coastal areas and the marine environment

- To increase the capacity of countries to undertake industrial development efforts in an environmentally sound manner to support their development objectives

- To increase efficiency in the production and consumption by industry of energy and other resources and materials.

To realize these objectives, the following activities, which are directly related to this project, were endorsed by the participating states:

- Strengthening national and subregional research facilities or, where appropriate, developing systematic observation of marine pollution

- Promoting the development and application of methods, such as national resource and environmental accounting, including pollution, marine erosion, loss of resources and habitat destruction

- Supporting pilot demonstration programmes and projects in integrated coastal and marine management

- Promoting environmentally sound co-treatment of domestic and compatible industrial effluents

- Promoting primary treatment of municipal sewage discharged to rivers, estuaries, and the sea, or other solutions appropriate to specific sites

- Establishing and improving local, national, subregional and regional, as necessary, regulatory and monitoring programmes to control effluent discharge, using minimum sewage effluent guidelines and water quality criteria and giving due consideration to the characteristics of receiving bodies and the volume and type of pollutants

- Developing and maintaining data bases for assessment and management of coastal areas and all seas and their resources

- Conducting regular environmental assessment of the state of the environment of coastal and marine areas

- Preparing and maintaining profiles of coastal area resources, activities, uses, habitats and protected areas based on the criterion of sustainable development

- Exchanging information and data

- Stimulating public education, awareness, and information programmes.

International concern about environmental degradation has led to increased awareness of the environmental problems facing the countries of the Gulf of Guinea. At the national level, governments have adopted policies aimed at protecting the environment and utilizing natural resources on a sustainable basis. Some countries have also adopted policies for the protection and development of the marine environment and the coastal areas of the subregion.

The Government of Benin has adopted an Environmental Action Plan (Plan d'action pour l'environnement (PAE)) with the main objective of promoting and developing environmental awareness and capabilities for environmental management, including better management of biodiversity with the involvement of the population.

Very early on, Cameroon joined the international initiatives concerning the environment, especially the protection of natural resources. Since 1972, a set of standards has been evolved for specific aspects of nature protection and the control of pollution.

In Côte d'Ivoire, several decrees on pollution control have been announced, the first one being that of 20 October 1926, which classified industries according to their potential of risk, prescribed a procedure for an industry to obtain authorization, and provided for fines for non-compliance with environmental regulations. A set of regulations for the protection of marine

resources and the coastal zone environment also exists. There are, however, no standards in Côte d'Ivoire for pollution control. In certain cases, international standards (in particular the French standards) are used for pollution control. A network to monitor lagoons and atmospheric pollution has also been initiated. Industrial units have to satisfy effluent quality objectives on a time schedule.

In Ghana, the national environmental policy aims, inter alia, at maintaining the ecosystems and preserving biological diversity.[2] Non-governmental organizations (NGOs) have been especially effective in Ghana in sensitizing the local population on environmental issues.

Nigeria's federal policy on the environment aims at achieving a cleaner environment and sustainable development and, in particular: to restore, maintain, and enhance the ecosystems or ecological processes essential for the functioning of the biosphere; to preserve biological diversity; to raise public awareness and promote understanding of essential linkages between the environment and development; to encourage individual and community participation in environmental improvement efforts; and to cooperate with other countries and intergovernmental organizations and agencies for the effective prevention or abatement of environmental pollution.[3] At the federal level, a National Environmental Policy and National Environmental Action Plan have been formulated. At the state level, State Environmental Action Plans are being developed. The Federal Environmental Protection Agency (FEPA) has set standards for water quality, and the state governments have passed environmental regulations which are in some cases more stringent than the federal regulations.

At the subregional level, the protection and development of the marine environment and coastal areas of the West and Central African subregion (which invariably includes the Gulf of Guinea) have been accorded priority in the environmental programme of the Global Environment Facility (GEF). The Facility has identified four focal areas for its operations. Two of them, namely protection of biodiversity and the protection of international waters, are covered by the present project, as well as by the Economic Community for West African States (ECOWAS) and the Economic Community for Central African States (ECCAS). The aims and objectives of these programmes are to develop an action plan for the protection of the marine environment and coastal areas with a view to improving the health and well-being of the population.

5. Prior and ongoing assistance

In 1978, an International Workshop on Marine Pollution in the Gulf of Guinea was organized by the Intergovernmental Oceanographic Commission (IOC)/FAO/World Health Organization (WHO)/UNEP. The workshop identified industrial waste as a major source of marine pollution in the subregion. The main recommendations of the workshop include, inter alia, the need for a detailed survey of land-based sources of industrial and agricultural pollutants discharged directly or indirectly into the sea. As a follow-up, a survey of marine pollutants from industrial sources in the

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[2]   See the Environmental Action Plan of Ghana.

[3]   National Policy on the Environment, Federal Government of Nigeria, 1989.

West and Central African subregion was jointly carried out by the United Nations Industrial Development Organization (UNIDO) and UNEP in 1980-1982. Although information on industry, industrial waste water, and pollution discharges was limited, it was observed that pollution discharges into the rivers and oceans were already creating significant problems which needed to be addressed to arrest environmental degradation of the subregion.

In 1988, an International Workshop was held on Monitoring of Pollution in the Marine Environment of the West and Central Africa Region (Joint FAO/IOC/WHO/IAEA/UNEP Project referred to WACAF/2—First Phase) with participants from the region to discuss the establishment of a coordinated marine pollution monitoring programme. Through the WACAF Action Plan, UNEP (Oceans and Coastal Areas Programme Activity Centre (OCA/PAC)) supports the implementation of the WACAF/2 Programme by FAO. UNEP has—within its regional seas programme—also assisted the countries in designing an Action Plan for the Protection of the Marine Environment and Coastal Areas of the West and Central African Region. In Cameroon, the Institut de recherches médicales et d'etudes des plantes médicales (IMPM) has actively participated in the joint FAO/IOC/WHO/IAEA/UNEP project on the monitoring of pollution in the marine environment of the West and Central African Subregion (WACAF/2) from 1984 to 1990.

At the national level, the governments have taken certain initiatives to address environmental problems. In Benin, the preparation of a Plan of Action was jointly financed in 1990 for US$ 1 million by the World Bank, UNSO, Gesellschaft fuer Technische Zusammenarbeit (GTZ), and FAO for developing human resources for environmental management with rational exploitation of natural resources, improving the environment and better management of biodiversity. The preparatory plan ended in December 1992. A project funded by the United Nations Development Programme (UNDP), Promotion of the Utilization of Sanitary Facilities, has addressed faecal water pollution problems in support of the Master Plan for Hygiene and Sanitation currently being prepared.

In Côte d'Ivoire, the World Bank is funding the extension of the Abidjan sewerage system and sea outfall. Monitoring the quality of coastal waters forms another area of focus.

A large-scale project currently under implementation in the subregion is the Ghana Environmental Resource Management Project which, as the title implies, aims at strengthening the capacity and capabilities of the government, NGOs, and local people to manage environmental resources. The main components of this project cover institutional support to Ghana's Environmental Protection Council, environmental system development, environmental education, and conservation of biodiversity. The project also provides for the demarcation and management of five coastal wetland sites that are recognized sites of international importance for migratory water fowls. Other aspects of the project include inventory, monitoring, and studies of the ecology of the sites. The activities and outputs of the Ghana project will be taken into consideration during implementation of this GEF project.

The World Bank sponsored a project to establish criteria for environmental pollution monitoring in Ghana. UNDP also sponsored a project with the University of Ghana to draw up a management plan for the Accra township which included plans to plant trees along costal areas. In February 1993, the World Bank co-sponsored a project with GEF on Ghana Environmental Resources Management (GERM), which includes management of some of the coastal wetlands.

In Nigeria, assistance from the World Bank has been obtained for studies on solid waste disposal and on aquifer water quality and supply. Technical assistance has also been given to the Government of Nigeria for the assessment of the viability of reactivating/commissioning three incinerating plants in Lagos State. The study included a thorough environmental impact assessment. UNDP is providing ongoing assistance in Environment and Natural Resource Management. Japanese assistance is proposed for a study of pollution in the Lagos lagoon. Studies on urban or industrial effluents are yet to be taken up.

In all the countries, environmental research and protection council and agencies are involved in biological, chemical, and ecological monitoring of various activities and the environment, including the marine environment of the Gulf of Guinea.

UNIDO, through its environmental programme, is assisting developing countries, including the countries of the Gulf of Guinea, to achieve environmentally sustainable industrial development. The aims and objectives of the programme are to increase the awareness of environmental issues and strengthen the capabilities of these countries in industry-related environmental impact assessments, and in developing sound environmental policies, standards and legislation. In addition, the technical cooperation programme also covers policy advice on the introduction of new, cleaner technologies, improved maintenance and operation of industrial plants, and proper energy and environmental auditing and management.

A specific UNIDO ongoing project of relevance to this project is the Project for National Cleaner Production Centers in Developing Countries (NCPCs) (US/INT/92/X06). The NCPCs will serve a coordinating and catalytic role for cleaner production by providing technical information and advice, stimulating demonstrations of cleaner production techniques and technologies, and training industry and government professionals in this area of industrial environmental management. Nigeria and Cameroon have been identified as two of the twenty countries which will support NCPCs.

In 1988, UNIDO organized a workshop under the Regional Africa Programme on the purification of industrial waste water with a view to assisting the participating African countries to develop policy measures to deal with long-term environmental problems associated with industrial water pollution, especially those related to agro-industries (such as abattoirs, tanneries, textiles and sugar processing factories). A survey was also carried out on industrial waste water management in some African countries. The survey showed that although all the countries had legislation or decrees relating to industrial waste water pollution control and management, only one country had all the essential elements of an environmental regulatory programme.

A project on Coastal and Oceanic Fisheries and their Environment is funded by FAO/CECAF to provide complementary data on water pollution, sediments and fish tissues, as well as information on trends in fisheries in the subregion.

In April 1992, UNDP/UNIDO fielded a preparatory assistance/appraisal mission with the participation of four international consultants for this GEF project. The mission encountered difficulties due to the unavailability of data, which is reflected in its report. The problems to be addressed, outputs to be produced, and activities envisaged under this project are based on the findings and recommendations of the preparatory assistance/appraisal mission.

6. Institutional framework for subsector

Given the importance of water resources and the need to control water pollution, each individual state has assumed primary responsibility for water development and pollution control. The individual states determine policies, and in some cases, establish environmental codes.

The Merchant Marine in Benin is responsible for the monitoring and control of marine pollution, and for the enforcement of marine fisheries regulations. In 1991, the Ministère de l'environnement, de l'habitat et de l'urbanisme (MEHU) was created to be the first body responsible for managing policies and initiating actions in the domain of environment through its Direction de l'environnement.

In Cameroon, the Ministry of Environment was set up in 1992 for direct management of flora and fauna (both terrestrial and aquatic), and the formulation of environmental policies and regulations, as well as for collaboration with other ministries to implement a programme for ecodevelopment and pollution control.

In Côte d'Ivoire, the Centre Ivoirien anti-pollution (CIAPOL) conducts water quality and sediment pollution monitoring at several sites in coastal lagoons. Oceanographic research and monitoring is carried out by the Centre de recherches océanologiques (CRO). The control of industrial and urban effluents is the function of the Direction de l'environnement. The Direction has designed the environmental policy for the recently set-up Ministère de l'environnement de la construction et de l'urbanisme (MECU) which shares the responsibility for managing natural resources with other ministries.

In Ghana, the Environmental Protection Council (EPC) was established in 1974 with representatives drawn from several government ministries, including health, agriculture, lands and natural resources, industry, science and technology, foreign affairs, and works and housing. In addition, two distinguished Ghanaian experts on environmental matters are also members of the council. EPC is charged with the responsibility of setting environmental standards for industry and promoting greater environmental awareness. EPC decides whether an environmental grant or environmental certificate may be issued. A formal EIA procedure, however, is yet to be introduced. EPC has recently completed a National Environmental Action Plan which awaits promulgation and passage into law by Parliament. In April 1993 the Ministry of Environment was created and EPC was moved from the Ministry of Local Government to this new ministry. In addition, the Ghana Water and Sewerage Corporation is responsible for the provision, distribution, and conservation of water for public, domestic, and industrial purposes, as well as for the establishment, operation, and control of waste water removed through the sewerage system.

In Nigeria, the Federal Environmental Protection Agency (FEPA) was established in 1988. FEPA is primarily responsible for initiating environmental research and policy measures to protect the environment, as well as for promoting the development and use of environmentally sound technology. FEPA is also responsible for establishing and implementing water pollution control and environmental monitoring programmes. FEPA runs one central laboratory for water, air, and soil quality analysis. In addition to FEPA, there is: a National Council on Environment, established in 1989, to facilitate coordination and cooperation between FEPA and the relevant environmental

authorities in the different states; and the Nigerian Institute of Oceanography and Marine Research (NIOMR) which conducts research on the resources and physical characteristics of the country's territorial waters, including pollution control activities. The government has also established the Ecological Fund, with a levy of 1 percent of the sales of products of crude oil, to provide grants to government agencies for environmental purposes.

In addition, regional workshops have been organized jointly by FAO/IOC/WHO/IAEA/UNEP on the monitoring of pollution in the marine environment of the West and Central African subregion.

In all the countries, there are also other government ministries/authorities, universities, research institutions, and NGOs involved in environmental protection. Successful implementation of this project will therefore require the involvement of national environment protection agencies, public health administrations, sewage works associations, industries, universities, and NGOs.

B.   PROJECT JUSTIFICATION

1.   Problem to be addressed and the present situation

The productivity and biomass yields of the coastal waters of the Gulf of Guinea LME are dependent on land drainage, river floods, and turbulent diffusion. The waters further offshore are affected by a seasonal upwelling of nutrients. The health and economic vitality of the coastal regions are at risk from the growing problems of coastal pollution, habitat degradation, and losses of fishery species due to growing contamination of nursery areas of both coastal and offshore species.

In the five countries visited by the preparatory assistance mission, lagoons and estuaries constitute nursery grounds for many important species. Biodiversity is high in these waters because of the vast and complex brackish to fresh water wetland systems. The status of biodiversity in the region varies depending on the proximity of pollution sources to the lagoons.

The countries bordering the Gulf are mainly agricultural, although industry (in some cases, the petroleum industry) plays an increasingly important role in economic development and in the economic welfare of the people. Industry is a major contributor to environmental degradation in the subregion.

Manufacturing industries established over the years generate various sorts of wastes. The bulk of such wastes is not treated because of the lack of treatment facilities. In particular, agro-based industries (such as textiles, rubber, wood, vegetable oil and tanneries), the majority of which are located along the coastal areas and in urban centres, are all generating and depositing/emitting diverse wastes and pollutants. Gaseous by-products, liquid waste, and hazardous solid wastes all contribute to soil contamination and water pollution, thereby posing a threat to the water supply system and the safety of drinking water. All these factors invariably threaten the achievement of the objective of "health for all by the year 2000."

The preparatory assistance mission observed that sources of industrial pollution in the countries bordering the Gulf of Guinea have been inventoried in a 1982 UNIDO/UNEP study which

provided estimates of the amount and type of pollutants released in the coastal environment. Since then, hardly any attempts have been made to collect data on pollution discharges. Reliable data on the types and quantities of industrial pollutants discharged into the Gulf of Guinea is therefore scarce.

On the basis of the limited information available, the preparatory assistance mission concluded that the main sources of industrial organic pollution in the five countries visited were the breweries, and the palm oil, soap, and textile industries. Agro-industries, fish canning, coffee, cocoa, and aluminum industries also contribute to the substantial amount of pollutant discharges into the Gulf.

Oil spills and the occasional catastrophic oil blow-out have released thousands of barrels of oil into the Gulf. The exact quantity of discharge is unknown. Nevertheless, the millions of tons of oil that have been deposited in the Gulf area have created oil pollution problems, including, inter alia, the contamination of beaches, damage to the physical structures of ports, the destruction of sea birds, and the killing and contamination of living marine resources.

With the growing awareness in many developing countries of the potential environmental impact of industrial growth and urbanization, the urgent need for environmental protection and resource conservation policies and programmes has become increasingly manifest. However, in developing countries, including the countries surrounding the Gulf of Guinea, even the basic minimum industrial pollution control measures are lacking. An emphasis on public policy involvement is thus essential to formulate appropriate environmental standards, ensure their enforcement, and devise longer-term solutions to environmental problems.

Côte d'Ivoire is the only country in the subregion where actions are taken against industrial pollution, although there are no water pollution standards. The Service de l'inspection des installations classées, which is an integral part of the Ministère de l'industrie, works closely with industries to ensure that their pollution discharges are reduced.

With increased population, the volume of domestic waste and sewage has increased without a corresponding increase in waste treatment facilities and proper sewage systems. These wastes are all too often dumped untreated in rivers and lagoons, and eventually reach the Gulf. High urban pollution is found in the Ebrié lagoon around Abidjan, in Korle lagoon in Accra, and in Lagos lagoon around Lagos. The Nokoué lagoon around Cotonou and Porto Novo, and the Wouri estuary around Douala, seem less polluted.

In Ghana, central sewerage facilities without treatment exist in Tema and Accra. The system in Accra is not utilized because of the cost for individual house owners. In some residential areas, septic tanks are being used. Consequently, human and domestic waste discharges into the ocean have become a serious threat to the marine environment.

Mining activities in Ghana generate liquid wastes containing substantial amounts of toxic material which find their way into the sea. These chemical pollutants pose a major challenge to the life of the marine ecosystems. Currently there are no standard acceptable levels of toxic wastes for the purpose of monitoring.

In Benin, no sewerage system exists in the cities of Cotonou and Porto Novo which have populations of 533,200 and 177,600, respectively. Where septic tanks are not used, effluents are discharged in open ditches and channels which flow into the lagoon. The same situation is found in Lagos; with the discharge from a population of about 7 million, the Lagos lagoon waters now show very high bacteriological and organic pollution. In Douala, the actual situation of urban effluents has not been assessed, but it is feared that urban pollution may become a problem.

In all these cities, human effluents are directly or indirectly discharged into the environment. In Abidjan, for example, of a population estimated at 2.7 million, 30 percent are connected to a sewerage system, 45 percent use septic tanks, and 25 percent have no system at all. Abidjan has a partial sewerage system which is operational. Works are underway to improve this system, and by the end of 1994, the collector will be connected to a sea outfall without any treatment of effluents before they are released out at sea. There are some very small treatment plants for small groups of buildings in Abidjan, only one of which is operational.

Agricultural wastes and the increased use of fertilizers and pesticides are also contributing to the degradation of the environment. Marine life is threatened by the accumulation of pesticides and other chemicals. Wrong practices in the application and use of fertilizers and pesticides have been known to contaminate food, soil, and water in the subregion.

Industrial and urban pollution are the more prominent threats to the marine environment in the Gulf of Guinea and its urban coastal areas. While there is a growing realization of these dangers, accurate information is scarce, and hardly any credible examples of "cleaner production" techniques exist on the ground. Such examples would concentrate on pollution prevention, rather than treatment, and provide practical evidence of the economic benefits to be achieved along with the environmental benefits. In sewage co-treatment (of sewage and industrial effluents), the existing facilities adopt classical methods based on relatively complex energy-intensive systems. No working examples of cheaper and simpler alternative methods in the region have recently been developed.

An assessment of the capacities and capabilities of existing facilities for industrial water pollution control shows that these vary greatly from country to country. While a few countries have some highly qualified scientists, they lack many types of critical equipment and are often short of personnel trained in the full spectrum of activities involved in comprehensive monitoring, data analysis, and the processing and storing of information.

In Côte d'Ivoire, there are several reasonably well equipped facilities in the area of water quality and pollution. CRO carries out oceanographic research and monitors water quality and pollution. The Laboratoire national d'essais et de métrologie appliquée (LANEMA), a public agency under the Ministère du commerce et de l'industrie, monitors hydrocarbon pollution, industrial waste water pollution, and the quality of drinking water. The Centre Ivoirien anti-pollution (CIAPOL) is also very well equipped with the necessary equipment for water pollution analysis, and conducts water quality and sediment monitoring at several sites.

In Ghana, there are institutions working on the quality of water and biological resources. The Institute of Aquatic Biology (IAB) works on heavy metal pollution and has developed a data base for West African fisheries.

The Nigerian Institute of Oceanography and Marine Research (NIOMR) conducts research into the physical and chemical characteristics of Nigerian lagoons and territorial waters. The Government of Japan has provided equipment for the central and five zonal laboratories of FEPA, which conduct water, air, and soil quality analysis.

At present, there is hardly any exchange of information on the results of the monitoring of the local environment by these institutions. Consequently, an overall picture of the state of the environment of the Gulf of Guinea as an integrated ecological system is lacking.

Without reliable and up-to-date information on the state of this ecosystem which would only be available on a sustained basis through a network of ongoing monitoring activities, the foundation for sound environmental management decisions is lacking. No rational management decisions can be possible, whether in response to early warnings of the onset of serious environmental degradation in specific areas, or in formulating appropriate management strategies or rehabilitation and protection plans. Nor is it possible to assess the degree of effectiveness of such actions through reliable and timely feedback on the impacts of specific remedial or protective actions.

For this basic need to be met, and as a basis for sustainable industrial and urban development in the countries bordering the Gulf of Guinea, three requirements have to be satisfied:

- Upgrading of the physical facilities and human resources of the existing institutions involved in environmental monitoring

- The establishment of effective, clear, and sustainable lines of communication between these institutions for the exchange and correlation of information

- Mechanisms for the provision of decision-support systems at the national/regional levels, to provide decision-makers with feasible management options, based on the analysis of the information gathered by the network.

2.   Expected end-of-project situation

The project is expected to promote greater cooperation between government authorities, industries, and institutions that are involved in water pollution control and habitat conservation activities. Greater cooperation will also be promoted between government agencies and relevant industries, and internationally between government authorities in the participating countries. By promoting greater cooperation between all of the above, the project will help to establish a regional foundation for safeguarding the health of the LME.

The project is designed to overcome the present sectorized approach to coastal pollution, fisheries, and habitat loss problems in the countries of West Africa bordering the Gulf of Guinea ecosystem. The assessment and monitoring efforts to be supported by the project are designed to bring forward environmental and biological information on which to build mitigation and management actions, and are based on a more integrated approach addressing the problem of environmental degradation. One of the primary long-term aims of the project is to ensure that an infrastructure will be developed, during the first three years of the project, that will have as its major

objective the sustainable development of the resources of the Gulf of Guinea ecosystem. In the short term, the reports of the project's findings will be brought forward for implementation of the most pressing mitigation actions as soon as this is feasible (for example, improvement of the water quality and health of the coastal waters, and increases in the long-term productivity of the local and regional fisheries resources).

Regional cooperation will permit accurate identification and monitoring of coastal water pollution and other driving forces in the ecosystem, and the exchange of data and experiences between responsible parties. In conjunction with this information, the case studies and pilot projects carried out with technical and capital assistance will provide a sound basis for the formulation of appropriate national/regional policies, plans, and projects for the rehabilitation and conservation of the Gulf of Guinea LME. Furthermore, cooperation in monitoring and exchanging information on the LME will provide the necessary feedback for assessing the impacts of rehabilitation and conservation approaches and activities.

It is expected that the monitoring system of coastal and nearshore pollution will become operational in all five participating countries. This system will be supported by appropriate technical infrastructure for research and development in the areas of water and marine pollution. The project will also lay the foundation for greater cooperation among the five participating countries in exchanging information related to pollution and its effects in the Gulf of Guinea, including the design of appropriate mechanisms for policy and strategy formulation for a greater regional cooperation in the area. It is also expected that, at the end of the project, a uniform set of effluent standards for industrial waste water will have been developed.

Improved laboratory facilities for essential waste water analysis will also exist in each of the countries. A core of trained technical personnel with upgraded skills and increased capabilities will be in a position to solve practical problems relating to industrial waste water discharges and re-use, and to improve waste water treatment in the subregion. Local expertise will be enhanced by the involvement of national experts in this project.

NGOs will be strengthened by their participation in project activities and by the support they receive for communication and dissemination of information. They will be able to utilize project information and results to increase public awareness of environmental problems, and to support environmental protection activities.

An integrated programme will have been developed, covering both technical assistance and investment capital needs, which is aimed at developing marine monitoring activities for the Gulf of Guinea LME. The programme will be designed to assess sources and impacts of pollution, as well as other anthropogenic and natural stresses on the health and biodiversity of the system.

The programme will incorporate training and awareness activities. It is also expected that a mechanism will be established for subregional coordination and monitoring of activities for the rehabilitation of the LME, aimed at ensuring continued cooperation between responsible authorities and industries within and among the participating countries.

A proper assessment of the sources of environmental stress on the LME, particularly in relation to industrial water pollution, will have been carried out. Such information, together with the case studies and pilot projects carried out in urban waste management and industrial pollution abatement and prevention in the relevant industrial sectors, will provide a credible basis for the formulation of national and regional policies, programmes, and projects for dealing with these sources of environmental stress. They will also provide the basis for a mechanism to monitor their impacts.

The project will develop an incentive system for the reduction and amelioration of industrial and urban effluent discharges. It will also identify financial instruments and mechanisms both to provide the necessary funds to achieve a reduction in pollution, and to fund recurrent costs for the continuation of project activities.

Finally, the project will have helped to identify investment opportunities, and through the activities undertaken, will lay the foundation for follow-on investment related to water pollution control in the LME.

3. Target beneficiaries

- Government authorities, institutions, and NGOs interested in ecologically sustainable industrial and urban development, as well as those authorities concerned with environmental issues and responsible for monitoring pollution of the marine environment.

- Individual industrial enterprises for whom a greater awareness of environmental considerations and management (including cleaner production, pollution prevention, waste management and treatment techniques) could encourage the adoption of suitable measures combining the efficient use of resources with pollution prevention/abatement, resulting in economic and environmental benefits. Such enterprises will also be in a position to improve their public image and improve the quantity and quality of products.

- The people in the countries bordering the Gulf of Guinea who will be assured of an environment that is more conducive for their health and well-being, and of the sustained productivity of the waters of the Gulf of Guinea.

4. Project strategy and institutional arrangements

The health of coastal waters and their resources are under threat from pollution, overexploitation, and habitat degradation. The institutional framework for improving these negative trends will be enhanced and augmented by the project. At present, water resources, fisheries resources, and coastal development in West African coastal countries are under various national jurisdictions. This project will develop an infrastructure of multidisciplinary government and non-government specialists that will provide the information needed to mitigate coastal pollution and the degraded conditions of marine habitats, leading to improvements in the health of the Gulf of Guinea ecosystem. In the countries of the region, there are governments, universities, research

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institutions, and NGOs involved in environmental and marine resources assessment, monitoring and management. The successful implementation of this project will require the involvement and cooperation of agencies that are collectively responsible for protecting the health of the coastal ecosystem. Support for improving the infrastructure to implement an ecosystems approach to the assessment, monitoring, and protection of the Gulf of Guinea ecosystem will be forthcoming from marine specialists in the coastal Gulf of Guinea region, as well as those specialists to be provided to the project by collaborating marine institutions and agencies from countries outside the region engaged in similar programmes (such as Denmark, France, Germany, Norway, Sweden, United Kingdom and the United States).

Given the limitations of individual countries and the magnitude of the problems of water pollution and biodiversity conservation, a regional approach consisting of the following five major elements is proposed:

- Strengthening of regional institutional capacities to prevent and remedy pollution

- Developing an integrated information management and decision-making support system

- Establishing a national and regional sustainable programme for coordinated monitoring and assessment of the changing states of the health of the region's coastal ecosystem

- Preventing and controlling land-based sources of pollution

- Developing national and regional strategies and policies for the long-term management and protection of the Gulf of Guinea LME.

The project will be executed by UNIDO in cooperation with UNEP and the National Oceanic and Atmospheric Administration (NOAA) of the United States Department of Commerce, in accordance with the Tentative Work Programme prepared by UNIDO, and in close consultation with the UNDP offices in the respective participating countries. UNEP will be the lead agency for the following project activities: 3.3.1 (identification of sources, types, and quantities of industrial and urban waste entering the lagoons); 4.4.1 (definition of effluent standards); and 4.4.2 (preparation of preliminary effluent standards). UNEP will cooperate with UNIDO in other project activities (including 4.4.3 (developing an incentive programme for industrial pollution reduction), and 4.4.4 (developing an overall strategic plan outlining options for industrial pollution control measures)). NOAA will provide scientific experts and take the lead in developing the overall LME monitoring and assessment, as well as the accompanying training programmes.

The project will be implemented with the help of a team of international experts and national experts from the five participating countries. National experts will be involved as far as possible in all project activities, and provided with relevant training whenever necessary. The main elements of an institutional framework already exist. Most institutions are staffed by qualified senior staff. The team of experts will be responsible for carrying out the activities described in the job descriptions prepared by UNIDO in cooperation with UNDP and UNEP. These experts will assist

the participating countries in developing a regional network of organizations to monitor and control pollution of the waters and critical habitats of the Gulf of Guinea LME, as well as in developing control measures for land-based industrial and urban pollution. This will include carrying out case studies and pilot projects on urban sewage management and the prevention/abatement of industrial pollution caused by the major industrial activities in the region, using appropriate techniques that are economically and technologically feasible. At the same time, some project activities will be implemented through subcontracting organizations, institutions and/or companies. Whenever possible, the national experts will be recruited from the national environmental institutions and universities familiar with the environmental problems of their countries, who can continue the activities of the project after it ends and so ensure their sustainability.

International experts, national experts, and subcontractors will be designated for the various activities based on the nature of the functions to be performed, and the availability of experts. An effort will also be made to provide opportunity and exposure for national experts. Subcontracts shall be open to international and national institutions/organizations as appropriate.

Various supporting project activities will be carried out to create a regional network for monitoring, assessment, and pollution control, including training and upgrading participating centres, institutions, and laboratories through provision of appropriate equipment for analytical work and pollution control.

Project activities in the field will be coordinated by the participating environmental agencies, ministries, institutions, and laboratories to establish a pollution monitoring network, in cooperation with UNDP Resident Representatives in the participating countries. A Project Coordinator will be responsible for overall coordination of the project.

The Project Coordinator will formulate a detailed work plan in collaboration and coordination with UNIDO, NOAA and UNEP. This plan will specify benchmarks of accomplishments and indicators of successful project implementation against which progress of the project will be measured. The Project Coordinator will review project implementation, performance, and the achievement of targets every six months. This biannual review will: identify completed and pending actions as well as any new actions required; identify any problems with fulfilling project activities and objectives; and make adjustments in the work plan if necessary. Six-monthly reports will be submitted to UNIDO, UNDP/GEF, and to the Steering Committee sufficiently in advance to serve as an input for the Steering Committee meetings.

The Centre des recherches océanologiques (CRO), Abidjan, will serve as the project Regional Coordination Centre. It will function as an information focal point and clearinghouse, and coordinate pollution and resource monitoring and assessment activities, as well as data management and training activities. The participating countries will designate National Focal Point Institutes and Agencies to form a network of scientific institutions and agencies, which are responsible for pollution control, environmental management, and pollution and resource monitoring and assessment (see Section D, Immediate Objective 1).

The governments of the five countries participating in the project will be able to apprise themselves of progress in the project and take decisions on matters of policy and strategy through

the Committee of Ministers which is envisaged to meet at least once a year. These meetings will be organized by the Project Coordinator in collaboration with the project Steering Committee. The UN bodies associated with the formulation, funding, and implementation of the project—UNDP, UNIDO and UNEP—will have the opportunity to attend the meetings of the Committee of Ministers.

A Project Steering Committee shall be constituted to guide and monitor the project, ensure coordination of the activities of the implementing institutions, and provide guidance and advice to the Project Coordinator. The committee shall comprise representatives from UNDP, UNIDO, UNEP, NOAA, and the participating National Focal Point Institutes and Agencies. Representatives of the industrial sector and national NGOs will be encouraged to participate in the Steering Committee as observers. The committee will be chaired by UNDP and meet twice per year, or more often, if required. The Project Coordinator shall act as the Secretary of the Committee. The first meeting of the Committee will be held shortly after the Project Document is signed. UNDP will provide the detailed Terms of Reference for the Project Steering Committee.

A Working Group of experts representing the five National Focal Point Institutes (NFPIs) and the CRO, headed by the Project Coordinator, shall be constituted to coordinate technical activities (including training), and render assistance to the Project Steering Committee on such technical matters as may be referred by the Committee to the Working Group, or as may come before the Working Group in the course of review of findings and recommendations made by the operational teams working on project components. The chart in Annex 2 provides a graphic depiction of the project management structure.

The project will establish links and coordination arrangements with another project currently under development by the European Union (EU) referred to as the Regional Maritime Data Base Project (BDRM). This project, which includes the maritime region from Gibraltar to Namibia, will establish user-friendly, interactive, graphic interfaces linked to regional and national data bases on fisheries, resources, and the environment. It will be used for fisheries and coastal resource analysis and management. The BDRM project will provide research institutions in the region with standard equipment and software, as well as training in data handling, Geographic Information Systems (GISs), and resource management.

In addition, the Gulf of Guinea LME project will identify and share information with other potential collaborators to ensure the effective transfer of information and use of limited resources. Examples include the World Conservation Union (IUCN) review of natural resources and fisheries in the West Africa region, and the FAO-GIS for West African Ocean Fisheries (FAO/GIS-OF/WA), which has initiated pilot projects in Senegal and Morocco.

The continuation and long-term implementation of strategies for pollution control, prevention, and remediation will require investments. This project will therefore seek investment linkages and investigate possible investment mechanisms on an ongoing basis, while keeping financial institutions such as the World Bank and the African Development Bank informed of project activities and outputs. The project is intended to serve as a catalyst for attracting targeted additional assistance for the protection of the Gulf of Guinea, through Round Table and Consultative Group mechanisms. UNDP will, through its Country Offices in the participating countries, sponsor such Round Tables of donors.

It is planned that NGOs will play an active role in project implementation. At present, their environmental actions are directed towards protecting human health and forests. However, they are willing to extend their field of activity and get involved in problems related to the quality of coastal waters. NGOs, both national and international, will be encouraged to participate from the planning stage itself. Their participation is expected to generate public awareness of water pollution control and biodiversity issues. The capacity of NGOs to take up ecological issues will thus be improved.

The foregoing description of the project's strategy and implementation arrangements should in no way curtail flexibility in the planning and implementation of the project. In an innovative and complex project like this one, flexibility may be a key factor for its success.

5. Reasons for GEF assistance

The project is designed to provide the basis for carrying out the activities endorsed at the United Nations Conference on Environment and Development (UNCED) for the protection of internationally shared water resources.

The need to assess the extent of industrial water pollution in the LME and design a programme for its control was recognized by governments and the UN organizations. The problem was brought to the attention of UNDP and UNIDO. UNDP's technical assistance was requested for implementation of this programme.

The objectives of this project are fully in line with those of the GEF, namely:

- Protection of international waters through programmes to enhance contingency planning for marine oil spills, to abate industrial and waste water pollution that may affect international marine and freshwater resources, and to prevent and clean up toxic waste pollution along major rivers which affect international water courses

- Protection of biodiversity that includes support to the efforts of developing countries to preserve specific areas to ensure the protection of their ecosystems and biodiversity.

UNIDO and UNEP have the capacity and capabilities to assist in the implementation of this project. UNIDO's participation is consistent with its increasing interest in contributing to the control of environmental pollution by industry.

6. Special considerations

The project is directly related to the preservation and improvement of environmental conditions and health. It has a direct bearing on the relations between industrial and urban development activities and the environment in that measures will be taken to identify pollutants which adversely affect the environment. Guidelines and standards will then be introduced for cleaner and environmentally sustainable industrial production and urban development.

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The project will also be directed to industrial enterprises in the private sector and the implementation of some of the activities, especially the networking component, could be linked to the Sustainable Development Network of UNDP. It therefore provides a good example of government support for, and coordination with, the private sector.

The project is expected to create a much sharper awareness of the problems associated with industrial/urban water pollution control and treatment in the participating countries. It will also provide them with the requisite capabilities to address these problems in a coordinated manner, thereby contributing greatly to minimizing the risk of pollution from land-based sources and improving the environment.

The project aims at establishing a regional network for pollution monitoring and control, and promoting regional cooperation among national authorities dealing with these issues. It therefore has the potential for strengthening technical cooperation among the developing African countries (TCDC/TCAC).

The project offers a unique opportunity for more effective cooperation between NGOs and the government in the area of environment. In the course of the preliminary assistance/ appraisal mission, some NGOs expressed an interest in participating in implementation of the project. Friends of the Earth, GAPVOD, NENGO, and Green Forum were found to be among the NGOs active in Ghana. Given a role, they could be helpful in stimulating public education, and awareness and information programmes, especially in the protection of mangroves and coastal fisheries. The effectiveness of NGOs can be improved if they are provided with reliable information, and equipment for communication and information dissemination. Their group activities, such as seminars, workshops, and public awareness campaigns, should also be supported through participation by project authorities and financial grants.

When this project was formulated, conditions in the country did not allow the participation of Togo in the project. Nonetheless, the participation of Togo in the activities of the LME Monitoring and Assessment Programme, particularly with respect to marine pollution monitoring, could readily be established, as samples would be transferred to the institutions performing the laboratory analyses. With the assistance of the UNDP Country Office and UNIDO, the Project Coordinator will initiate discussions with the Government of Togo to explore the possibility and extent of its participation in the project, whenever this becomes possible.

7.   Coordination arrangements

The project will establish links and maintain close liaison with the projects mentioned above. Close coordination will also be established with the ongoing Ghana Environmental Resource Management project.

The project will be closely related to ongoing projects and programmes at the national level on environmental resource management, in particular, on industrial water pollution control and monitoring of coastal waters in the subregion. Close liaison will also be maintained with the activities of the Sustainable Development Network that UNDP is establishing in many countries. The international and national experts of these other projects will be expected to provide relevant

information and data on pollution control and monitoring in their respective areas and countries. This could assist in facilitating the activities envisaged under this GEF project.

8.   Counterpart support capacity

In the preparatory phase of the project, consultations were held with government ministries and other relevant national authorities (such as research and pollution control laboratories) on the proposed outputs, activities, and estimated input requirements of the project. Consultations were held mainly with: CRO and CIAPOL in Côte d'Ivoire; the Institute of Aquatic Biology in Ghana; the Centre of Scientific and Industrial Research of the University of Benin; the Federal Environmental Protection Agency (FEPA) and the Nigerian Institute of Oceanography and Marine Research in Nigeria; and the Centre d'etude des plantes medicinales in Cameroon.

The governments, and in particular the relevant national institutions, will be in a position to provide a counterpart to the Project Coordinator and experts to be assigned to the project. The physical facilities for the installation of the equipment and pilot treatment units (for industrial effluents and co-treatment of sewage and industrial effluents), and the facilities for conducting the training programmes will be made available to the project at no cost. They will be considered in-kind contributions by the countries concerned.

Although the governments and institutions have agreed to provide local facilities and administrative and other support services to ensure effective implementation of specific activities in the countries and subregion, this will have to be negotiated in detail again, once the project is approved.

C.   DEVELOPMENT OBJECTIVE

To protect and restore the health of the Gulf of Guinea Large Marine Ecosystem and its natural resources.

D.   IMMEDIATE OBJECTIVES, OUTPUTS AND ACTIVITIES[4]

IMMEDIATE OBJECTIVE 1

To strengthen regional institutional capacities to prevent and remedy pollution of the Gulf of Guinea LME, and the associated degradation of critical habitats.

This project component is directed at strengthening environmental management capacity through the following:

- •   Establishment of a Regional Coordination Centre at CRO in Abidjan, Côte d'Ivoire, to function as a regional information focal point and clearinghouse. The centre will

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[4]   See Annex 9 for an overview of immediate objectives, outputs and activities.

also coordinate pollution and resource monitoring/assessment activities, data management, and training.

- Establishment of a network of scientific institutions to act as National Focal Point Institutes (NFPIs) for pollution and resource monitoring and assessment (see table below).

- Establishment of a cross-sectoral network of government agencies responsible for environmental management, pollution control, and industrial development, including agencies charged with management of natural resources, such as fisheries, forestry, and protected areas. National environmental agencies or councils will act as National Focal Point Agencies (NFPAs) to coordinate the development of management applications of project activities (see table below). Additional relevant national organizations will be identified for collaboration in technical project activities.

- Facilitation of NGO participation in project activities.

- Training of scientists, technicians, and resource managers in monitoring, assessment, and environmental management techniques and tools.

National Focal Point Institutions

Côte d'Ivoire	Centre Ivoirien anti-pollution (CIAPOL)
Ghana	Institute of Aquatic Biology (IAB)
Benin	Direction de l'hydraulique, Service hydrologie (DHSH)
Nigeria	Nigerian Institute for Oceanography and Marine Research (NIOMR)
Cameroon	Institut de recherche medicale et d'etudes des plantes medicinales/Centre de nutrition et Centre d'etude des plantes medicinales (IMPM/CN/CEPM)

National Focal Point Agencies

Côte d'Ivoire	Ministère de l'environnement
Ghana	Ministry of Environment
Benin	Ministère de l'environnement
Nigeria	Federal Environmental Protection Agency
Cameroon	Ministry of Environment

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NFPIs and NFPAs will closely collaborate with other relevant national institutions, agencies and ministries. Among these are:

Côte d'Ivoire: Ministère de l'environnement, de la construction et de l'urbanisme; Centre de cartographie et télédétection de la DCGTx; Direction de l'assainissement et des infrastructures; Service de l'inspection des installations classées; and Université nationale, Faculté des sciences et techniques.

Ghana: Water Resources Research Institute (WRRI).

Benin: Ministère du développement rural, Direction des pêches, Direction des forêts et ressources naturelles, and the College polytechnique universitaire, Université du Benin (CPU/UNB).

Cameroon: Ministry of Commerce and Industry; Institut de recherches zootechniques (IRZ).

Output 1.1

A network of scientific and monitoring institutions equipped for monitoring and assessment of the Gulf of Guinea LME.

Activities for Output 1.1

1.1.1 Prepare, based on the proposed project activities, a detailed checklist of the basic necessary equipment, accessories, glassware, chemical reagents, and so on, which should be available in each water pollution control laboratory involved in the project.

Responsible party: Project Coordinator.[5]

1.1.2 Prepare an inventory of the available resources at the national focal point laboratories, including specification of the required additional equipment/materials.

Responsible party: Project Coordinator.

1.1.3 Assist in procurement of the specified equipment and materials for CRO and national focal point laboratories in Benin, Cameroon, Côte d'Ivoire, Ghana and Nigeria.

Responsible party: Project Coordinator.

Output 1.2

Scientific and technical personnel at CRO and NFPIs trained to carry out the project monitoring and assessment programme.

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[5] Underline indicates primary responsibility for the activity.

<u>Activities for Output 1.2</u>

1.2.1   Review and analyze the functional structure of the regional centre and focal point institutes, and translate the functions related to the project's activities into duties and tasks. Define the competence and performance requirements of project personnel. Identify the required skills and knowledge to perform each task. Assess the current competence and performance, and specify the training needs for personnel involved in the various activities of the project.

Responsible party: <u>Subcontractor</u> and Project Coordinator.

1.2.2   Design a modular training package to upgrade the technical skills necessary for performing different duties and tasks. The training package shall consist of instructor aided, self-paced, and, if feasible, computer-based training sessions. On-the-job and practical sessions will be integrated in the package using laboratory facilities, expertise available at the centres, and opportunities for "in field" training in the course of accomplishing project activities.

Responsible party: <u>Subcontractor</u>, CRO and NFPIs.

Trainers will be selected from among local experts at CRO, the NFPIs and NFPAs. International experts will also be included. The training of trainers and the design of a modular package will ensure the continuity of the training programme.

1.2.3   Prepare the training plan and schedule in accordance with the implementation of project activities.

Responsible party: <u>Subcontractor</u>, CRO and NFPIs.

1.2.4   Participation of two national specialists (selected from the staff of the regional centre, the focal point institutes, and government agencies) in relevant international conferences over the course of the project. Participation in conferences, for example, on the theory and management of LMEs, coastal resources management, and pollution control and management will offer the means for continued learning about evolving knowledge in these fields.

Responsible party: <u>UNIDO</u> and Project Coordinator.

The national specialists will be required to present papers at these conferences on the activities of the Gulf of Guinea LME project and will report back to their respective institutions on the latest developments in their fields.

Output 1.3

Personnel of government regulatory and management agencies trained in environmental assessment and management techniques related to pollution control and resource management.

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<u>Activities for Output 1.3</u>

1.3.1 Training of personnel to upgrade their knowledge of industrial process technologies within representative industries such as textiles, breweries, palm oil, soap, rubber and oil. Training will include waste audit techniques, waste water/ sludge treatment techniques, waste water monitoring systems, and alternative "cleaner" technologies.

Responsible party: <u>International expert</u>, CRO and NFPIs.

1.3.2 Training of personnel in environmental management techniques and regulatory instruments for industrial pollution control, such as introduction of clean technologies, waste reduction/recycling, establishment of effluent standards, compliance programmes, financial incentive programmes, and taxation (shared cost systems). (This training component is linked to Output 4.4 (development of a strategic plan outlining options for industrial pollution control.))

Responsible party: <u>International expert</u>.

1.3.3 Training of personnel in integrated coastal resources planning and management techniques, such as coastal resource surveys and assessments, use of Geographic Information System technology to support coastal land-use planning, and formulation of coastal zone management strategies, plans and regulations. (This component is linked to Output 5.1 (guidelines for integrated coastal zone management planning to guide coastal development and conservation at the national and regional level.))

Responsible party: <u>International expert</u> and GIS expert.

1.3.4 Participation of personnel of government management and regulatory agencies in relevant conferences described under Activity 1.2.4 above.

Responsible party: UNIDO and <u>Project Coordinator</u>.

Output 1.4

Enhanced capacity of NGOs to participate in environmental management and generate public awareness.

<u>Activities for Output 1.4</u>

1.4.1 Assess and support, as necessary, the capacity of NGOs to participate in project activities directed at environmental management and policy, and promotion of public awareness of environmental pollution.

Project components to be conducted in collaboration with NGOs include the mangrove survey and the prevention and control of industrial, urban, and combined pollution programme (Objective 4).

Responsible party: <u>Project Coordinator</u>.

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IMMEDIATE OBJECTIVE 2

To develop an integrated information management and decision-making support system for environmental management.

This objective aims to strengthen environmental management capacity by setting up tools for integrated management of the coastal and marine environment which links all relevant sectors. The project will develop a regional environmental information management system which will include a GIS, serving primary functions for compilation, analysis, and communication of data collected during the course of the project. The GIS system shall be micro-computer based and run standard software customized to suit local needs and conditions. The environmental information system and GIS data base will contain: information on the distribution of coastal and marine resources; information derived from the LME monitoring and assessment, and the industrial and urban pollution monitoring programmes; and relevant, existing information gained from international organizations active in the region.

The information will be centralized in a multi-purpose GIS which will initially be located at CRO in Abidjan. As needs increase and applications unfold, it will progressively be transferred to the NFPIs or NFPAs in each of the participating countries. The GIS data base will serve as a management decision-support tool for national coastal resources management and planning, industrial facility siting, identification of critical environmentally sensitive areas, identification of other sources of environmental degradation, and identification of particular resources at risk.

The GIS data base will also support project planning, assessment, analysis and communication. In the initial stages of the project, the information management system and GIS will be used to organize and distribute data and products related to the Gulf of Guinea LME programme. Over the course of the programme, a series of GIS spatial analyses will be performed on the Gulf of Guinea LME data base to help focus management attention on:

- Important national and regional populations of living coastal and marine resources
- Sources of coastal and marine environmental and ecosystem degradation
- Extent of environmental damage
- Risk to resources.

The clarification and understanding of resource management issues obtained from GIS analyses will aid decision-makers in setting priorities and implementing effective action plans at both the national and regional levels.

Output 2.1

A regional environmental information management system, including a multi-purpose GIS and other data base modules in CRO.

Activities for Output 2.1

2.1.1 Investigate the suitability of hardware and software available at CRO, NFPIs, NFPAs

and other institutions. Also investigate local availability of software, and local support and maintenance capabilities for both hardware and software.

Responsible party: UNIDO, subcontractor and international expert.

2.1.2   Design, configure, and specify the particulars for the information management system according to the following :

The GIS and other data base software modules will be designed for easy access to information related to all the coastal, marine, and industrial surveys and assessments. This will require a system to enter, store, map, query, and retrieve geo-referenced information in all resource and use topics collected (such as resource distributions, samples collected, analysis of the results, level of pollutants and indicating parameters, properties of pollutants, and sources of pollution) for the monitoring, surveying, and analytical activities mentioned in this programme.

The system software should have a computation intensive module for the integration of data, modelling, and simulation (for example, discharge of pollutants in the LME). All the information will be integrated through GIS technology to provide mapping and spatial analysis capabilities at both the regional and national levels. The tool will be used as an aid to decision-making by providing visualization of resource-use issues, mapping, analysis and modelling. A report generating module should be integrated to provide a presentation of pollution status and trends in the regional coastal water quality.

Eventually, to facilitate access to the information management system between remote centres and the regional centre, a communication interface may be considered, pending investigation of the grade of service and performance characteristics of the national and international telecommunications network. However, in the initial stages, transfer of information may be accomplished by print-outs of the reports and data transportation via an appropriate medium (magnetic tape, removable hard disks, optical read/write disks, and so on).

Responsible party: UNIDO and subcontractor.

A computer-based training module will be required both for use of the GIS and in methods of statistical analysis, modelling and spatial analysis. Additional tutorials may be needed for use of the different software modules.

2.1.3   Procure and install the required hardware and software in CRO complying with the specifications mentioned above. Procurement will follow a phased approach as the data compilation, processing, and analysis needs increase in their requirements during the project, and as the data base is progressively transferred to the national focal points. A tentative training plan and schedule is shown in a brief form in Annex 4. The final hardware and software selected for GIS applications will be determined following an assessment of: national capabilities and available equipment; the EU

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programme that may also provide GIS equipment and training for similar applications to the five participating countries; and the specific data management and analysis requirements of this project.

Responsible party: UNIDO and Project Coordinator.

2.1.4   As a continuation of Activities 2.1.2 and 2.1.3, a multi-purpose GIS data base will be created over the course of the project for compiling, organizing, displaying, analyzing, and communicating all the relevant information and data produced. This information will include:

- Information and data from the Gulf of Guinea LME Monitoring Programme (Immediate Objective 3)

- Information and data from the industrial pollution survey and assessment (Immediate Objective 4)

- Existing information derived from relevant international agencies (Activity 2.2.2).

Responsible party: Project Coordinator and international expert.

Output 2.2

A multi-purpose GIS data base assembled from all known national and international electronic sources, and from the relevant scientific literature.

A variety of existing relevant national and international GIS data bases will be assembled and entered into the project GIS data base to provide initial information that will be useful in designing the surveys for the coastal and marine resources, industrial sites, and pollution monitoring activities, as well as initiating national coastal zone management planning activities. Much of the information will be derived from international sources and will be compiled and organized for all five countries before being entered into the project's GIS data base. The known, readily available thematic maps that could be input into the GIS data base almost immediately include the following:

- Bathymetry
- Protected areas (existing, proposed and recommended)
- Mangroves
- Wetlands
- Tropical forests (in the coastal zone)
- Towns, cities, roads and railways
- Rivers
- Marine Catchment Basins (MCB) of the LME
- Areas of high biodiversity (as indicated by endemic bird areas)

- National exclusive economic zone (EEZ) boundaries
- General oceanographic information (such as currents and upwellings).

This data base will provide an initial base map and thematic "layers" of maps of the LME region. The LME offshore boundaries will tentatively be obtained from the scientific literature and presented in a preliminary fashion in the GIS data base to provide an initial "vision" of the size and extent of the marine component of the LME. Since the LME concept includes the MCB of the Gulf of Guinea, the CRO will investigate the potential of developing an MCB map of the region through GIS analysis, using the Digital Chart of the World and the digital elevation model of analysis. This will constitute the terrestrial component of the Gulf of Guinea LME.

Relevant complementary data from a variety of sources that are available will also be taken into consideration, for example, data from the Intergovernmental Oceanographic Commission (IOC) of UNESCO, and the Fishery Committee for the Eastern Central Atlantic (CECAF) of FAO. Other international groups will be consulted, including the World Conservation Union (West Africa Programme), the World Wildlife Fund, the World Conservation Monitoring Programme (WCMP), UNEP's Oceans and Coastal Areas Programme Activity Centre (OCA\PAC), UNEP's Global Resource Information Database (GRID) and Global Environment Monitoring System (GEMS), the Regional Maritime Data Base (BDRM) Programme for the Conference of Fisheries Ministers of West Africa (funded in principle by the EEC), the World Bank's Programme on Environmental Information Systems in Sub-Saharan Africa, and a variety of French research institutions.

Activities for Output 2.2

2.2.1 Identify relevant GIS data bases, hard copy maps, and data that would be useful in the project GIS data base to achieve the project's objectives.

Responsible party: Subcontractor.

2.2.2 Input relevant data into the GIS data base and produce a preliminary "electronic" atlas of the region for distribution to the National Focal Points in the form of a desktop GIS mapping system (with only partial GIS analytic capabilities).

Responsible party: Subcontractor.

2.2.3 Use the data base in preparing analyses of coastal and marine resources, and pollution and degradation trends; and in preparing applications for the national coastal zone management planning activities.

Responsible party: International expert, Project Coordinator and NFPIs.

Output 2.3

"Manager's Version" GIS data base transferred to NFPAs.

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As the "Preliminary Edition" GIS data base is completed, a management-level desktop version of it will be transferred to the National Focal Points for use in national coastal zone planning activities. This "manager's version" will be a desktop electronic data atlas that contains all the relevant information but does not have the full GIS capabilities for analysis. It will be a user-friendly, interactive system with access to the full data base for query, simple analysis, mapping, and visualization as an aid to management.

<u>Activities for Output 2.3</u>

2.3.1 Compile each of the five national GIS data bases (sub-sets of the Gulf of Guinea LME data base) and transfer hardware, software, and desktop version of data base to each of the National Focal Points. This will be based on a needs assessment to identify existing capacity and determine the most appropriate institution to use the "manager's version."

Responsible party: <u>International expert</u>.

2.3.2 Provide short training courses for the National Focal Points as part of the coastal zone management workshops.

Responsible party: <u>International expert</u>.

2.3.3 Provide guidance and advice on integrating this data base into existing national government GIS systems and/or establishing a new, fully operational, national GIS data base, built around the project's data base and expanded for national and regional planning purposes.

Responsible party: <u>International expert</u>.

2.3.4 As each of the National Focal Point Agencies progressively have applications for the desktop GIS data base, and as funds for a complete GIS system are identified, the complete or relevant portions of the Gulf of Guinea LME data base will be transferred to each Focal Point Agency for its own national use.

Responsible party: Project Coordinator and <u>international expert</u>.

IMMEDIATE OBJECTIVE 3

To establish a comprehensive programme for monitoring and assessment of the health and productivity of the Gulf of Guinea Large Marine Ecosystem.

The aim of the LME monitoring and assessment programme is to address management needs which are often regional in scope but for which responsibility is divided among a wide array of jurisdictions. The programme will provide information that will enhance the ability of national and regional authorities to develop and implement effective management and remedial programmes for the coastal and marine environment.

The monitoring and assessment activities in the LME sub-system are integrated into an overall monitoring programme which places greatest emphasis on those areas of the Gulf of Guinea ecosystem that are most directly and intensely affected by pollution and habitat degradation. The programme consists of the following elements:

- Development of a hierarchically structured regional monitoring and assessment programme emphasizing sub-systems under greatest stress, to determine the quality of coastal environments and the extent of degradation of critical habitats

- Generation of a consistent system of coastal ecosystem and environmental measurements, information synthesis, analysis, and reporting to be used in the mitigation of coastal ecosystem stress

- Development of indices of environmental quality and assessment of coastal ecosystem health

- Development of recommendations for marine environmental management, and mitigation and recovery of degraded coastal ecosystems.

Output 3.1

Integrated monitoring programme design for the LME.

Activities for Output 3.1

3.1.1 Design a hierarchically structured monitoring and assessment programme for the LME.

Responsible party: NOAA experts.

3.1.2 Review the LME monitoring and assessment programme and establish harmonized work plans.

Responsible party: NOAA experts.

Output 3.2

Mangrove survey.

Activities for Output 3.2

3.2.1 Survey mangrove systems in the region to determine the level of degradation through pollution and overcutting, and develop criteria for selection of potential restoration sites.

Responsible party: NFPAs, international expert and national expert.

3.2.2   Compilation of data in the regional data base and GIS.

Responsible party: International expert, national expert, NFPIs and Project Coordinator.

3.2.3   Analysis and assessment of data to determine criteria for selection of sites with potential for restoration.

Responsible party: National expert and NFPIs.

3.2.4   A two-day working meeting to discuss the survey assessment and to recommend appropriate restoration programmes.

Responsible party: International expert, national expert and Project Coordinator.

3.2.5   Promote public awareness among the local communities about mangrove degradation and restoration. (NGOs will actively participate in this activity.)

Responsible party: Project Coordinator, NFPIs and NGOs.

3.2.6   Based on the mangrove survey, recommend sites in the region requiring restoration and enhancement. Identify additional funds required to implement this as a regional follow-on project.

Responsible party: National expert and Project Coordinator.

Output 3.3

Pollution monitoring programme in coastal lagoons to identify status, trends and critical areas.

A three-year programme for monitoring the following lagoons will be undertaken:

Country	Lagoon	Laboratory
Ghana	Korle and Sakumo	IAB
Benin	Nokoué	UNB
Nigeria	Lagos	NIOMR

Activities for Output 3.3

3.3.1   Identification of sources, types and quantities of industrial and urban and/or combined waste entering the lagoons.

Responsible party: UNEP, Project Coordinator, CRO and NFPIs.

3.3.2   Organization of a fellowship training programme for staff to carry out water and

sediment sampling, analysis, inter-calibration and data assessment. Since this training curriculum overlaps with training under the nearshore monitoring programme (see Output 3.4 below), components common to both (collection and preparation methods, and analysis techniques) will be covered in joint training sessions. On-the-job training for this output will be incorporated in the different activities in the field.

Responsible party: NOAA, NFPIs and national expert.[6]

3.3.3   Quarterly sampling of water and sediments at 10 to 15 fixed sites in each lagoon and 3 to 5 sites in the nearshore waters fronting the lagoon outlets.

Responsible party: NOAA, national expert[6] and NFPIs.

3.3.4   Analysis of water samples which will cover physical, chemical, biochemical and microbiological parameters. Sediments will be analyzed to detect heavy metal content.

Responsible party: NOAA, national expert[6] and NFPIs.

3.3.5   Quarterly biological surveys of 3 to 5 fixed sites in the lagoons for pollution analysis, and survey of biological diversity.

Responsible party: NOAA, national expert[6] and NFPIs.

3.3.6   Analysis will be carried out for detection of pesticides and heavy metals in selected fish or filter feeding shellfish, and benthos (deep sea organisms).

Responsible party: NOAA, national expert[6] and NFPIs.

3.3.7   Entry of collected data into the regional data base and GIS for spatial data analysis, and transfer of results (digital and hard copy maps) to NFPIs.

Responsible party: CRO, NFPIs and NOAA.

3.3.8   Evaluation and classification of compiled data to identify major resource management concerns. Recommendations for further research and management actions will be developed and submitted to the NFPAs and other relevant institutions and organizations.

Responsible party: NOAA, national expert[6] and NFPIs.

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[6]   The national expert will assume responsibility on the occasions when the international expert is not present.

Output 3.4

Pollution monitoring programme for nearshore waters and sediments.

The nearshore water and sediment samples will be collected during the sampling activities of the living marine resource survey (see Output 3.5).

Activities for Output 3.4

3.4.1 Preparation of a detailed survey and sampling programme and selection of fixed monitoring sites in nearshore waters.

Responsible party: NOAA, NFPIs and national expert.

3.4.2 Organization of training programme for staff to carry out sampling, analysis and inter-calibration. This activity will be conducted before the start of the above activities, unlike on-the-job training, which will occur in the course of the project.

Responsible party: NOAA, CRO, NFPIs and national expert.

3.4.3 Sampling coastal waters and sediments. Sampling in nearshore waters (less than 10 metres in depth) will be done in conjunction with the sampling activities of the living marine resource survey (see Output 3.5). A vessel from the Fisheries Research and Utilization Branch (FRUB) of Ghana will collect samples at about forty fixed stations distributed in the coastal waters of Côte d'Ivoire, Ghana and Benin.

Responsible party: NOAA, national expert and NFPIs.

A vessel from NIOMR based at Lagos, Nigeria, will collect samples at about thirty fixed stations distributed in the coastal waters of Nigeria and Cameroon.

3.4.4 Definition of detailed procedures for laboratory analysis, and analysis of the collected samples. Pollution analysis of water and sediment samples will be carried out at CIAPOL for samples collected from the coastal waters of Côte d'Ivoire, Ghana and Benin, and at NIOMR for samples collected from the coastal waters of Nigeria and Cameroon.

Responsible party: NOAA, national expert and NFPIs.

3.4.5 Annual inter-calibration to insure the comparability of the results of the analyses conducted by the different laboratories involved. Detailed procedures will be designed according to international standards. (These inter-calibration exercises will be linked to those of the lagoon monitoring programme.)

Responsible party: NOAA, CRO and NFPIs.

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3.4.6 Data entry into the regional GIS data base and assessment of water quality.

Responsible party: CRO, NFPIs and NOAA.

3.4.7 The results of the analysis of samples will be evaluated to classify the suitability of coastal waters for various uses. The extent to which the existing water quality falls short of the desired quality will be assessed.

Responsible party: NOAA, national expert and NFPIs.

3.4.8 Using the evaluation and the GIS data base, identify and map water and sediment pollution "hot spots," identify major resource management concerns for nearshore waters, and make recommendations for mitigation and recovery. Disseminate report through CRO to NFPIs, NFPAs, and other relevant agencies and institutions.

Responsible party: NOAA, national expert, NFPIs and NFPAs.

Output 3.5

Living marine resource survey programme.

Fish community surveys will be carried out within the Gulf of Guinea LME, building on existing research institutions that have specialized in fish biology and ecology. These surveys will provide information on LME structure, function, productivity, and health, including:

- Assessments of the state of biodiversity in the LME

- Information on fish community interactions and stock dynamics

- Information on contamination levels in water and fish

- A comprehensive picture of the health of the LME when combined with pollution, productivity, biodiversity, and oceanographic information from the continuous plankton recorder (CPR) and undulating oceanographic recorder (UOR) surveys.

The Gulf of Guinea LME, comprising a large area of watershed, coastal, and ocean space, contains a variety of subsystems, such as upwelling areas and regions dominated by river outputs. In addition, the LME is characterized by seasonal production cycles, for example, the Ghana-Ivorian upwelling system which is characterized by two seasonal upwelling periods separated by periods of thermal stability. Because of this temporal and spatial variability within the LME, any monitoring programme will need to be comprehensive in terms of both time and space. Fish community survey activities within the Gulf of Guinea LME should be conducted on a quarterly basis at two locations at least. Surveys will be carried out in two coastal areas:

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- Nigeria—NIOMR will carry out the activities of this survey which will provide information on the living marine resources in Nigeria and, more specifically, in the Niger Delta

- Côte d'Ivoire, Ghana—CRO will carry out the activities of this survey and provide information on the fish and fisheries of the Ghana-Ivorian upwelling system which appears to be critical to fish productivity within the LME.

<u>Activities for Output 3.5</u>

3.5.1 Provide the necessary equipment to carry out the survey.

Responsible party: <u>UNIDO</u> and Project Coordinator.

3.5.2 On-the-job training of the necessary staff to carry out: (i) collection and analysis of fish tissue samples for heavy metals, organochlorines and bacteriological contamination; (ii) installation and use of the bioacoustics survey system; and (iii) gross pathological examinations.

Responsible party: <u>NOAA expert</u>, CRO, NFPIs and national expert.

3.5.3 Prepare, organize, and carry out a programme of marine resource surveys for approximately twenty days each year over the course of the project, in the nearshore area dominated by the Niger Delta and the Ghana-Ivorian upwelling. A quarterly survey will be conducted with research vessels from NIOMR for the coast off Nigeria and Cameroon. Vessels from FRUB will survey the coast of Côte d'Ivoire, Ghana, and Benin on a quarterly basis. The programme will include the following:

- Bottom and pelagic trawl surveys to collect specimens necessary to determine levels of biodiversity, stock levels, and contaminant loading in fish tissues

- Towed bioacoustics survey to estimate the biomass of pelagic stocks and changes in species composition, and biomass of fisheries resources

- Collection of sediment for contaminant loading analysis.

Responsible party: <u>NOAA expert</u>, NFPIs and national expert.

3.5.4 Prepare inventories of fish and marine organisms collected to quantify biodiversity, augmented with molecular genetic studies to distinguish between species when required.

Responsible party: <u>NOAA expert</u>, NFPIs and national expert.

3.5.5 Perform gross pathological examination of fish for evidence of pollution effects.

Responsible party: NOAA expert, NFPIs and national expert.

3.5.6   Analysis of the collected water, fish, and sediment samples to identify contaminant loading and pollution stress. These activities will be conducted in conjunction with the analysis of samples from larger sites.

Responsible party: NOAA expert, NFPIs and national expert.

3.5.7   Investigation of fish age/growth to determine if fish stocks are being overexploited.

Responsible party: NOAA expert, NFPIs and national expert.

3.5.8   Assessment of data collected by the bioacoustics survey (biomass and species composition) to monitor changes in biomass of living marine resources, and data related to the analysis of collected samples.

Responsible party: NOAA expert, NFPIs and national expert.

3.5.9   Entry of survey data into the regional data base and GIS for spatial data analysis (digital and hard copy maps), and transfer of results to NFPIs.

Responsible party: CRO.

3.5.10 Assessment of compiled data (see Activity 3.4.8) to identify major resource management concerns about the health and productivity of nearshore waters. Conduct working meetings to develop recommendations for research and management interventions, and forward these to all relevant agencies and institutions.

Responsible party: NOAA expert, NFPIs and NFPAs.

Output 3.6

Plankton survey programme.

Continuous plankton recorder (CPR) and undulating oceanographic recorder (UOR) surveys in the Gulf of Guinea LME will provide information on:

* Physical oceanographic conditions
* Plankton community diversity, dynamics and overall productivity
* Nearshore and offshore pollution levels
* Overall LME health and productivity, when combined with the results from living marine resource and contaminant loading surveys.

Monitoring plankton amount and type provides information on: the water movements (currents and upwellings); the availability of nutrients for ocean fauna and flora; and the presence of pollutants.

CRO, NIOMR, and FRUB will be responsible for the CPR/UOR and the training equipment. The laboratory equipment and computer will be placed at FRUB.

<u>Activities for Output 3.6</u>

3.6.1 Provide the necessary equipment to carry out the plankton survey.

Responsible party: <u>International expert</u>, UNIDO and Project Coordinator.

3.6.2 Train the necessary staff to carry out the plankton survey.

Responsible party: <u>International expert</u> and Project Coordinator.

3.6.3 Carry out sampling by means of CPR/UOR towed by "ships of opportunity" (commercial liners sailing this area). Shipping lines have been contracted and preliminary agreements reached for towing the CPR/UOR at no cost to the project.

Responsible party: <u>International expert</u>, NFPIs and national expert.

3.6.4 Training of staff in analysis and interpretation of CPR/UOR survey data, interpretation of data, and entry into the regional GIS data base.

Responsible party: <u>NOAA expert</u>.

3.6.5 Assessment of survey results to identify major resource management and ecosystem health issues. Recommendations for scientific research and management actions will be forwarded to CRO, NFPIs, NFPAs, NGOs and governments.

Responsible party: <u>International expert</u> and NFPIs.

Output 3.7

LME working meetings to develop ecosystem health indices.

<u>Activities for Output 3.7</u>

3.7.1 Convene annual working meetings of scientists and international experts carrying out the LME monitoring programme to analyze and integrate the collected data and assessments of the sub-systems of the LME. The purpose of these work sessions is to develop and apply indices of diagnostic characteristics (such as biological diversity, productivity and resilience) of the status of the Gulf of Guinea LME, and to translate the results of this programme into a usable form for decision-makers.

Responsible party: <u>NOAA experts</u>, national experts, NFPIs and CRO.

IMMEDIATE OBJECTIVE 4

To prevent and control land-based sources of industrial and urban pollution.

This project component is designed to develop a series of strategic options and an action plan for the region for the control and prevention of marine environmental pollution. This programme consists of a review of the current situation, an assessment of technological pollution control options, and an identification of incentive mechanisms for pollution control.

Output 4.1

Inventory and assessment of industrial pollution.

Activities for Output 4.1

4.1.1 Inventory of polluting industries: Prepare an inventory of industries discharging pollutants into water bodies. Existing information on polluting industries will be verified, revised, and updated prior to use in preparing the inventory. The inventory should include the types and amounts of pollutants discharged, the existing method of disposal of industrial waste water, and the exact location of the industry (latitude and longitude coordinates using Global Positioning System (GPS)).

Responsible party: International expert, national expert and NFPIs.

4.1.2 Input data into regional GIS: The data generated by the inventory of industries will be entered into the regional data base to generate maps according to parameters required for analysis (such as volume of discharge, type of plant and clusters of plants).

Responsible party: International expert and national expert.

4.1.3 Selection of industries to be monitored: Industries will be selected through a spatial analysis of the information contained in the regional GIS data base related to natural resources (for example, proximity to important fish spawning or nursery areas, and areas of high biodiversity) and characteristics of industries (level and type of pollution discharge or large uncertainties in the discharged amounts).

Responsible party: International expert, national expert and NFPIs.

4.1.4 Monitoring industrial pollution from selected industrial facilities. Monitor the pollutants discharged into the coastal waters by the industries selected to provide quantitative distribution of coastal pollution sources in the Gulf of Guinea. Monitoring will be conducted twice a year on the 100 most polluting industries of which at least ten will be from any one country.

Responsible party: International expert, national expert and NFPIs.

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4.1.5 Dissemination of results: The reports, findings, and recommendations of this investigation will be published and distributed to decision-makers in the relevant governmental authorities, industries and NGOs. The reports will also be discussed during the periodic meetings of decision-makers dealing with environmental matters and the workshops for staff of institutes and agencies concerned with pollution control in the five countries.

Responsible party: Project Coordinator, CRO, NFPIs and NGOs.

Output 4.2

Case studies for demonstration of industrial waste treatment and management.

Activities for Output 4.2

4.2.1 Based on the prepared inventory of polluting industries (Activity 4.1.1), visit potentially suitable industries for implementing the demonstration projects. Investigate the manufacturing processes and the methodologies used for prevention, treatment and disposal of wastes. Select suitable industrial sites in participating countries for implementation of the demonstration projects. Potential types of industries to be selected include a brewery in Benin and Ghana, an oil-soap factory in Cameroon, a palm-oil factory in Côte d'Ivoire, a textile mill in Ghana and an oil industry in Nigeria.

Responsible party: Subcontractor, Project Coordinator and NFPIs.

4.2.2 Recommend the appropriate process modifications and/or methodology for waste treatment and management at the selected demonstration sites, specifying the technical and financial requirements for such process modifications or installation treatment facilities. Recommendations will take into account cost/benefit analyses, potential incentive programmes, and cleaner practices to make the installation of pollution control devices more feasible from an economic standpoint.

Responsible party: Subcontractor and NFPIs.

The cost for each demonstration unit is taken as an average in the range of US$ 300,000 - US$ 350,000. The size of the demonstration unit can be adjusted accordingly.

Output 4.3

Feasibility study of urban sewage waste management.

Activities for Output 4.3

4.3.1 Select urban area for a feasibility study of urban sewage waste management where

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sewage discharge into lagoonal waters constitutes the primary pollution concern (for example, Accra, Ghana).

Responsible party: UNIDO and international expert.

4.3.2   Conduct field survey of sewage volume, infrastructure, and avenues of discharge into coastal waters. Review any existing plans for the management of sewage and identify a range of technological options to treat and manage sewage waste.

Responsible party: UNIDO and international expert.

4.3.3   Report the feasibility assessment which lays out options, including financial assessments, for the management of sewage waste to reduce pollution of coastal waters. The report will be transmitted to the appropriate national agencies/ institutions and shared regionally to apply the results of their study as appropriate.

Responsible party: UNIDO and international expert.

Output 4.4

Development of a strategic plan outlining options for industrial and urban pollution control.

Activities for Output 4.4

4.4.1   Define effluent standards. Environmental management agencies in the five countries review in detail the status of any existing effluent and ambient water quality standards (in collaboration with the NFPIs).

Develop a rationale for transforming such standards into acceptable regional standards for the five countries, taking into account technology, cost, and geographic factors, as well as meeting World Health Organization (WHO) standards for waste water.

Responsible party: UNEP, national expert, CRO and NFPAs.

4.4.2   Prepare preliminary effluent standards at three levels (degrees of stringency) for the concerned industrial sectors and for public sewers, watercourses and coastal waters.

Develop qualitative and quantitative factors to indicate how such effluent standards might vary for different natural conditions.

Responsible party: UNEP, national expert, CRO and NFPAs.

Prepare a report summarizing the study findings and recommendations on effluent standards. These will be formulated for eventual inclusion in the five countries' national legislation or in a regional agreement on controlling land-based industrial and urban sources of pollution.

Discussion of the effluent standards and different options, and adoption of standards acceptable for all participant countries will be conducted at regional strategy and policy meetings (see Output 5.3).

4.4.3 Develop an incentives programme to reduce industrial and urban pollution. Assess the feasibility of setting up an incentive system in each country for reduction of industrial and urban effluent discharge or improvement in effluent quality. Identify financial instruments to provide funds to achieve reduction of pollution. For example, with respect to industrial pollution, a fund could be created to receive payments of polluting industries depending on the quantity of pollutants they release. The fund could be used to help install or improve industrial treatment facilities and/or modify industrial processes. (This activity is linked to Activity 5.2.2 (identify financial mechanisms to generate funds for ongoing project activities.))

Development of incentive programmes will include a review of practices and methods related to cleaner technologies, cleaner production techniques, or recycling of wastes which industry could adopt. Undertake cost/benefit and opportunity cost analyses that may illustrate the economic advantages of these techniques.

Responsible party: UNIDO/UNEP, international expert, NFPIs, NFPAs and CRO.

4.4.4 Develop an overall strategic plan outlining various options for industrial, urban, and combined urban/industrial pollution control and management measures to be disseminated to all relevant agencies and institutions.

Responsible party: UNIDO/UNEP, international expert, NFPAs, NFPIs and CRO.

IMMEDIATE OBJECTIVE 5

To develop national and regional strategies and policies for the long-term management and protection of the Gulf of Guinea LME.

Output 5.1

Guidelines for integrated coastal zone management planning to guide coastal development and conservation at the national and regional levels.

Activities for Output 5.1

5.1.1 In order to promote national strategies and policies that will result in effective management of the coastal zone, a ten-day Coastal Resources Management Workshop will be held in each country, where a series of draft recommendations will be developed for consideration and action by senior-level decision-makers in each government.

The workshop, which will emphasize the benefits of adopting an integrated approach to coastal resources management, will proceed in three phases:

Phase 1:   Compiling relevant information on coastal and marine resource use, including legal and institutional information (using the national GIS coastal data base derived from the CRO regional GIS data base, as appropriate)

Phase 2:   Analysis of the socioeconomic and resource information to identify problems and opportunities along the coast

Phase 3: Development of a series of coastal zone management recommendations for actions based on stated goals and objectives, such as: "To ensure the protection, enjoyment, development and sustainable use of the coastal zone of Ghana." The recommendations to the respective government's decision-makers would be likely to include the following topics:

- Institutional arrangements that would facilitate a coordinated inter-sectoral approach to coastal zone management

- Continued development of a coastal protected area system to protect biodiversity and species of economic importance

- Preparation of a coastal land and marine use zoning system and relevant coastal zone management regulations and guidelines

- Development of appropriate research and monitoring programmes for the LME, such as the continuation of activities of this project

- Development of a national oil-spill contingency plan

- Development of public awareness programmes indicating the importance of coastal resource management

- Identification of issues and actions that are common to all activities in the Gulf of Guinea region, indicating how all five countries might benefit from a regional approach.

Responsible party: International expert, NFPIs, NFPAs and Project Coordinator.

5.1.2   Conduct a Regional Coastal Resource Management Workshop at CRO to present and discuss the results of each of the national coastal zone management guideline documents, with the purpose of enhancing each country's national coastal zone management programmes through sharing the lessons learned by all five countries, as well as identifying the common issues and actions that might be accomplished through a regional approach. These may include the following:

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- A regional strategy for the prevention of coastal erosion

- A regional strategy for oil-spill contingency response (in light of the nationally gained information preparing the national coastal zone management guidelines)

- A regional protocol regarding protection and management of coastal endangered wildlife of common concern

- Establishment of a regional system of protected areas (linked through research monitoring, interactive programmes, and ecotourism opportunities).

Prepare workshop recommendations to be addressed to national-level decision-makers identifying regional coastal zone management concerns that would benefit from regional-level actions by the five countries bordering the Gulf of Guinea.

Responsible party: International expert, NFPAs and NFPIs.

5.1.3   Conduct a series of senior-level Coastal Zone Management Policy and Strategy Meetings, to be held at CRO, to prepare regional policies and strategies regarding the topics developed under Activities 5.1.1 and 5.1.2 above. These policies and strategies may relate to coordinating responses to combatting oil spills; regional coastal erosion prevention guidelines; regional protocols dealing with management of endangered, threatened, and rare species and habitats in the coastal zone, and so on.

Responsible party: Project Coordinator, international expert, CRO, NFPAs and NFPIs.

Output 5.2

Mechanisms for financial support for CRO, NFPIs, NFPAs, and NGOs for the long-term continuation of the LME monitoring programmes, GIS data base development, and coastal resources and environmental management activities.

Activities for Output 5.2

5.2.1   Estimate the recurrent costs associated with this project that could be anticipated over the next twenty years. Secure the participation of the Ministries of Planning and Finance in the participating governments.

Responsible party: Subcontractor, CRO, NFPIs and NFPAs.

5.2.2   Assess financial mechanisms, such as debt swaps or taxation, to generate funds to pay for recurrent costs associated with ongoing project activities, and provide a feasible plan of action to set up such mechanisms. (This activity is linked to Activity 4.4.3 (development of an incentive programme for the reduction of industrial and urban pollution.))

Responsible party: Subcontractor, Project Coordinator, NFPIs and NFPAs.

5.2.3   Establish a trust fund or some other similar arrangement with funds generated from the above financial mechanism and other available resources, to assist governments to pay the recurrent costs associated with maintaining the project's activities.

Responsible party: UNIDO, Project Coordinator, NFPIs and NFPAs.

Output 5.3

Mechanisms for regional policy and strategy formulation and implementation.

Activities for Output 5.3

5.3.1   Organization of a series of Policy and Strategy Meetings for senior-level staff of ministries and agencies responsible for environmental and natural resource management and pollution control, held during the project for a duration of three to four days. The meetings will be organized by the Project Coordinator and CRO. Representatives from UNIDO, UNEP, UNDP, as well as scientific and management experts, will be invited as required.

The meeting will focus on developing joint regional policies, strategies, and agreements to prevent and remedy industrial and urban pollution of the coastal and marine environment. Based on the findings and recommendations resulting from the project's activities, the meeting will establish common grounds for policies, legislation, and enforcement measures for the long-term protection of the Gulf of Guinea LME.

Responsible party: Project Coordinator, CRO, NFPIs and NFPAs.

5.3.2   The policies and strategies thus developed during the senior-level meetings at CRO will be reviewed and discussed at ministerial-level meetings aimed at improving the health of the Gulf of Guinea LME.

Responsible party: NFPAs, UNEP, Project Coordinator and CRO.

E.   INPUTS

1.   Government inputs

The participating governments will provide qualified counterpart staff at the Regional Coordination Centre, CRO, and the National Focal Point Institutes listed below (along with any other collaborating institutes, as appropriate):

Côte d'Ivoire:	Centre Ivoirien anti-pollution (CIAPOL)
Ghana:	Institute of Aquatic Biology (IAB)
Benin:	Direction de l'hydraulique, Service hydrologie (DHSH)
Nigeria:	Nigerian Institute for Oceanography and Marine Research (NIOMR)
Cameroon:	Institut de recherche medicale et d'etudes des plantes medicinales/Centre de nutrition et centre d'etude des plantes medicinales (IMPM/CN/CEPM), and Institute de recherches zootechniques (IRZ)

The governments will make available to UNIDO, UNEP, and to the project international experts and staff all relevant studies, documents, information and data. They will also make all the necessary arrangements to facilitate access to industrial plants and mining sites. The governments will, in addition, ensure that adequate office facilities and necessary clerical support are provided to the Project Coordinator and international experts.

Participating governments hosting training programmes and/or workshops (as described in Section D of this document) will provide, at no extra charge to the project, suitable conference and meeting facilities, as well as accommodation for national trainees of the other participating counties. Entry and movement will be facilitated within the host country for trainees attending programmes.

The Government of Nigeria, through NIOMR in Lagos, will provide a research vessel for carrying out the activities related to sample collection in nearshore waters at no cost to the project, and a research vessel for conducting fish surveys.

The Government of Ghana, through the Fisheries Research and Utilization Branch, will also provide a research vessel for carrying out the activities related to sample collection in nearshore waters, and for conducting fish surveys, at no cost to the project. The project will bear the fuel cost of these vessels.

2. Global Environment Facility

International staff

Post	Title	Total (mm)	Cost
11-01	Project Coordinator	48	696,000
11-02	GIS expert	9	121,500
11-03	Expert in plankton survey and training	3.5	47,250
11-04	Expert in industrial pollution assessment and training	8	108,000
11-05	Expert in urban sewage waste treatment and management	3	40,500
11-51	Consultant for mangrove survey	4	54,000
11-52	Consultant for incentives for industrial pollution reduction	4	54,000
11-53	Consultant for coastal zone planning	6	81,000
11-54	Consultant for pollution monitoring in lagoons	9	50,400*
11-55	Consultant for monitoring coastal pollution	6	33,600*
11-56	Living marine resource survey techniques	6	33,600*
11-57	Stock assessment & fish population dynamics	6	33,600*
11-58	Contaminant loading in water & fish tissue	6	33,600*
11-59	Fish pathology	6	33,600*
11-60	CPR/UOR instruments electronics training	1.5	20,250
11-61	Training on CPR/UOR data management, analysis and follow-up	3.5	19,600*
11-62	Training expert on zooplankton identification	2	27,000
11-63	Bioacoustics training	3	16,800*
11-64	LME monitoring programme design	1	5,600*
11-99	**Sub-total international staff**	135	1,469,400

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* Salaries of these experts (46.5 man-months (mm)) will be provided, as a contribution in kind, by the National Oceanic and Atmospheric Administration (NOAA), United States Department of Commerce. Provision has been made for their travel and per diem.

Administrative support personnel

Post	Title	Total mm	Cost
13-01	Bilingual secretarial services	48	72,000
13-02	Driver	48	38,400
13-03	Programme assistants (one in each country)	240	360,000
15-00	Project travel		120,000
16-00	Other personnel costs, evaluation		140,000
	Sub-total	**336**	**730,400**

National experts

Post	Title	Total mm	Cost
17-01	GIS	42	63,000
17-02	GIS analyst	36	36,000
17-03	Mangrove survey	10	15,000
17-04	Pollution monitoring in lagoons	12	18,000
17-05	Monitoring coastal pollution	12	18,000
17-06	Marine resource survey	9	13,500
17-07	Plankton survey	9	13,500
17-08	Industrial pollution assessment	12	18,000
17-09	Policy, standards and enforcement	12	18,000
17-99	**Sub-total national consultants**	**156**	**213,000**

Subcontracting

Post	Title	Total mm	Cost
21-01	Regional system for storage and analysis of data		60,000
21-02	Development of training modules (French and English), including training needs analysis (development of modules referred to in output 4.1 and 4.2, on monitoring and management of industrial pollution, and environmental economics).		190,000
21-03	Case studies on treatment and management of industrial wastes (4 units) and co-treatment of municipal and industrial wastes (1 unit)		225,000
21-04	Mechanism for financial support (debt swap)		60,000
21-05	Support to NGOs for awareness generation and dissemination of information		50,000
29-00	Sub-total subcontracting		585,000

Training

Post	Title	Total mm	Cost
31-00	Individual fellowship		60,000
32-00	Study tour: UNDP group training		257,000
33-00	In-service training		50,000
39-99	**Sub-total training component**		**367,000**

Equipment

Post	Title	Total (mm)	Cost
41-00	Expendable equipment		210,000
	Sub-total exp. equipment		**210,000**
42-00	Non-expendable equipment:		
	Laboratory equipment for four focal point institutions and regional centre		650,000
	Computer equipment for the regional information network and GIS database		155,000
	Plankton monitoring and analysis equipment		345,000
	Sensors for monitoring primary productivity, oil and gas residues, eutrophication		75,000
	Fish survey equipment		315,000
	4-wheel drive Landrover		20,000
	Sub-total non-exp. equipment		**1,560,000**
49-99	**Sub-total equipment**		**1,770,000**

Miscellaneous

Post	Title	Total (mm)	Cost
51-00	Sundries (including interpretation and translation for meetings and documents, printing and photocopying costs for reports, communication costs, cost of fuel for vessels used during sampling, etc.).		130,000
55-00	Hospitality		20,000
52-00	Reporting		10,000
59-99	**Sub-total miscellaneous**		**160,000**

99-99	**GRAND TOTAL**	**627**	**5,294,800**

3. United States Government

The United States Government, through the National Oceanic and Atmospheric Administration (NOAA), has agreed to provide a total of 46.5 mm of experts to the project (the equivalent of US$ 512,700 in salaries).

F. RISKS

Although some preliminary assessments had been carried out by UNIDO/UNEP, the international consultants, and the national environmental authorities to determine which coastal areas, lagoons, and industries should be covered by the project, the particular sites and industrial plants could only be determined after further consultations with the governments and enterprises. The industries should be willing to make available relevant data and information on management and operations. Failure to do so might delay certain aspects of project implementation. To minimize the risk of this occurring, national environmental institutions should be requested to collect such information immediately after this project is approved by UNDP/GEF.

In matters of the environment and subregional cooperation, a strong political will is required for concepts and programmes to be translated into meaningful projects. Implementation of this project might be affected if, during its course, political factors in particular countries or government planning ministries prevent the endorsement of certain project activities because these are not in line with national aspirations. The risk of this occurring during the project life of four years is, however, low.

G. PRIOR OBLIGATIONS AND PREREQUISITES

The governments and national research/environmental agencies should provide suitable offices for the project's staff. They should identify national project directors to be assigned to the project, and inform UNDP/UNIDO of the name(s) of these directors and other counterpart staff prior to the arrival of the CTA in the field.

The inputs enumerated in Section E of this document should be made available to the project prior to the arrival of the experts and consulting firms. These inputs include:

- Office space, a well ventilated room for the computer system/data base, and adequate, spacious, and well-equipped rooms for activities such as training workshops and seminars

- Administrative and other support staff/services

- All existing microcomputer and software available in the national agencies concerned.

The Project Document will be signed by UNDP/GEF and the participating governments. Assistance from UNDP/GEF will be provided to the project subject to UNDP/GEF receiving satisfaction that the prior obligations and prerequisites listed above have been fulfilled or are likely to be fulfilled. When anticipated fulfillment of one or more prerequisites fails to materialize, UNDP may, at its discretion, either suspend or terminate its assistance.

H.   PROJECT REVIEWS, REPORTING AND EVALUATION

The project will be subject to tripartite review (joint review by representatives of the governments, executing agency and UNDP) at least once every twelve months, with the first such meeting to be held within the first twelve months of the start of full implementation. The Regional Project Coordinator and senior project officer of the United Nations executing agency shall prepare and submit to each tripartite review meeting a Project Performance Evaluation Report (PPER). The PPER will also serve as an input for the Steering Committee meetings, and should therefore be finalized in a timely manner prior to the relevant Steering Committee meeting. Additional PPERs may be requested, if necessary, during the project.

The Project Coordinator will, on a six-monthly basis, review and report on project implementation and performance and the achievement of targets. This biannual review will identify completed and pending actions and any new actions required. It will also identify any problems with fulfilling project activities and objectives, and make adjustments in the work plan, if necessary. These six-monthly reports will be submitted to UNIDO, UNDP/GEF, and to the Steering Committee in a timely manner to serve as an input for the Steering Committee meetings.

A project terminal report will be prepared for consideration at the terminal tripartite review meeting. It shall be prepared in draft sufficiently in advance to allow review and technical clearance by the executing agency at least four months prior to the terminal tripartite review.

The project shall be subject to evaluation fourteen months after the start of full implementation, including an in-depth evaluation, four months prior to the scheduled termination and six months following termination. The evaluation's terms of reference and timing will be decided after consultations between the parties to the Project Document and the associated United Nations agencies.

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I.   LEGAL CONTEXT

The original Project Document shall be the instrument referred to as such in Article 1 of the Standard Basic Assistance Agreements between the Governments of Benin, Cameroon, Côte d'Ivoire, Ghana, and Nigeria and UNDP signed by the parties on 3 December 1993, 27 November 1978, 18 January 1974, 12 April 1988, and 25 October 1991, respectively. The host countries' implementing agencies shall, for the purpose of the Standard Basic Assistance Agreement, refer to the government cooperating agencies described in these agreements.

The following types of revisions may be made to the original Project Document with the signature of the UNDP Resident Representative only, provided he or she is assured that the other signatories of the document have no objections to the proposed changes:

- Revisions in, or additions to, any of the annexes of the original Project Document

- Revisions which do not involve significant changes in the immediate objectives, outputs or activities of the project, but are caused by the rearrangement of inputs already agreed to or by cost increases due to inflation

- Mandatory annual revisions which rephase the delivery of agreed project inputs or increased expert or other costs due to inflation, or take into account agency expenditure flexibility.

J.   BUDGET

The project budget is attached (including AOS for the executing agency, UNIDO).

UNIDO

PROJECT BUDGET/REVISION

COUNTRY	PROJECT NUMBER AND AMENDMENT
Regional Africa	EG/RAF/92/G34

PROJECT TITLE
Water Pollution Control and Biodiversity Conservation in the Gulf of Guinea Large Marine Ecosystem (LME)

10. PROJECT PERSONNEL	TOTAL		Prior Years		1994		1995		1996		1997	
	M/M	$	M/M	$	M/M	$	M/M	$	M/M	$	M/M	$
11-00 INTERNATIONAL EXPERTS												
11-01 Project Coordinator	48	696,000			12	174,000	12	174,000	12	174,000	12	174,000
11-02 Expert in Geographic Information System	8	108,000			4	54,000	1	13,500	1	13,500	2	27,000
11-03 Expert in Plankton Survey and Training	3.5	47,250			1.5	20,250	2	27,000	0	0	0	0
11-04 Expert in Industrial Pollution Assessment	7	94,500			6	81,000	0	0	1	13,500	0	0
11-05 Expert in Urban Sew. Waste Treat. & Manag.	3	40,500			0	0	3	40,500	0	0	0	0
11-49 Sub-Total: Experts	69.5	986,250			23.5	329,250	18	255,000	14	201,000	14	201,000
11-50 CONSULTANTS												
11-51 Consultant for Mangrove Survey	4	54,000			4	54,000	0	0	0	0	0	0
11-52 Incentives for Industrial Pollution Reduction	3	40,500			0	0	3	40,500	0	0	0	0
11-53 Consultant for Coastal Zone Planning	6	81,000			0	0	3	40,500	3	40,500	0	0
11-54 Pollution Monitoring in Lagoons	9	50,400			5	28,000	2	11,200	1	5,600	1	5,600
11-55 Consultant for Monitoring Coastal Pollution	6	33,600			3	16,800	1	5,600	1	5,600	1	5,600
11-56 Fish Community Survey Techniques	6	33,600			3	16,800	1	5,600	1	5,600	1	5,600
11-57 Stock Assessm. & Fish Population Dynamics	6	33,600			3	16,800	1	5,600	1	5,600	1	5,600
11-58 Contaminant Loading in Water & Fish Tissue	6	33,600			3	16,800	1	5,600	1	5,600	1	5,600
11-59 Fish Pathology	6	33,600			3	16,800	1	5,600	1	5,600	1	5,600
11-60 CPR/UOR Instruments Electronics Training	1.5	20,250			1.5	20,250	0	0	0	0	0	0
11-61 Training on CPR/UOR Data Management	3.5	19,600			2	11,200	0.75	4,200	0.75	4,200	0	0
11-62 Training Expert on Zooplankton Identification	2	27,000			2	27,000	0	0	0	0	0	0
11-63 Bioacoustics Training	3	16,800			3	16,800	0	0	0	0	0	0
11-64 LME Monitoring Programme Design	1	5,600			1	5,600	0	0	0	0		
11-98 Sub-Total: Consultants	63	483,150			33.5	246,850	13.75	124,400	9.75	78,300	6	33,600
11-99 Sub-Total: Int'l experts/consultants	132.5	1,469,400	0	0	57	576,100	31.75	379,400	23.75	279,300	20	234,600

REMARKS:

Prior to 1993

(more than 16 experts required check here ( ) and attach continuation sheet 1A. This sub-total must include all experts.

PROJECT BUDGET/REVISION

PROJECT NUMBER EG/RAF/92/G34	TOTAL M/M	TOTAL $	Prior Years* M/M	Prior Years* $	1994 M/M	1994 $	1995 M/M	1995 $	1996 M/M	1996 $	1997 M/M	1997 $
12. OPAS EXPERTS												
bl 12-01												
bl 12-02												
bl 12-03												
bl 12-99 Sub-Total OPAS experts												
13. ADMINISTRATIVE SUPPORT PERSONNEL												
13-01 Bilingual secretarial services	48	72,000			12	18,000	12	18,000	12	18,000	12	18,000
13-02 Driver	48	38,400			12	9,600	12	9,600	12	9,600	12	9,600
13-03 Programme Assistant - One in each country	240	360,000			60	90,000	60	90,000	60	90,000	60	90,000
13-99 Sub-Total Admin. support personnel	336	470,400			84	117,600	84	117,600	84	117,600	84	117,600
14. UN VOLUNTEERS												
bl 14-01	0	0										
bl 14-02	0	0										
bl 14-03	0	0										
bl 14-04	0	0										
bl 14-99 Sub-Total UN VOLUNTEERS	0	0	0	0	0	0	0	0	0	0	0	0
15-00 Project travel		120,000				30,000		30,000		30,000		30,000
16-00 Other personnel costs (including UNIDO staff mission costs)		140,000				35,000		35,000		35,000		35,000
17. NATIONAL EXPERTS (functional titles required)												
17-01 Geographic Information System (GIS)	42	63,000			9	13,500	12	18,000	12	18,000	9	13,500
17-02 GIS Analyst	36	36,000			3	3,000	12	12,000	12	12,000	9	9,000
17-03 Mangrove Survey	10	15,000			10	15,000	0	0	0	0	0	0
17-04 Pollution Monitoring in Lagoons	12	18,000			6	9,000	2	3,000	2	3,000	2	3,000
17-05 Monitoring Coastal Pollution	12	18,000			6	9,000	2	3,000	2	3,000	2	3,000
17-06 Marine Resource Survey	9	13,500			3	4,500	2	3,000	2	3,000	2	3,000
17-07 Plankton Survey	9	13,500			3	4,500	2	3,000	2	3,000	2	3,000
17-08 Industrial Pollution Assessment	12	18,000			8	12,000	2	3,000	2	3,000	0	0
17-09 Policy, Standards and Enforcement	12	18,000			4	6,000	4	6,000	2	3,000	2	3,000
17-99 Sub-Total National experts	154	213,000		0	52	76,500	38	51,000	36	48,000	28	37,500
18-00 Surrender prior years' obligations (1)		167,585		167,585		167,585						
19-99 TOTAL PERSONNEL COMPONENT	622.5	2,580,385	0	167,585	193	835,200	153.8	613,000	143.8	509,900	132	454,700

* Prior to 1993

(1) Preparatory assistance/appraisal mission in 1992

If additional individual budget lines are required, check here ( ) and attach continuation sheet 1A. These sub-totals must include budget lines listed on page 1A.

UNIDO

PROJECT BUDGET/REVISION

4. PROJECT NUMBER: EG/RAF/92/G34

	TOTAL		Prior Years*		1994		1995		1996		1997	
	M/M	$	M/M	$	M/M	$	M/M	$	M/M	$	M/M	$
20. SUBCONTRACTS												
21-01 Regional Data System		60,000				60,000		0		0		0
21-02 Development of Training Modules		190,000				190,000		0		0		0
21-03 Case Studies on Industrial Wastes		225,000				120,000		105,000		0		0
21-04 Mechanism for Financial Support		60,000										0
21-05 Support to NGOs for Awareness Generation		50,000				0		0		0		60,000
28-00 Surrender prior years' obligations		0				15,000		15,000		15,000		5,000
29-00 TOTAL SUBCONTRACTS		585,000				385,000		120,000		15,000		65,000
30. TRAINING												
31-00 Individual fellowships		60,000				16,000		16,000		16,000		12,000
32-00 Study tours; UNDP group training		257,000				94,500		56,250		106,250		0
33-00 In-service training		50,000				50,000		0		0		0
34-00 Non-UNDP group training		0										
35-00 Non-UNDP meetings		0										
38-00 Surrender prior years' obligations		0										
39-99 TOTAL-TRAINING COMPONENT		367,000		0		160,500		72,250		122,250		12,000
40. EQUIPMENT												
41-00 Expendable equipment		210,000				70,000		50,000		50,000		40,000
42-00 Non-expendable equipment		1,560,000				1,560,000		0		0		0
43-00 Premises		0										
48-00 Surrender prior years' obligations		0										
49-99 TOTAL EQUIPMENT COMPONENT		1,770,000		0		1,630,000		50,000		50,000		40,000
50. MISCELLANEOUS COMPONENT												
51-00 Sundries		130,000				32,500		32,500		32,500		32,500
52-00 Reporting		10,000				2,500		2,500		2,500		2,500
55-00 Hospitality (non-UNDP projects)		20,000				5,000		5,000		5,000		5,000
56-00 Support costs (CC and DC projects only)		0										
58-00 Surrender prior years' obligations (1)		15,000		15,000								
59-99 TOTAL MISCELLANEOUS COMPONENT		175,000		15,000		40,000		40,000		40,000		40,000
99-99 PROJECT TOTAL	622.5	5,477,385	0	182,585	193	3,050,700	153.8	895,250	143.8	737,150	132	611,700

* Prior to 1993

(1) Preparatory assistance/appraisal mission in 1992

Project Budget for Implementing Agency UNIDO (in US $)

Project Number: EO/RAF/92/O34/Rev.C
Project Title: Water Pollution Control and Biodiversity Conservation in the Gulf of Guinea Large Marine Ecosystem (LME)
Revision Code: C
Source of Funds: GEF
AOS Source of Funds:
Executing Agent: Government (Benin, Cameroon, Côte d'Ivoire, Ghana and Nigeria)

Component	Budget Line	Description	Total w/m	Total Input $	Total AOS$	Prior years w/m	Prior years Input $	Prior years AOS$	1994 w/m	1994 Input $	1994 AOS$	1995 w/m	1995 Input $	1995 AOS$	1996 w/m	1996 Input $	1996 AOS$	1997 w/m	1997 Input $	1997 AOS$
10		**Project Personnel**																		
	11.99	Intern. experts/consultants	112.5	1,469,400	132,247	0	0	0	61.50	636,850	57,317	28.5	335,525	30,197	23.5	275,925	24,833	19	221,100	19,199
	13.99	Adm. support personnel	336	470,400	51,744	0	0	0	84	117,600	12,936	84	117,600	12,936	84	117,600	12,936	84	117,600	12,936
	15.00	Project travel		120,000	10,800		0	0		30,000	2,700		30,000	2,700		30,000	2,700		30,000	2,700
	16.00	Other personnel cost		140,000	12,600		0	0		35,000	3,150		35,000	3,150		30,000	3,150		35,000	3,150
	17.99	National experts	154	213,000	23,430	0	0	0	52	76,500	8,415	38	51,000	5,610	36	48,000	5,280	28	37,500	4,125
	18.00	Surr. prior years obligations		167,585	21,786		167,585	21,786												
	19.99	Component total	622.5	2,580,385	252,607		167,585	21,786	197.50	895,950	84,518	151	569,125	54,593	143.50	506,525	48,899	131	441,200	42,810
20		**Subcontracts**																		
	29.99	Component total		585,000	64,350		0	0		385,000	42,350		120,000	13,200		15,000	1,650		65,000	7,150
30		**Training**																		
	31.00	Fellowship		60,000	7,200		0	0		16,000	1,920		16,000	1,920		16,000	1,920		12,000	1,440
	32.00, 33.00	Other training		307,000	64,470		0	0		144,500	30,345		56,250	11,813		106,250	22,313		0	0
	39.99	Component total		367,000	71,670		0	0		160,500	32,265		72,250	13,733		122,250	24,233		12,000	1,440
40		**Equipment**																		
	46.00	Int'l procurement over $70,000		770,000	30,800		0	0		770,000	30,800		0	0		0	0		0	0
	47.00	Int'l procurement below $70,000		1,000,000	100,000		0	0		860,000	86,000		50,000	5,000		50,000	5,000		40,000	4,000
	49.99	Component total		1,770,000	130,800		0	0		1,630,000	116,800		50,000	5,000		50,000	5,000		40,000	4,000
50		**Miscellaneous**																		
	51,52,55	Sundries and hospitality		160,000	0		0	0		40,000	0		40,000	0		40,000	0		40,000	0
	58.00	Surr. prior years obligations		15,000	1,950		15,000	1,950		0										
	59.99	Component total		175,000	1,950		15,000	1,950		40,000	0		40,000	0		40,000	0		40,000	0
90	99.00	**Total Budget total**	622.5	5,477,385	521,377	0	182,585	23,736	197.50	3,111,450	275,933	151	851,375	86,526	143.50	733,775	79,781	131	598,200	55,400

* A flat rate of 13 % is adopted for working out AOS reimbursement for the two items related to prior years obligations.
Other rates are adopted according to the rates stated in Annex 4 of the UNDP Guidelines for determination of execution and implementation arrangements.

GOVERNMENT IN KIND CONTRIBUTION BUDGET

BENIN

(in million FCFA)

Description	Total		1993		1994		1995		1996	
	M/M	CFA	M/M	CFA	M/M	CFA	M/M	CFA	M/M	CFA
National personnel										
National director	38	5,700	2	300	12	1,800	12	1,800	12	1,800
Secretary	38	3,040	2	160	12	960	12	960	12	960
Guard	38	1,330	2	70	12	420	12	420	12	420
Personnel total	114	10,070	6	530	36	3,180	36	3,180	36	3,180
Tax exemption		17,681		15,385		816		740		740
Rent		5,700		300		1,800		1,800		1,800
Miscellaneous				100		600		600		600
Total	114	35,35351	6	16,315	36	6,396	36	6,320	36	6,320

GOVERNMENT CONTRIBUTION IN KIND TO THE PROJECT

CAMEROON

I.   PERSONNEL FOCAL POINT INSTITUTION (FPI)

,000 FCFA	TOTAL	1994	1995	1996	1997
I. PERSONNEL					
Project Director (1)	18,000	4,500	4,500	4,500	4,500
Researchers (2)	28,000	7,200	7,200	7,200	7,200
Laboratory Technicians (2)	14,400	3,600	3,600	3,600	3,600
Driver (1)	2,400	600	600	600	600
Watchman (1)	1,680	420	420	420	420
Secretary (1)	4,800	1,200	1,200	1,200	1,200
SUB-TOTAL	70,080	17,520	17,520	17,520	17,520
II.PREMISES					
Office rents	16,000	4,000	4,000	4,000	4,000
SUB-TOTAL	16,000	4,000	4,000	4,000	4,000
III.EQUIPMENT					
Non- Expendable:					
Micro-computer (2)	1,200	1,200			

GRAND TOTAL   87,280

GOVERNMENT IN KIND CONTRIBUTION BUDGET

COTE D'IVOIRE

ESTIMATED COSTS COVERED BY CRO

Premises	Unit price per month (FCFA)	Rent per month (FCFA)	Rent 48 Months (FCFA)
Permanent premises (89 m², offices 15, 13, and 11 m²; communal room)	2,500	222,500	10,680,000
Temporary premises (34 m², meeting room 2 weeks per month; laboratories)		85,000	4,080,000
Total premises (123 m²)		307,500	14,760,000

Electricity	Consumption (at 62 per KW)	Total per month	Total 48 months
Air conditioner 3 units at 1.25 HP 2 units at 2 HP	36 36	66,960 66,960	
Lighting and miscellaneous	8	14,880	
Total electricity	80	148,800	7,142,400

	Cost per day	Total per month	Total 48 months
Maintenance and miscellaneous	10,000	300,000	
Security	3,000	90,000	
Misc. costs except telecommunications	13,000	390,000	18,720,000

Utilization of scientific equipment (100 days per year, estimated at 82,500 per day)		8,250,000	33,000,000

Total contribution by CRO*			73,622,400

* Not including budget for communication which is covered by the project

CONTRIBUTION BY CIAPOL
(in FCFA)

CIAPOL personnel	58,100,000
Depreciation of equipment	158,400,000
Expenses	20,700,000
Premises	36,000,000
Total	273,200,000

SUMMARY OF EXPENSES (in FCFA, 4 years)

A. Personnel costs

A. 1.	Component 1: Determine supplies	
	1 month researcher	420,000
A. 2.	Component 2: Sampling and analysis of marine pollution	
	20 months researcher	8,400,000
	52 months technician	7,280,000
	Total	15,680,000
A. 3.	Component 2: Sampling and analysis of pollution in lagoons	
	24 months researcher	10,080,000
	60 months technician	7,280,000
	Total	18,480,000
A. 4.	Component 3: Control of land-based pollution	
	16 months researcher	6,720,000
	48 months technician	6,720,000
	Total	13,440,000
A. 5.	Training module:	
	12 months researcher	5,040,000
	30 months technician	5,040,000
	Total	10,80,000
A. 6.	Workshop on pollution control	
	2 months researcher	840,000
Total personnel cost		**58,100,000**

B. Laboratory Expenses

B. 2.	Sampling and analysis of marine pollution:	
	Depreciation of equipment:	
	8 months x 22 x 400,000	70,400,000
	Costs:	
	8 months x 1,150,000	9,200,000
	Total	79,600,000
B. 3.	Sampling and analysis of pollution in lagoons	
	Depreciation of equipment	
	6 months x 22 x 400,000	52,800,000
	Costs: 6 months x 1,150,000	6,900,000
	Total	59,700,000
B. 4.	Control of land based pollution	
	Depreciation of equipment:	
	2 months	17,600,000
	Costs: 2 months	2,300,000
	Total	19,900,000
B. 5.	Training module (once in 4 years)	
	Depreciation of equipment:	
	2 months	17,600,000
	Costs: 2 months	2,300,000
	Total	19,900,000

Total laboratory costs and expenses   179,100,000

C. Premises

C.1.	Premises	
	18 months x 800 m^2 x 2,500 F/m^2	36,000,000

Grand total (personnel, laboratories, premises)   273,200,000

GOVERNMENT IN KIND CONTRIBUTION BUDGET

GHANA

Description	Duration	Total US$
National Coordinator	48 m/m	14,400
Administrative cost related to providing names of qualified nominees for the national professionals and trainees for various training programmes		10,000
Cost of providing and reproducing documents, reports and information data to UNIDO/UNEP/NOAA		5,000
Laboratories and demonstration sites		30,000
Offices and workshop centres		32,000
Administration cost in arranging hotel bookings for short-term consultants		200
Transportation rental for short-term consultants	1 m/m	1,500
Total		93,000

GOVERNMENT IN KIND CONTRIBUTION BUDGET, NIOMR

NIGERIA

BL	COMPONENT DESCRIPTION	M/M	AMOUNT in US$
10	PROJECT PERSONNEL		
13	Administrative support		
13.01	Secretary 1	48	4,235
13.02	Secretary 2	48	3,529
13.03	Administrative Officer	48	4,705
13.99	Sub-total		12,469
17	National Professional		
17.01	Counterpart at CRO	48	5,882
17.02	Counterpart at NIOMR	48	5,882
17.99	Sub-total		11,764
19	Component total		24,233
41	Expendable equipment		2,941
42	Non-expendable equipment		2,941
43	Premises		
43.01	Office for project coordinator		2,941
43.02	Offices for national experts		14,706
43.03	Hall hire for meetings		1,471
43.04	Research vessel		70,588
49	Component total		95,588
50	Miscellaneous		
51	Operation cost and maintenance of equipment		8,235
52	Reporting cost		2,941
53	Sundries		2,353
59	Component total		13,529
99	Total		133,350

Annex 1

OVERVIEW OF PROJECT APPROACH

Warning signs of stress within the nearshore areas of the Gulf of Guinea LME are sufficiently widespread and serious, particularly from eutrophication, as to require immediate action to assess the extent of ecosystem damage, and implement appropriate actions. Left unchecked, economic opportunities will be diminished, and excessive nutrient loadings, toxic effluents, habitat loss, and water quality degradation could lead to serious disruption of the balance among the marine communities within the LME. It is preferable to improve the health of the coastal ecosystem now rather than undertake the greater expense of restoration projects later.

A cooperative programme will be conducted by marine specialists from the region, augmented with outside technical assistance, that will consist of three related activities to ensure the sustained health of the Gulf of Guinea LME:

1. Organization of a team of specialists from countries in the region, to be augmented by specialists from outside the area, to implement the project and provide the organizational core for ensuring continuity of the project from an integrated LME perspective;

2. Ecosystem assessment and monitoring, including lagoon and near-shore monitoring focused on pollution, and coastal monitoring of productivity, physical processes, pollution, and living marine resources;

3. Ecosystem stress mitigation and recovery.

Significant advances have been made in recent years in understanding the transport and biological effects of a number of contaminants, and their potential severity can now be evaluated (for example, in the case of municipal sewage effluents). Some success stories have also emerged as a result of remedial measures to control specific contaminants such as DDT and tributyltin. In addition, promising techniques are now being developed (for example, biomarkers) that can detect the onset of pollution problems in coastal biota or ecosystems before the environment becomes substantially degraded or warrants an emergency response. However, the problem of coastal pollution and environmental degradation continues to loom as large as ever. New issues are emerging (for example, cumulative effects of different contaminants) and in the case of chronic, low-level pollution, synergism may play an important role which is presently difficult to define.

To a large extent, the seemingly slow progress in controlling and abating coastal pollution can be attributed to the lack of comprehensive approaches in pollution studies (resulting from both conceptual and material shortcomings), and inadequate interaction among scientists and decision-makers in resolving specific issues. This critical shortcoming has resulted in fragmented efforts and diffused areas of responsibilities. This Gulf of Guinea project has been therefore been structured to require a strong linkage between scientific information and its use in resource management decisions, and effective coordination of all coastal assessment and monitoring activities from a more holistic ecosystem perspective.

Environmental and ecosystem monitoring constitutes an integral, and often the most critical, component of coastal resource management as it provides information that is useful not only for the protection and rehabilitation of the natural environment and its valued resources, but also for formulating policies regarding human activities that can adversely affect the coastal environment. In this context, monitoring programmes must be comprehensive. They should include time-series measurements, data integration, information synthesis, and reporting in usable formats in a continually interactive and iterative process. In terms of their objectives, they must focus on specific problems or issues to be addressed and on practical management alternatives. Cause-effect or dose-response relationships, natural variability, and uncertainty in measurements must be carefully considered not only in programme design to determine optimal field sampling sites and frequency, but also in the synthesis and reporting of information. They need to be hierarchical in practice, with the greatest effort for assessment, monitoring, and mitigation to be directed to near-coastal areas and marine lagoons subject to greatest stress, with less intensive time-series measurement needed from the more pristine "healthier" waters of the offshore regions.

Present marine programmes in the region have too limited a focus to provide adequate information for regional environmental management, lack a clear definition of the programme's goal and objectives, and are not designed to assess the threat of the cumulative impacts of human activities on the coastal and marine environments. It is clear from the evaluations of coastal monitoring activities from the region that a number of deficiencies persist. Most important in this regard is the inadequate definition and, as a result, lack of inclusion of decision-making needs in the conceptual framework and scientific design of monitoring programmes. Thus, there has been a tendency to adopt and implement monitoring programmes, particularly those with national scope, with very broad objectives. Regional programmes, designed to assess a wide range of coastal issues are either inadequate or do not exist. When they do exist, the results of such programmes are frequently difficult to evaluate in terms of regional coastal management as virtually all such programmes address medium-specific, site-specific or contaminant-specific requirements. Such narrow and unfocused approaches inevitably result in a posteriori assessment of risks and impacts, often requiring substantially large costs for remedial or mitigatory activities. As a preferred alternative, monitoring programmes must be based on explicit, testable hypotheses so that feedback from the interpretation of their results can be used to answer specific management questions and also increase the effectiveness of mitigation actions interactively over the long term.

The key lies in effective monitoring to quantitatively measure changes in diagnostic environmental attributes and the health of coastal ecosystems. It is important in assessing changing conditions to validate models aimed at predicting consequences of different environmental management scenarios and actions, and in establishing the status and trends of coastal environmental quality and ecosystem health. Present inadequacies in monitoring programmes in the Gulf of Guinea region pose a serious shortcoming in efforts to protect and restore the coastal environment and its resources. This project will provide the means and guidance to encourage the nations of the region to develop a more effective, coordinated regional programme to meet management needs which in most cases are regional in scope, but for which management responsibilities are divided among a wide array of jurisdictions.

The Gulf of Guinea GEF project represents a regional effort to assess, monitor, restore, and enhance the LME to provide increased potential for economic opportunities over the next decade. The project will build onto existing infrastructure a regionally coordinated and integrated effort consisting of:

- A hierarchically structured regional monitoring programme to determine the quality of the coastal environments and health of the Gulf of Guinea ecosystem

- A consistent system of coastal ecosystem and environmental measurements, information synthesis, and reporting to be used in the mitigation of coastal stress

- Development of indices of environmental quality and assessments of coastal ecosystem health

- Development and implementation of methods for the mitigation and recovery of degraded coastal ecosystems.

The proposed programme will include an ecosystem-wide monitoring network; intensive monitoring of specific coastal areas; and research, assessment, and management activities related to coastal ecosystem health recovery and enhancement. The strategy for implementing the comprehensive programme will be based on restructuring, coordinating, and augmenting pertinent monitoring programmes that are being carried out by national governmental, and non-governmental organizations. Each of these monitoring programmes has a different emphasis in terms of environmental and ecosystem parameters of concern, a different structure in terms of the spatial area of interest, or focus on a specific groups of pollutants or resources. Combining the salient features of pertinent programmes and strengthening some of their activities around a nucleus of monitoring activities on a regional scale will form the basis of the ecosystem assessment, monitoring and mitigation programme.

The region-wide monitoring network of coastal ecosystems will include components of monitoring and assessment programmes that are currently operating on a national scale. The programme will encompass regional, intensive environmental and ecosystem monitoring programmes within a sparser network of monitoring sites in the offshore waters. The sampling sites for the national network will be selected for long-term trend assessment of common parameters of environmental quality and health of coastal ecosystems. Existing programmes will be expanded where necessary to quantify pollutant stresses.

The programme is designed to develop specific mitigation actions related to specific cause-effect relationships between living marine resources, coastal ecosystems and environmental contamination or habitat alteration. Each action will be tailored to support and evaluate specific environmental and ecosystem management needs in the region. Greatest emphasis will be placed on the areas of the Gulf of Guinea ecosystem that are most directly and intensely affected by risks to living marine resources or environmental quality from coastal pollution and habitat losses, and where institutional frameworks exist to benefit from the results of such a programme.

Combining and coordinating field sampling, data analysis, and interpretation of results on key environmental attributes and ecosystem parameters, which operate on different spatial scales and temporal frequencies, will also result in a continuum of observations that is essential to achieving a comprehensive assessment of regional environmental and ecosystem health. Using a hierarchical scheme in the study design, particular emphasis will be placed on areas, marine populations, and other resources under greatest stress from chemical contaminants, nutrient over-enrichment, degradation of habitats, unusual plankton blooms, biotoxic events, and other anthropogenic sources of stress. This will also facilitate formulation of specific hypotheses for elucidating cause-effect

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relationships, and for developing appropriate mitigation to improve conditions. The overall coordinated approach, as proposed herein—strengthening of existing monitoring programmes, focusing on regional environmental and ecosystem management issues, and providing for a continuum of observations and supporting mitigation action—will contribute significantly to the development and long-term sustainability of coastal resources.

The national experts, with the assistance of international experts, will prepare a number of specific documents, engage in inter-agency and inter-governmental consultations, and contract with other organizations. These activities are intended to lay the groundwork for improving the health of the coastal ecosystem. The principal purpose of the regional assessment and monitoring programmes is to provide information that will enhance the ability of national and regional authorities to develop and implement effective remedial programmes for waters and coastal resources of the region. The programme calls for an integrated and holistic approach to coastal assessment and monitoring, and development of new approaches and indices to determine if the quality of the coastal environment and the health of its ecosystems have deteriorated as a result of human activities. As such, the requirements of the programme pose a strong challenge to governments of the region to address the problems of coastal pollution, environmental degradation, and risk to ecosystems and living marine resources in a way that is most appropriate for effective mitigation and remedial activities. Further, the programme provides an impetus to government agencies and international agencies operating in the region (such as FAO and UNEP) to impart leadership in improving the conditions of coastal environments, many of which are severely stressed, and to address concerns on this issue in a positive and fruitful manner.

The assessment and monitoring "core" programme includes bottom trawling to assess and monitor changes in the finfish, shellfish, and macrobenthic communities; plankton and productivity sampling to asses and monitor the euphotic zone, and coastal eutrophication; and a module for sampling and evaluating water quality and benthic quality of coastal ecosystems using bioindicators. For this module, biological indices will be used to detect the effects of chronic exposure to chemical contaminants. The approach includes identifying characteristic physiological changes associated with contaminant exposure that affects growth, reproduction, and metabolic systems. Such physiological biomarkers serve as important early indicators of the effects of chemicals on key life history stages of living marine resources. Further, the use of such biomarkers has gained widespread acceptance, and no other new approach appears to offer the same opportunity to enhance environmental monitoring and assessment programmes directed towards ecosystem health. Enhanced sensitivity for detecting chemical contaminant-induced effects implies the potential for the biological indices to be predictive of more serious perturbations. The concerted use of a suite of biological indices that assess both exposure and effects in marine biota will provide a comprehensive assessment of the impact of the complex mixture of chemical contaminants present in the lagoons and near-coastal waters. The complexity of the mixture of potentially toxic chemicals present in most polluted areas strongly argues against any single index being able to adequately discriminate between populations of organisms exposed to different levels of chemical contaminants. An integrated assessment on an ecosystem scale of anthropogenic stresses on the Living Marine Resources (LMRs) in both near-coastal and off-coastal areas using state-of-the-art biomonitoring techniques will considerably enhance the capability to measure changes in diagnostic environmental attributes that reflect the health of large marine ecosystems and promote the implementation of appropriate mitigation actions.
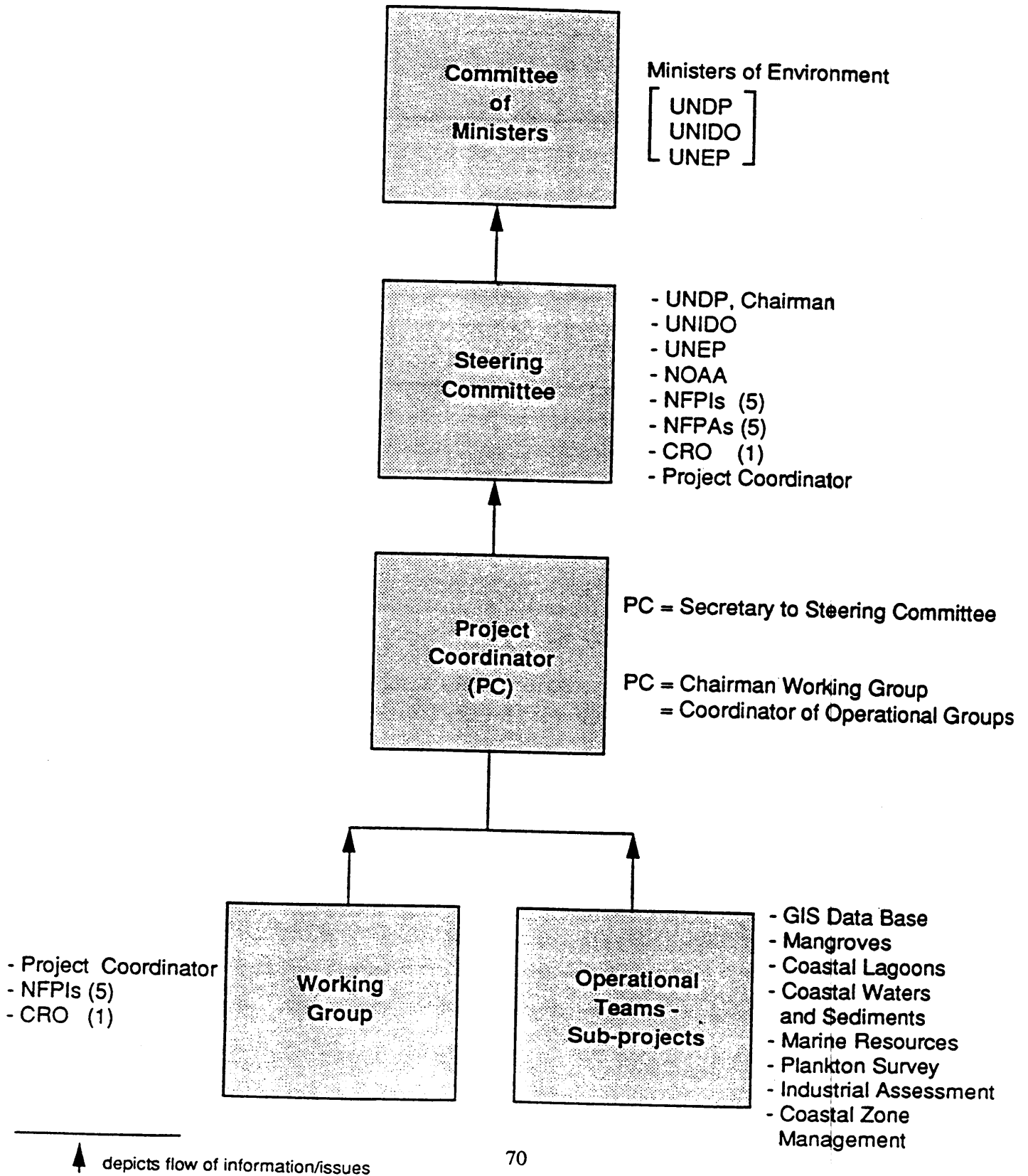
Population studies of the key LMRs investigated for contaminant-related effects will be conducted according to procedures established by Fish Trawl Surveys in near-shore/estuarine and offshore habitats. Data from these studies will be integrated with data from bioeffects studies, and predictive models will be developed to estimate the impact of contaminated near-shore/estuarine environments on population indices of the key LMRs and the overall health of the coastal ecosystems.

The results of the assessment and monitoring efforts will provide information on the sources, causes, and effects of coastal pollution on the habitats, living marine resources, and other components of the Gulf of Guinea LME. This information will form the basis for implementing mitigation actions. Annual reports of the assessment and monitoring will include statements on the following conditions:

1. An assessment of the health of the Gulf of Guinea ecosystem in relation to the several sub-areas of the systems (such as lagoons, near-coastal and offshore waters).

2. An evaluation of trends in the health of the ecosystem and the several sub-areas of the system.

3. Identification and quantification of sources of environmental degradation affecting the ecosystem, including waste water discharges and non-point-source pollution.

4. An assessment of regionally oriented government programmes (and the need for new programmes) to enhance coastal ecosystem quality.

5. An evaluation of the adequacy of this project's assessment and monitoring programmes, and a survey of results in relation to the capacity of the programme to:

    (a)   Prevent, reduce, and control degradation of the marine environment so as to maintain and improve its life-support and productive capacities;

    (b)   Develop and increase the potential of marine living resources to meet human nutritional needs, as well as social, economic, and development goals;

    (c)   Promote the integrated management and sustainable development of coastal areas and the marine environment;

    (d)   Increase countries' capacities to undertake industrial development efforts in an environmentally safe and sound manner to support their development objectives; and

    (e)   Increase efficiency in the production and consumption by industry of energy and other resources and materials.

From the results of the assessment and monitoring activities, mitigation actions will be recommended for implementation by the governments in the region as part of a region-wide effort to improve the health and long-term sustainability of the resources of the Gulf of Guinea ecosystem.

PROJECT MANAGEMENT STRUCTURE

Committee
of
Ministers

Ministers of Environment
$$\begin{bmatrix} \text{UNDP} \\ \text{UNIDO} \\ \text{UNEP} \end{bmatrix}$$

Steering
Committee

- UNDP, Chairman
- UNIDO
- UNEP
- NOAA
- NFPIs (5)
- NFPAs (5)
- CRO   (1)
- Project Coordinator

Project
Coordinator
(PC)

PC = Secretary to Steering Committee

PC = Chairman Working Group
    = Coordinator of Operational Groups

- Project Coordinator
- NFPIs (5)
- CRO   (1)

Working
Group

Operational
Teams -
Sub-projects

- GIS Data Base
- Mangroves
- Coastal Lagoons
- Coastal Waters
  and Sediments
- Marine Resources
- Plankton Survey
- Industrial Assessment
- Coastal Zone
  Management

↑ depicts flow of information/issues

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Annex 3

OUTLINE OF TERMS OF REFERENCE FOR PROJECT STEERING COMMITTEE

The Project Steering Committee (PSC) will consist of experts from the National Focal Point Institutes, National Focal Point Agencies and the Regional Coordinating Centre in the participating countries (Benin, Cameroon, Côte d'Ivoire, Ghana and Nigeria) as well as technical representatives from UNDP, UNIDO, UNEP and NOAA. The PSC will be chaired by UNDP and the Project Coordinator will act as its Secretary. The functions of the PSC include:

(a)   to provide guidance and monitor the progress and timely implementation of the project;

(b)   to facilitate coordination of the activities involving two or more participating countries;

(c)   to ensure coordination of activities and to promote cooperation between the implementing organizations and the governments of the participating countries;

(d)   to develop regional policies and strategies to reduce pollution in the Gulf of Guinea LME; and

(e)   to assist in devising mechanisms to ensure that the systems and programmes developed under the project will be carried on for maintaining the health of the Gulf of Guinea.

TENTATIVE TRAINING PLAN AND SCHEDULE

Budget line	Activity Reference	Training component	Number of trainees	Total expenses	1994	1995	1996	1997
31-00	1.2.4 and 1.3.4	Participation of two national specialists (from CRO, NFPIs and NFPAs) in two international conferences per year	15	60,000	16,000	16,000	16,000	12,000
32-01	1.3.1	Training in industrial process technologies	15x2 weeks	22,500	0	0	22,500	0
32-02	1.3.2	Training in environmental management techniques	15x3 weeks	30,000	0	0	30,000	0
32-03	1.3.3	Training in integrated coastal resources planning	15x2 weeks	22,500	0	0	22,500	0
32-04	2.3.2	Short-term training in integrated information management	15x(0.5+0.5) weeks	12,500	0	6,250	6,250	0
32-05	3.2.4	Workshop for mangrove survey	15x1 week	10,000	10,000	0	0	0
32-06	3.2.5	Promote public awareness for restoration of mangroves	20	15,000	0	15,000	0	0
32-07	3.4.2	Fellowship programme to carry out sampling, analysis, inter-calibration and data assessment for pollution monitoring in coastal lagoons	10x(1+2+1+2) weeks	30,000	30,000	0	0	0
32-08	3.5.2	Monitoring pollution in nearshore waters and sediments: sampling and analysis	10x(1+2+1+2) weeks	40,000	40,000	0	0	0
32-09	3.7.1	LME Workshops	15x(1+1+0.5) weeks	54,500	4,500	25,000	25,000	0
32-10	3.6.2	Training in plankton survey	16x(4) weeks	10,000	10,000	0	0	0
32-11	4.4.2	Regional meeting on setting effluent standards	10x1 week	10,000	0	10,000	0	0
32-99	Sub-Total	Study tours: UN Group Training	156	257,000	94,500	56,250	106,250	0
33-00	3.5.2	On-the-job training on Marine Resource Survey under NOAA experts	4-7	50,000	50,000	0	0	0
		Training Component						
39-99	Total		175-178	367,000	160,500	72,250	122,250	12,000