GLOBAL ENVIRONMENT FACILITY

Yemen

Protection of Marine Ecosystems of the Red Sea Coast

Project Document

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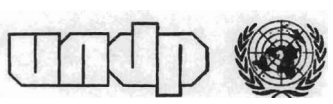

ABBREVIATIONS AND ACRONYMS

ALESCO	Arab League Educational, Scientific and Cultural Organization
EIA	Environmental impact assessment
EPC	Environmental Protection Council
FAO	Food and Agriculture Organization of the United Nations
IMO	International Maritime Organization
IOC	International Oceanographic Committee
IUCN	World Conservation Union (formerly the International Union for the Conservation of Nature and Natural Resources)
MARPOL	International Convention for the Prevention of Pollution from Ships
MSRC	Marine Science and Resources Research Centre
MTC	Maritime Training Centre
NGO	Non-governmental organization
PCMA	Public Corporation for Maritime Affairs
PERSGA	Regional Environment Programme for the Red Sea and Gulf of Aden (Regional Convention for the Conservation of the Red Sea and Gulf of Aden)
UNEP	United Nations Environment Programme
UNEP-GRID	Global Resources Information Database of the United Nations Environment Programme
WB	World Bank
YEPS	Yemen Environment Protection Society

UNITED NATIONS DEVELOPMENT PROGRAMME

GLOBAL ENVIRONMENT FACILITY

Project of the Republic of Yemen

Title:	Protection of Marine Ecosystems of the Red Sea Coast
Number:	YEM/92/G31
Duration:	Three years
Project Site:	Sana'a, Aden, Red Sea coast, offshore reefs
UNDP Sector:	Marine Resources and Environment
Subsectors:	Fisheries and Environment
Government Implementing Agency:	Ministry of Fish Wealth/Marine Science and Resources Research Centre
Executing Agency:	Office for Project Services of the United Nations Development Programme (UNDP)
Estimated Starting Date:	April 1993
Government Inputs:	3,806,000 Yemeni riyals (in kind)[1]
UNDP/GEF Inputs:	US$ 2.8 million

Brief Description:

This project aims to protect marine ecosystems of the Yemen Red Sea coast, including coral reefs and other critical habitats, by assisting Yemen to develop the sustainable use of its marine resources. Project activities will include:

- Surveys of marine habitats to determine environmental trends
- Creation of an interactive database

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[1] The United Nations official exchange rate at the date of the last signature of the Project Document was US$ 1.00 = 18 Yemeni riyals.

- Establishment of a monitoring programme to protect the waters of Yemen as well as adjacent international waters from pollution

- Training of national counterparts through overseas training for higher studies; in-country training through workshops and short courses; and on-the-job training through participation in all project elements.

The project will secure recurrent cost financing and equip existing Yemeni facilities to undertake the work of the project. It will also serve as a framework for the planning and management of adjacent international waters.

The project incorporates a regional component which will be implemented by the United Nations Environment Programme (UNEP). This will prevent duplication by ensuring liaison with a concurrent GEF project in Egypt, the Regional Environment Programme for the Red Sea and the Gulf of Aden (PERSGA), and with other regional organizations. This component will provide capacity building for PERSGA through regional training programmes, and a basis for planning any future expansion of the Red Sea framework using the Yemeni and Egyptian models.

A. CONTEXT

Current information on Yemen's marine resources and their use is insufficient to provide the groundwork for regulations to prevent pollution. Most marine pollution in the region is caused by oil and tar from shipping. Landfill activities have also damaged valuable habitats. Shippers have deliberately sought these waters for polluting activities such as tank cleaning because of the lack of monitoring on this coast; the absence of adequate background marine biological data has also contributed to making such actions relatively simple. In addition, there is concern about latent problems stemming from land-based sources of pollution such as sediment, heavy metal, pesticide and fertilizer run-off. Although no clear evidence exists even to determine whether the present level of resource use is sustainable, the rise in coastal population has led to plans to increase industrial/commercial fishing.

This project has a three-pronged approach:

- Finding out *what* is important in these waters, *where* the important areas (such as coral reefs) are, and *how much* of these have been damaged so far. This activity will require extensive data collection.

- Educating the public about marine conservation issues and the importance of sustainable development for Yemen.

- Preparing the ground for effective marine management.

Implementing this approach will require:

- Establishment of an interactive database which can be used to determine present conditions and future trends in the Yemen Red Sea environment

- Creation of an ability to assess marine ecosystems
- Evaluation of marine habitats critical to maintaining high biodiversity, including fish nursery habitats
- Preparation of the means to detect and control pollution sources before damage is caused to the waters of Yemen and adjacent international waters.

1. Description of subsector

The Red Sea coast of the Republic of Yemen extends about 450 kilometres north from the Bab el Mandeb which is considered the entrance to the Red Sea. Aden, with its large fisheries and locally important centres of marine science, lies approximately 100 kilometres east of this point. Several aspects of the Yemen Red Sea environment are poorly understood. This has important consequences for this project in terms of design and strategy, especially with regard to the monitoring of pollution and the protection of critical habitats.

Principal characteristics of Yemen's Red Sea coast

The only biological information for this area exists in the form of surveys of about 100 sites, dated 1985 and 1991. These studies show the presence of three biological zones that are roughly equal size in size. The northern zone (from the northern border till about As Salif) has the most stable sediments, and its mangroves are vital breeding grounds for fish. The central zone (from As Salif to south of Al Khawkhah) has mobile and coarse sediments, with occasional boulder/gravel and berm formations which indicate a high energy environment.[2] Palms and other freshwater dependent vegetation dominates in this area, extending up till the high-water mark, which can sometimes be more than a kilometre inland. These environments tend to be barren, but in the few fringing reefs that do exist, biodiversity is high. The shoreline vegetation in the southern zone (from south of Al Khawkhah to Dhubab) is limited to salt tolerant species, but biodiversity is likely to be highest in this part because of the greater occurrence of coral reefs and seagrass. Offshore, patch reefs and other reefs occur throughout the Yemen Red Sea, providing substantial shallow breeding and feeding grounds for fish. Although these reefs probably contain immense biodiversity, very little is known about them.

Fisheries of Yemen's Red Sea coast

The coastal waters of the Red Sea are richest in nutrients and plankton in the section that borders Yemen. This is mostly due to plankton blown in through the Bab el Mandeb from the Gulf of Aden where it arises from nutrient rich upwellings. Fish that are dependent on this plankton form a very important element of the economy. Fish also represent the country's second most important source of protein. However, if fish catches from these waters are to be sustainable, measures to control pollution and protect marine habitats are urgently required. Evidence suggests that catches

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[2] Areas prone to strong waves and currents that move large amounts of sand, debris and other material, are termed high energy environments. Low energy environments are characterized by the movement of finer sediments.

from the Yemen Red Sea are already close to the maximum sustainable, but these resources face increased pressures from the large influx of returnees from other Gulf States after the 1991 war.

Current or proposed fisheries projects (see page 6) do not form part of any planned conservation strategy. The data for fisheries is also poor. Current catches of pelagic fish are reported to be about 9,500 tonnes, but could reach a figure of 10,000 or even 20,000 tonnes. Demersal fisheries, which are more closely linked to the health of shallow habitats, report catches of 4,000 tonnes, but could go as high as 5,000 tonnes. The reliability of these figures is questionable and catches are probably higher than reported, but little useful data exists to provide a basis for estimates of sustainable catch size. Increases in the human population dependent on the Red Sea, or localized damage to spawning grounds, could quickly lead to depletion of the fish resource. Fishing efforts would then intensify to compensate for declining catches, causing further damage to critical shallow water habitats.

This project will determine the location of important and diverse habitats, develop capabilities for monitoring pollution and other forms of physical damage to these habitats, and create a database which will include a prediction capability.

Pollution control and marine management infrastructure for Yemen's Red Sea

Since the unification of North and South Yemen, a consolidated infrastructure is being developed in the country. Although this will assist in the implementation of this project, there remains a serious lack of essential background and time-series data required for the assessment of trends. National technical skills and equipment for this project are also limited.

The Red Sea shoreline of Yemen forms almost a third of the country's total shoreline, with the remainder lying along the Gulf of Aden. The latter, being an exposed coast without significant coral reefs and mangroves, is substantially different from the Red Sea, and contains a much richer population of pelagic fish. Although this project focuses on the Red Sea, it also incorporates two elements which are important for the entire coast of Yemen. First, the proposed procedures and techniques can be applied to other shores of the Gulf of Aden should a similar project be developed there. Second, the mandate of the implementing agency of this project—the Marine Science Resources and Research Centre (MSRC)—extends to the entire coastline of Yemen. The MSRC, based in Aden, is a part of the Ministry of Fish Wealth.

2. Host country strategy

The first country programme for the Republic of Yemen has identified environmental protection as one of its four principal priorities. Yemen is party to a number of international agreements, including:

- International Convention for the Prevention of Pollution of the Sea
- International Convention on Civil Liability for Oil Pollution Damage
- Convention concerning the Protection of the World's Cultural and Natural Heritage (World Heritage Convention)
- International Convention for the Prevention of Pollution from Ships (MARPOL)

- United Nations Convention on the Law of the Sea (UNCLOS).

Relevant national legislation currently in force in Yemen includes:

- Law Number 13 of 1963 establishing the Water and Sewerage Authority
- The Quarantine Health Law Number 16 of 1965
- Fisheries Law Number 20 of 1978
- Decree Number 24 of May 1984 on the Reorganization of the Ministry of Municipalities and Housing, providing for the establishment of the General Department of Environmental Health
- Animal Resource Protection Law Number 88 of 1986
- The Ports and Airports Health Precautions Law Number 13 of 1986
- Decree Number 7 of 19 February, 1987, providing for the establishment of the Environment Protection Council. This was updated after reunification in 1990, as per the Prime Minister's Resolution Number 94, to coordinate and conduct environmental affairs. The Technical General Secretariat (TGS) has an important role in this council. On 31 March, 1988, the Environment Protection Council published seven decrees (Numbers 125-131) establishing specific committees on:

  (i) Environmental Sanitation;
  (ii) Environmental Legislation;
  (iii) Environmental Awareness and Education;
  (iv) Marine Environment;
  (v) Housing and Land Use;
  (vi) Agriculture; and
  (vii) Industry.

The Government of Yemen aims to protect its marine ecosystems and develop a sustainable fishing industry. But despite being a member of MARPOL and PERSGA, monitoring for pollution and the identification of critical habitats for fisheries and other purposes have received too little attention to ensure the cost-effective, sustainable use of marine resources.

3. Prior or ongoing assistance

Several projects in Yemen are relevant to this project because of their focus on:

- Efforts to increase fish capture
- Basic environmental research and protection.

Despite the interdependence of these two areas, they are not effectively linked at present, and projects related to them do not form a clearly structured or interconnected group. An important function of this project will be to coordinate these activities so that one area does not impact negatively on the other. Projects or elements of projects which could be of relevance to this GEF undertaking are listed below.

Fisheries and efforts to increase fish capture

- *FAO Programme in the Republic of Yemen—"Overview and Programme Objectives (March 1992)."* This document of the Food and Agriculture Organization (FAO) states its goal of extending the marine fisheries operations in the Gulf of Aden "to include Yemen's coastal zone in the Red Sea which is largely untapped" (page 4). The latter assumption is almost certainly false, and could pose a potential danger to the resources of the Red Sea. It could also threaten the environmental protection elements of this and other projects.

- *Strengthening of Marine Inspection and Supervision TCP/PDY/8954 (T), US$ 120,000. June 1991-1992.* This FAO project, now complete, was intended to train Yemeni personnel in marine inspection and control of offshore fishing operations. It is relevant to this project because, as stated in its objectives, "consideration is also being given to introduction of a fish catch assessment system as part of a national fisheries management programme." This statistical element, however, has apparently not been implemented.

- *Technical Support to the Marine Science and Resources Research Centre YEM/92/018 (PDY/88/009), US$ 532,500. 1988-1991.* This project aimed to assess fish stock resources on a scientific basis for use in fisheries management and environmental protection. The project was to be executed jointly by FAO and the United Nations Educational, Scientific, and Cultural Organization (UNESCO). While this project has been delayed, another project at MSRC, financed by UNESCO, is nearing completion. Data on fish plankton obtained by the project may prove useful for this GEF project.

- *Technical Assistance to Fisheries Development UTFN/PDY/008, Phase III. US$ 2 million. 1984-1992.* This project, intended to train skilled technicians in industrial and artisanal fisheries, was extended so that it could be linked with the start of Fisheries IV (see below).

- *World Bank/IFAD/EEC Fisheries Development IV.* This joint project by the World Bank, the International Fund for Agricultural Development (IFAD) and the former European Economic Community (EEC), is primarily concerned with the marine sector in the Gulf of Aden. The project aims to "assist in the restructuring of the coastal fisheries cooperatives to increase fish production" (FAO, March 1992). The implications of this are relevant since Yemen intends to increase fish production in the Red Sea. The impact of Fisheries IV on this GEF project could be especially significant because its funding is to be much greater than the environmental protection budget of the latter project.

Basic research and environmental protection projects

- *UNDP—TSS-1 Environment and Development. Terms of Reference for "Strategy and*

Guidelines for a Participatory National Environmental Planning Process." 15 May, 1992. This document was issued by the Ministry of Planning and Development, the Environmental Protection Council (EPC) of Yemen, and UNDP. It outlines tasks for the development of a Participatory National Environmental Planning Process scheduled to start in 1993. (A draft programme document is available.) The Terms of Reference (TOR) emphasize environmental management as one of the key components of UNDP's five-year country programme, along with natural resource management, including pollution control and the marine environment. A marine scientist is scheduled to participate on the project team. The Ministry of Planning and Development and EPC will be the lead government executing agencies for the project, and FAO the principal aid agency. It is anticipated that this GEF project will eventually be incorporated into the broader agenda for action to be defined under the Participatory National Environmental Planning Process.

- *Yemen Arab Republic (YAR) Marine Conservation Survey. Volume 1: The Distribution of Habitats and Species along the YAR coastline. 110 pages. Volume 2: Preliminary Coastal Zone Management Recommendations for YAR. IUCN/Red Sea & Gulf of Aden Environment Programme. Gland, Switzerland and Jeddah, Saudi Arabia. 70 pages.* This 1985 survey by the World Conservation Union (IUCN) of about 100 mainland sites is the only significant survey of Yemen's Red Sea environment. It contains recommendations for marine environmental protection and the establishment of protected areas, but does not include offshore reefs or islands. These recommendations were apparently accepted by the government at the time, but have never been acted upon.

- *Netherlands Directorate General of International Cooperation. Haskoning (Royal Dutch Consulting Engineers and Architects) 1991. Proposal for Developing a Coastal Management Plan in the Republic of Yemen.* Ongoing Dutch assistance includes this valuable summary of the needs of the marine environment in Yemen, bringing together important elements of fisheries and marine environmental protection. The report illustrates how past and present policies have allowed damage to some fish stocks in the Gulf of Aden. It shows that less than half of the fish caught are reported, and that 80 percent of all fish are "trash fish" that go unreported. Thus the actual capture of fish is already far greater than assumed, possibly by a factor of ten. Should existing assumptions be applied to the much smaller fishing area of the Red Sea, as is appropriate, the consequences for Yemen can clearly be seen to be serious, running counter to both the stated desires and the best interests of the country. Although the report points to a need for marine environmental management, the degree to which its recommendations will be heeded by the government remains uncertain.

- *Hydraulics Research, UK, Coastal Erosion and Siltation Study. World Bank funded report for General Corporation of Yemen Ports (GCYP). March 1992.* This project for GCYP focused mainly on coastal erosion. Drawing heavily on IUCN data (see above), it also consolidated and updated many of IUCN's marine environmental recommendations.

- *UNEP/IOC, Memorandum of Understanding, August 1990. US$ 40,000.* A Memorandum of Understanding was signed by UNEP and the International Oceanographic Committee (IOC) for strengthening marine pollution monitoring capabilities in the Red Sea region. This includes Egypt, Jordan, Sudan and Yemen. The funds allocated specifically to Yemen are

therefore relatively small. Little is known about the objectives of the Yemen component of this project, or their realization. UNEP will ensure that there is no duplication of effort between the UNEP/IOC project and this GEF project.

- *UNEP agreement with EPC, February 1992.* Two agreements of relevance to this GEF project were reached during the visit of the Executive Director of UNEP to Yemen in February 1992. The first was aimed at strengthening the establishment of a network of information on the environment, particularly that related to freshwater and marine water. This was to involve UNEP's Global Resources Information Database (GRID). The second aimed to strengthen the Centre for Environment Research of the Ministry of Fish Wealth. The information network and the involvement of UNEP-GRID will be invaluable for this GEF project; coordination will be ensured through the regional components of the Yemen and Egypt GEF projects.

- *UNDP Project YEM/92/024, Maritime Training Centre, implemented by IMO.* This UNDP project provides support to the Maritime Training Centre (MTC) in Aden. The International Maritime Organization (IMO) currently delivers a total of thirty training courses, both in-house and overseas. Many of these courses deal with different aspects of controlling marine and port pollution, including oil spills and offshore pollution, and assistance with fulfilling obligations under MARPOL and other IMO conventions. A further phase of UNDP support is expected to begin in September 1992.

- *Marine Science and Resources Research Centre of the Ministry of Fish Wealth, funded in part by the Islamic Development Bank.* Located in Aden, the MSRC is involved in oceanographic and fisheries research. A programme on fisheries related plankton work is supported by UNESCO. Laboratories and equipment are limited, but the Islamic Development Bank has recently funded the construction of a new laboratory complex. The potential facilities offered by this complex are considerable, but it is currently faced with problems related to equipment and recurrent cost financing.

- *Oil spill contingency plans.* Two oil companies operating in Yemen—British Petroleum (BP) and Canadian Oxydental (CANOXY)—are reported to have substantial oil spill contingency plans, along with the required equipment. (In the case of BP, however, most of the equipment is stored overseas for rapid deployment.) This could provide a valuable contribution to marine environmental protection in Yemen; the project will take this into account in the details of its design.

4. Institutional framework for subsector

Several national and regional organizations, listed below, are involved in the management of Yemen's marine resources.

National

- *Ministry of Planning and Development.* This is the overall coordinating body to ensure consistency within national development strategies. All international cooperation is also routed via this ministry.

- *Environmental Protection Council.* This government agency coordinates Yemen's environmental protection policies and promotes public awareness of the need for better environmental management and protection. The EPC has been charged with developing a national environmental training and awareness programme. Areas of the EPC's mandate of particular importance to this GEF project include environmental data collection, assessment and monitoring.

- *Ministry of Fish Wealth.* This ministry is responsible for the management and development of Yemen's fish resources. Through the MSRC in Aden, the ministry is involved in oceanographic research which will be of relevance to this project. It also has a limited capacity for research in benthic ecology.

- *Ministry of Higher Education/University of Sana'a.* The Department of Oceanography at the University of Sana'a has a small capacity for research which may be of interest to this project.

- *Ministry of Transport/Public Corporation of Maritime Affairs.* Offshore marine and maritime affairs, including pollution, are the responsibility of the Public Corporation of Maritime Affairs.

- *Ministry of Transport/Maritime Training Centre.*

The wide range of parties involved creates obvious difficulties for the management of this project by any single party. Previous experience with the Dutch-assisted project, and information from EPC, showed institutional difficulties associated with the implementation of marine management. A lack of interdepartmental coordination further contributes to these problems. However, the activities and results of this project are necessary to create the groundwork for the protection and management of the nation's marine resources.

In order to maximize interagency cooperation, it is proposed that the project be implemented by a Project Steering Committee chaired by the EPC. The committee will consist of members drawn from the organizations listed above. (See Annex 1 for a schematic representation of coordination arrangements.) It is hoped that the involvement of all parties will strengthen the results of this project.

Regional/International

- *Regional Convention for the Conservation of the Red Sea and Gulf of Aden (PERSGA).* Yemen is one of seven signatories to PERSGA. The Secretariat of PERSGA was established in 1981 in Jeddah, Saudi Arabia. PERSGA is operated as an organizational unit of the Arab League Educational, Scientific and Cultural Organization (ALESCO) under the authority of ALESCO's Director General, based on decisions of the ALESCO General Conference and meetings of the Contracting Parties to the Jeddah Convention. PERSGA's scope for effective action is currently very limited.

- *Egypt GEF project.* A complementary GEF project is being implemented in Egypt—the World Bank's Egyptian Red Sea Coastal and Marine Resource Management Project. Although it is located in a part of the Red Sea where the ecological conditions are substantially different from those in Yemen, the projects share many common objectives. (See Annex 2 for more details on the Egypt GEF project.)

- *Regional United Nations (UN) agencies.* Several UN bodies including IMO, FAO, IOC and UNEP are involved to varying degrees in activities related to this GEF project. UNEP, through PERSGA, will ensure coordination between this project and the Egypt GEF project, and also between the UN bodies mentioned above.

B. PROJECT JUSTIFICATION

1. Problem to be addressed and present situation

The importance to Yemen of the Red Sea marine environment cannot be overstated. The coastal communities of Yemen are directly dependent on the high biodiversity and productivity of the Red Sea. This wealth of natural resources can also contribute to the future development of Yemen in terms of food, transport, industry, and recreational and other needs. The Red Sea is likely to play an increasingly important role in providing freshwater, via desalination plants, because existing subterranean water supplies are fast becoming depleted.

The sustainability of these resources depends on the maintenance of biodiversity and effective protection of the waters. This project aims to discover and define the marine resource base in Yemen, to help prevent and resolve conflicts of use, and to avoid damage and depletion of these key resources. The project will address these issues by focusing on three areas: vulnerability of the waters to pollution, the inadequate understanding of the links between land and sea, and the need for protection and management of resources. These three areas are described in greater detail below.

Increasing vulnerability to pollution

The harvesting of marine resources, already very high, is likely to increase further. Heavy fishing not only reduces stock size, but also impairs stock quality, and the action of trawls on the seabed can alter benthic habitats. Resources and ecosystems in national and international waters adjacent to Yemen are increasingly vulnerable to pollution from oil, and from urbanization and industrialization in localized but expanding areas. Red Sea marine ecosystems are also being damaged by coastal infilling and dredging, and by accelerated sedimentation associated with inappropriate agriculture and flash floods. Several sites of special environmental and economic importance have already been lost to coastal development.

Inadequate understanding of marine system and of interconnections between land and sea

Public awareness of the effects of land activities on the sea is limited. For instance, the influence of agricultural run-off on the marine environment, and the contribution of the marine

environment to sustainable development, are neither recognized nor understood. This lack of environmental awareness exists at the level of both government and the public, and contributes greatly to the difficulties of maintaining biodiversity and preventing pollution. This project will include activities to enhance environmental awareness. It will also define and analyze key issues affecting the marine environment as a means of identifying resource use opportunities and avoiding resource use conflict.

Inadequate protection and inappropriate management

Marine ecosystems and associated resources have traditionally received very little protection in Yemen. This has stemmed from a limited understanding of their value, combined with economic constraints and inadequate human resources. Even the principles of resource management have frequently contradicted the tenets of sustainable development. For example, some development projects have advocated short-term *maximization* rather than *optimization* of marine resources, with little or no funds being devoted to ensuring sustainability in the face of increased exploitation.

2. Expected end-of-project situation

This project is intended to increase Yemen's commitment to sustainable use of the Red Sea by creating a sharper awareness of environmental issues. The project will improve the country's capacity to protect its coastal waters from pollution, and to guard against depletion of its valuable biodiversity. These results are prerequisites for Yemen to tackle the mounting problems facing its marine environment. More specifically, the project will effect the following:

- Marine resource management issues will be dealt with more effectively in the national planning process.

- There will be an improved ability to recognize early on the potential damage from a wide range of marine activities, and a corresponding improvement in the ability to make planning and development decisions to minimize their environmental costs.

- Staff within government agencies and research organizations will have received on-the-job training through project participation in the following areas:

  (i) Environmental survey and monitoring;

  (ii) Environmental data collection and interpretation;

  (iii) Environmental impact assessment (EIA) and monitoring; and

  (iv) Public awareness programmes.

- Regional workshops on protected areas and activities such as surveying, monitoring, and conducting EIAs will have been organized to improve the capacity of national staff in these essential areas.

- Overseas courses at the masters and diploma levels will have been provided in tropical marine resources management, marine environmental protection, and ecosystems analysis and management.

- Overseas specialist short courses will have been provided in areas such as computer software, instrumentation, diving/photography and cartography to improve the technical base for national staff.

- Training programmes and public awareness campaigns will have enhanced local understanding of the importance of marine resources.

- A framework for continuing survey and monitoring systems will have been established. Arrangements to ensure the further development of a database for the Red Sea marine environment of Yemen will also be in place. This will include an integrated resource assessment framework to accommodate future work in the Gulf of Aden.

- A marine protected area system will be recommended, based on sites identified by this project and a review of previously proposed sites. Assistance with the management of selected protected areas will also have been provided

- An effective system will be in place to ensure recurrent cost financing for activities such as environmental monitoring, so that these may continue even after completion of this project.

3. Target beneficiaries

The principal beneficiaries of this project are the government agencies of the Republic of Yemen, including:

- Ministry of Planning
- Environmental Protection Council
- Ministry of Fish Wealth
- Marine Science and Resources Research Centre
- Ministry of Transport
- Public Corporation for Maritime Affairs
- Maritime Training Centre
- Ministry of Higher Education
- University of Sana'a (Department of Oceanography).

By participating in the various activities of this project, these agencies will acquire an enhanced understanding of the principles of sustainable development and marine environmental assessment and protection, including the management of protected areas.

It is expected that this knowledge will be passed on to a wider group of beneficiaries within the Ministries of Fish Wealth and Planning, research organizations, and other environmental

institutes. Fishermen and other villagers living and working around marine protected areas will also benefit directly or indirectly from the project. Other beneficiaries will include national environmental societies and non-governmental organizations (NGOs), in particular the Yemen Environmental Protection Society, and other Red Sea countries party to PERSGA and the associated Regional Seas Action Plan of UNEP.

The population of Yemen will benefit from the sustainable use of Red Sea resources. This will ensure marine ecosystems of continued viability, support habitat dependent activities such as artisanal fisheries, provide uncontaminated seawater (potentially an important source of freshwater), and offer prospects for the expansion of tourism.

Marine ecosystems and wildlife will be protected through the improved management of Yemen's Red Sea environment. These include coral reefs, mangroves, seagrasses, fisheries, and the innumerable species (such as crustaceans, turtles and seabirds) with economic, social and conservational value.

4. Project strategy and implementation arrangements

This project is designed to complement related initiatives in the region such as the WB/IFAD/EEC Fisheries IV project and the Dutch-assisted coastal zone management plan. Flexibility is provided in the framework of the project to allow for an extension of assessment activities in the Gulf of Aden, either through separately funded parallel activities or a subsequent project. In view of the pollution threats faced by the Gulf of Aden and its importance in terms of food, employment and foreign exchange, an integrated management plan for the entire marine environment of Yemen would clearly be of great value.

Implementation of this project will require the involvement of the bodies listed below:

- *Ministry of Planning and Development.* All international cooperation with Yemen is routed via this ministry whose role in this project will principally be initial approval and subsequent project monitoring.

- *Environmental Protection Council.* The EPC will ensure coordination of project activities with other national environmental initiatives, and play a significant part in the implementation of public awareness programmes in collaboration with the Yemen Environmental Protection Society and other environmental NGOs. The EPC will also chair the Project Steering Committee (see below).

- *Ministry of Fish Wealth.* This ministry is responsible for the management and development of fisheries. It will be the national executing agent and play a major technical role in this project by developing the marine protected area network with assistance from NGOs such as the Yemen Environmental Protection Society.

- *Project Steering Committee.* Project activities will be guided by a Project Steering Committee comprised of the UNDP Resident Representative and representatives of the Ministry of Planning and Development, EPC, the Ministry of Fish Wealth, the

Ministry of Education, and other ministries as appropriate. It is expected that this committee will be chaired by EPC. Both the subcontractor responsible for project management (subcontract #1) and for the regional component (subcontract #2) should be ex-officio members of this committee.

- *Subcontractor #1.* The project will be managed by the Office for Project Services (OPS) of UNDP through a subcontracted consultancy firm (subcontractor #1) which will be responsible for providing the UNDP-financed inputs to the project, such as project management and administration, short-term consultant services, training programmes, equipment and materials. The subcontractor will work directly with the Ministry of Fish Wealth and be responsible to the Ministry of Planning and Development, EPC and the UNDP office in Sana'a. The work of the subcontractor will be conducted in close collaboration with the Project Steering Committee.

- *Subcontractor #2 (UNEP).* Through PERSGA, UNEP will implement the regional project component to ensure effective linkages between the GEF projects in Yemen and Egypt, as well as with other regional initiatives.

- *Marine Science and Resources Research Centre, Aden.* The MSRC, responsible to the Ministry of Fish Wealth, is the main national research unit. It will initiate environmental surveys, monitoring, and other scientific and research components of this project. The facilities of the newly established subcentre in Hodeidah will be available for project work. MSRC currently has rudimentary programmes in oceanography, marine ecology, taxonomy and fisheries. It also has plans to increase its pollution monitoring research.

- *Ministry of Transport/PCMA/MTC.* The Public Corporation for Maritime Affairs (PCMA) and Maritime Training Centre (MTC), both of which are under the Ministry of Transport, will assist in the project. PCMA will participate in marine pollution monitoring undertaken during the project, and help ensure the integration of project activities and results with oil spill contingency plans (such as those developed by oil companies) and related oil spill surveillance, monitoring and combat activities.

  MTC provides a range of courses in maritime affairs, including one entitled "Prevention of Marine Pollution." MTC is expected to assist with project training courses in environmental information collection and interpretation; EIA and monitoring; and public awareness. MTC will also participate in regional workshops in EIA and related activities.

- *Ministry of Higher Education/University of Sana'a.* The Department of Oceanography at the University of Sana'a will assist MSRC in environmental survey and monitoring, and provide laboratory space and facilities for the project.

- *PERSGA.* As mentioned above, PERSGA will undertake implementation of the regional activities of the Yemen and Egypt GEF projects. This project will thereby substantively contribute to and benefit from regional training programmes and planning for future expansion of the Red Sea framework.

5. Reasons for GEF assistance

The Government of Yemen's commitment to conservation and environmental protection has been demonstrated by various actions in recent years, including the creation of the EPC. In the aftermath of reunification and the Gulf War, however, the government has had very few resources to allocate for these purposes. Per capita income in North Yemen was estimated at only US$ 640 per annum in 1989, and has almost certainly declined since then.

This project will provide support for existing infrastructure and enable government institutions to make valuable contributions both to the sustainable development of Yemen's marine resources, and to the protection of international waters and marine biodiversity in the region.

6. Special considerations

The GEF is committed to enhancing the role of women and NGOs in development. Although this project does not offer specific activities for women, the recruitment and participation of women as trainees in courses and programmes will be actively encouraged by the GEF project office and the Project Steering Committee.

The design of this project does incorporate the involvement of NGOs, but few NGOs in Yemen are as yet sufficiently developed to allow for extensive participation in project activities. One exception is the Yemen Environmental Protection Society (YEPS), whose involvement and support will be sought by the project implementing agency in enhancing public awareness of marine environmental issues.

The oil industry, an important user of the marine environment, already possesses the greatest marine pollution control skills in the region. This project will seek ways to collaborate with the oil industry, especially in conducting relevant environmental impact assessments, and in identifying possible sources of recurrent cost financing, such as "user fees."

7. Coordination arrangements

Section 4 above listed the government agencies that will participate in this project, most notably in the Project Steering Committee and the activities associated with subcontractor #1. Their involvement in this project is described in an organizational chart in Annex 1.

It will be particularly important to ensure coordination with: the WB/IFAD/EEC Fisheries IV project, located in MSRC, Aden; the Dutch cooperation programme, which may finance an environmental survey programme on the south coast; and the Maritime Training Centre, which will provide ongoing training in areas of interest to this project.

UNEP, through PERSGA, will maintain links with the GEF project in Egypt. PERSGA will arrange for joint short-term training programmes for both the Yemen and Egypt GEF projects. It will also maintain liaison with global organizations active in the region, such as IMO, FAO, IOC and UNEP. A detailed description of the regional project component is provided in Annex 2.

8. Counterpart support capacity

The requirements of this project, in terms of national counterparts and material resources, are listed below.

National staff/professionals

Two Yemeni counterpart staff will work with each short-term consultant. In this way, they will both participate in the project and receive on-the-job training (for more details see Section E, Inputs, and Section J, Budgets). For a number of activities yet to be specified, priority will be given to experienced national professionals to work alongside the short-term consultants.

Trainees

The Yemeni organizations participating in the project will nominate appropriate candidates for the project's various training programmes.

Project buildings

The Government of Yemen will provide project staff with the required office and laboratory space, as detailed in Section E, Inputs.

Special equipment

- *Pollution analysis equipment in Sana'a University.* The design of this project allows for flexibility to maximize the efficient use of existing equipment and facilities. Pollution analysis equipment at the University of Sana'a will be available for use in this project.

- *Boat.* A vessel will be required for a few weeks to survey the offshore reefs of the Red Sea. Rental for the boat is included in the budget. PCMA have affirmed their willingness to assist with the provision of the boat.

C. DEVELOPMENT OBJECTIVES

The objective of this project is to promote the sustainable use of natural resources by striking a balance between economic growth and environmental considerations, and to strengthen the human, institutional, technical and scientific capabilities in Yemen to protect the environment.

The Government of Yemen also intends to enhance both public and institutional awareness of the benefits to be derived from sound conservation practices in all sectors. An understanding of these long-term benefits in economic and social terms is essential to the sustainability of the results of this project. The task of coordinating and promoting environmental protection, and of promoting public awareness, has been assigned largely to EPC.

An important secondary objective is to reinforce *regional* efforts to manage the marine resources of the Red Sea. This will be achieved by ensuring coordination with parallel activities in the area through the regional component of this project.

This project also aims to develop procedures for combatting major oil spills, including access to oil spill control equipment. This is important because the nearest regional oil spill centre is located as far away as Djibouti. The project includes an element whereby the IMO can make a significant contribution in this field.

At the global level, this project will contribute to the protection of an international body of water that has significant biodiversity, as well as importance in terms of artisanal and commercial fisheries and tourism. The project is also replicable elsewhere along the Yemen coast of the Gulf of Aden and on the Red Sea coast of riparian countries.

D. IMMEDIATE OBJECTIVES, OUTPUTS AND ACTIVITIES

In this section, "time" indicates the periods in which project activities should take place. These activities are usually expected to occupy less than the full span indicated. "Work months" specify the duration of the service of short-term consultants.

IMMEDIATE OBJECTIVE 1

To evaluate the marine environment of the Yemen Red Sea in order to define and quantify its resource base, determine its present condition, and establish a monitoring programme to identify major areas of resource use conflict and compatibility.

Achievement Indicators

An improved understanding of the marine and coastal systems among government and other decision-makers to help them avoid or reconcile coastal conflicts, and identify future opportunities for sustainable marine resource use. This will be achieved principally through the generation of resource and resource use maps, databases and other technical information.

Output 1.1

Establishment of a Red Sea environmental database on marine and coastal ecosystems, key species groups, human uses and environmental pressures.

Activities for Output 1.1

1.1.1 Identification and recruitment of national personnel and external consultants, and the purchase of equipment.

Time (months): 1-12
Work months: 0.25
Responsibility: subcontractor.

1.1.2 Shoreline site assessment and classification of marine habitats along the mainland coast, based on mapping and rapid survey techniques. (A four-wheel drive vehicle will be used for this activity.)

Time (months): 6-24
Work months: 6
Responsibility: senior marine expert (#1), assistant marine expert (#2), and their counterparts.

1.1.3 Assessment of offshore reefs and associated biota based on rapid survey techniques as well as more quantitative methods, using ship transport.

Time (months): 6-24
Work months: 3
Responsibility: senior marine expert (#1), assistant marine expert (#2), and their counterparts.

1.1.4 Environmental analysis to determine geographical variations over time and assess current trends in the marine and coastal environment.

Time (months): 6-24
Work months: 1
Responsibility: senior marine expert (#1) and counterparts.

1.1.5 Production of maps and technical report based on environmental assessments of shoreline and offshore reefs.

Time (months): 18-24
Work months: minimal (derives from earlier activities)
Responsibility: senior marine expert (#1) and counterparts.

Output 1.2

Establishment of a marine environmental monitoring system for the Red Sea. The design of this will include identification of the most important sources and types of marine and coastal impacts, as well as a cost-effective monitoring protocol.

Activities for Output 1.2

1.2.1 Identification and recruitment of national personnel and external consultants, and the purchase of equipment.

Time (months): 1
Work months: 0.25
Responsibility: subcontractor.

1.2.2 Identification of major impacts on the marine environment from survey data obtained from Activities 1.1.2 and 1.1.3.

Time (months): 9-21
Work months: 1
Responsibility: senior marine expert (#1) and counterparts.

1.2.3 Design and plan of environmental monitoring system whose main component relates to marine impacts (municipal, industrial, and so on), while the secondary component consists of an appraisal of protection capability against oil pollution.

Time (months): 12-15
Work months: 1
Responsibility: senior marine expert (#1)

Time (months): 6
Work months: 0.5
Responsibility: IMO oil expert (#10).

1.2.4 Undertaking of environmental monitoring and development of monitoring protocol.

Time (months): 21-36
Work months: 4
Responsibility: senior EIA expert (#3), assistant EIA expert (#4) and their counterparts.

1.2.5 Writing of technical evaluation report.

Time (months): 30-36
Work months: minimal (derives from earlier activities)
Responsibility: senior marine expert (#1).

Output 1.3

Development of database and analysis of information.

Activities for Output 1.3

1.3.1 Identification and recruitment of national personnel and external consultants.

Time (months): 1
Work months: 0.25
Responsibility: sub-contractor #1.

1.3.2 Purchase of computer database and entry of data.

Time (months): 3-6
Work months: 1
Responsibility: senior marine expert (#1) and counterparts.

1.3.3 Creation of marine resource maps using the computer database and additional information from Outputs 1 and 2.

Time (months): 21-27
Work months: 2
Responsibility: cartographer (#5) and counterparts.

1.3.4 Sharing of resource data with regional and global programmes such as the GEF Egypt project, PERSGA and GEMS.

Time (months): 27-36
Work months: 0.25
Responsibility: Subcontractor #1.

1.3.5 Writing of technical report.

Time (months): 30-36
Work months: minimal (derives from earlier activities)
Responsibility: senior marine expert (#1).

IMMEDIATE OBJECTIVE 2

To improve Yemen's capacity to manage the marine environment, particularly in the areas of: environmental data collection and analysis, EIA and monitoring, and enhancement of public awareness. This capacity building will be achieved through the professional development of national counterparts during on-the-job training, and through in-service marine environmental training workshops. The provision for training includes sixteen overseas fellowships at the masters and diploma levels, and sixteen shorter courses in video-making/public awareness, cartography, and other vocational skills. Three regional workshops will provide additional training. Refer to Section E, Inputs and Annex 2 for additional details.

Achievement Indicators

An improved understanding among trainees of the contribution of the marine environment to national development and prosperity, through a range of in situ and ex situ courses. National counterparts and trainees will also be better equipped to undertake and manage marine environmental assessments, conflict resolution and avoidance, and most important, to incorporate marine issues in the national decision-making process. An increase in courses on marine conservation in university, college, and school curricula will be an additional indicator of success.

Output 2.1

Training in environmental data gathering and interpretation through:

- On-the-job training of national counterparts
- In-service training workshops
- One masters degree in tropical coastal management
- One masters degree in ecosystems analysis and management
- Diplomas in data collection and analysis
- Shorter courses/training for two trainees per course in computer software, instrumentation, diving/photography and cartography.

Activities for Output 2.1

2.1.1 Identification of training needs at the institutional and individual levels through an assessment of national skills and requirements in marine environmental data collection and analysis.

Time (months): 6-9
Work months: 0.5
Responsibility: information training expert (#6a).

2.1.2 Design of in-service training programmes and arrangements for overseas fellowships (masters and diploma levels) and short-term courses.

Time (months): 6-12
Work months: 1
Responsibility: information training expert (#6a) and subcontractor.

2.1.3 Implementation of the following training plans:

- On-the-job training of national counterparts
- In-service training in environmental data collection and interpretation
- Overseas fellowships in tropical coastal management (masters), ecosystems analysis and management (masters), and data collection and analysis (diplomas)
- Short-term courses/training in computer software, instrumentation, diving/ photography and cartography.

Time (months): 3-15
Work months: 1
Responsibility: information training expert (#6a), consultants and overseas institutions.

2.1.4 Writing of evaluation and technical report on in-service training.

Time (months): 3-18
Work months: 0.25
Responsibility: subcontractor #1.

Output 2.2

Training in EIA and monitoring through:

- On-the-job training of national counterparts
- In-service training programmes
- One masters degrees in marine environmental protection
- Diplomas in EIA and monitoring
- Short-term courses for two trainees per course in equipment operation/maintenance, technical training and analytical work.

Activities for Output 2.2

2.2.1 Identification of training needs at the institutional and individual levels through an assessment of national skills and requirements in EIA and monitoring.

Time (months): 6-9
Work months: 0.5
Responsibility: information training expert (#6a).

2.2.2 Design of in-service training programmes and arrangements for overseas fellowships (masters and diploma levels) and short-term courses.

Time (months): 6-9
Work months: 1
Responsibility: information training expert (#6a) and subcontractor.

2.2.3 Implementation of the following training plans:

- On-the-job training of national counterparts
- In-service training in EIA and monitoring
- Overseas fellowships in marine environmental protection (masters) and EIA and monitoring (diplomas)
- Short-term courses in equipment operation/maintenance, technical training and analytical work.

Time (months): 6-18
Work months: 1
Responsibility: information training expert (#6a), consultants and overseas institutions.

2.2.4 Writing of evaluation and technical report on training.

Time (months): 6-20
Work months: 0.25
Responsibility: sub-contractor #1.

Output 2.3

Training in public awareness enhancement through in-service training programmes, diplomas, and short-term courses for two trainees in video-making/public awareness.

Activities for Output 2.3

2.3.1 Identification of training needs at the institutional and individual levels through an appraisal of the current state of public awareness of marine environmental issues.

Time (months): 12-15
Work months: 0.5
Responsibility: public awareness training expert (#6b).

2.3.2 Design of in-service training programmes and arrangements for overseas diplomas and short-term courses.

Time (months): 12-18
Work months: 1
Responsibility: public awareness training expert (#6b) and subcontractor.

2.3.3 Implement the following training plans:

- On-the-job training for national counterparts and YEPS staff
- In-service training for counterpart public awareness specialists
- Overseas fellowships in public awareness (diplomas)
- Short-term courses in video-making/public awareness (YEPS).

Time (months): 12-20
Work months: 1
Responsibility: public awareness training expert (#6b), consultants and overseas institutions.

2.3.4 Writing of evaluation and technical report on training.

Time (months): 12-24
Work months: 0.25
Responsibility: sub-contractor #1.

IMMEDIATE OBJECTIVE 3

To develop a sustainable use system for the Red Sea environment and associated marine resources which will protect marine habitats and protected areas, and increase public and high-level government awareness of relevant problems and issues. A key requirement for the sustainability of project results is the provision of recurrent cost financing. The identification and acquisition of such financing will be facilitated by the project's regional coordination component. The attainment of this objective depends on the results of activities under Immediate Objectives 1 and 2.

Achievement Indicators

Establishment of the protected area system, an assurance of finances for recurrent costs, and the provision of assistance with certain management plans for EPC. An improved public awareness of the economic and environmental value of protected areas should also be achieved through educational materials.

Output 3.1

Assured recurrent cost financing for post-project activities.

Activities for Output 3.1

3.1.1 Identification of sources of funding from marine resource users such as the oil industry.

Time (months): 18-24
Work months: 1
Responsibility: financial specialist (#7).

3.1.2 Acquisition of secure finances for recurrent costs through negotiations with identified sources.

Time (months): 19-24
Work months: 1
Responsibility: financing specialist (#7).

Output 3.2

The development of a marine and coastal protected area system that avoids and/or reconciles resource use conflict.

Activities for Output 3.2

3.2.1 Identification of the extent and status of existing marine and coastal protected areas through an analysis of biophysical features and socioeconomic, institutional, cultural and legal issues.

Time (months): 12-15
Work months: 2 (for Activities 3.2.1 to 3.2.3)
Responsibility: senior marine expert (#1) and counterparts.

3.2.2 Review of the status of additional protected areas recommended in recent studies.

Time (months): 12-15
Work months: see Activity 3.2.1
Responsibility: senior marine expert (#1) and counterparts.

3.2.3 Proposal containing modifications for protected areas following environmental surveys and an analysis of the issues listed in Activity 3.2.1.

Time (months): 15-24.
Work months: see Activity 3.2.1
Responsibility: senior marine expert (#1) and counterparts.

3.2.4 Assistance with protected area management, including the development of management plans for selected high priority areas. Initially, these areas are likely to be multiple use areas on the coast.

Time (months): 18-27
Work months: 4
Responsibility: protected area manager (#8) and counterparts.

Output 3.3

Increased public awareness of marine environmental issues.

Activities for Output 3.3

3.3.1 Identification of public awareness/environmental education needs through consultation with government bodies (including EPC and the Ministry of Education) and environmental NGOs (YEPS).

Time (months): 18-20
Work months: 2
Responsibility: public awareness expert (#9).

3.3.2 Design and planning of public awareness/environmental education programmes and kits, involving EPC and the Ministry of Education, YEPS and the national media.

Time (months): 21-24
Work months: 2
Responsibility: public awareness expert (#9).

3.3.3 Implementation of public awareness/environmental education programmes, including the publication of materials.

Time (months): 24-32
Work months: 4
Responsibility: public awareness expert (#9).

3.3.4 Writing of evaluation and technical report on public awareness activities.

Time (months): 33-36
Work months: 1
Responsibility: senior marine expert (#1).

Output 3.4

Coordination with the GEF Egypt project and other regional activities (see Annex 2).

E. INPUTS

(See also Section J, Budgets.)

1. Government of Yemen

Personnel

The government will make available the services of professional staff from its agencies, institutions and other organizations or departments as required by the project. The following staff will be appointed:

Counterparts	*Work months*
Marine experts (2)	15
EIA & monitoring experts (2)	48
Cartographers (2)	8
Information experts (2)	4

Protected area managers (2)	12
Public awareness experts(2)	8
Subtotal:	95

Equipment and facilities

Office space for subcontractor (furnishings/equipment funded by UNDP)
Office and laboratory space for technical assistance.

Miscellaneous

Yemeni visas and work permits.

2. UNDP/GEF

Eighty percent of the share of the project covered by UNDP will be managed as a subcontract undertaken by an international company (subcontractor #1) with experience in the management of complex programmes in Yemen. Approximately 20 percent of project activities will be managed by UNEP (subcontractor #2) through PERSGA, which will provide coordination with the Egypt GEF project and other regional initiatives.

Subcontracted personnel

Project management	*Work months*
Subcontractor (full-time project management in Yemen)	36

Technical assistance	*Work months*
Senior marine expert (1)	11
Assistant marine expert (2)	4.5
Senior EIA monitoring expert (3)	2
Assistant EIA monitoring expert (4)	2
Cartographer (5)	2
Information & EIA training expert(6a)	5
Public awareness expert (6b)	2.5
Fund raiser/management expert (7)	2
Protected area manager (8)	4
Public awareness expert (9)	8
IMO oil pollution survey expert (10)	0.5
Subtotal (subcontracted personnel):	43.5

Subcontracted training

Fellowships	*Work months*
MSc in Marine Environmental Protection (1)	24
MSc in Tropical Coastal Management (1)	24
MSc in Ecosystems Analysis & Management (1)	24
Diplomas (6)	90

Study tours (short courses/training)	*Work months*
Computer software (2)	6
Equipment operation/maintenance (2)	6
Instrumentation (2)	6
Analytical work (2)	6
Technician training (2)	6
Diving/photography (2)	6
Video-making/public awareness (2)	6
Cartography (2)	6

Reimbursement to field offices for services provided in relation to GEF projects

Experience indicates that field offices are incurring a significant workload in relation to the identification, formulation, processing, support and monitoring of GEF projects. In line with UNDP's financial regulations, such support must be reimbursed and charged to the project budget (see letter of Mr. Gustaf Edgren, Assistant Administrator and Director, Bureau for Programme Policy and Evaluation, and Mr. Toshiyuki Niwa, Assistant Administrator and Director, Bureau for Finance and Administration, dated 18 December, 1992). The field office therefore requests reimbursement for the following services provided during implementation of this project:

- Locally recruited administrative assistant, based at UNDP field office, to assist the executing agent in project management on a daily basis (three years—US$ 36,000)
- Monitoring/field travel of office programme staff, four trips of three days each year (daily allowance—US$ 7,500 and rental of vehicles—US$ 2,200)
- Sundries: communication and office supplies (US$ 1,500)
- Contingencies (US$ 2,800).

Total: US$ 50,000

Equipment

The equipment for this project will be procured by the subcontractor according to UNDP rules and regulations. This equipment must be essential to the achievement of project objectives and,

in particular, to the development and transfer of knowledge and skills to national counterparts. The equipment intended for national institutions would be difficult to acquire by the government in the absence of hard currency and specific technical know-how.

All equipment used in the project will be operated by Yemeni personnel under supervision of the international staff. The project executing agency will be the recipient of the equipment at the end of the project.

The subcontractor will determine the exact specifications of the required equipment and ensure that its acquisition will be made on the basis of: quality, including productivity and durability at the lowest possible price; costs, availability and productivity of spare parts; and costs of operation and maintenance. The final list of required equipment will be determined with the executing agent upon arrival of the full-time project manager (subcontractor #1).

Expendable equipment

Thermometers (2)
Stationery, data sheets and miscellaneous office supplies
Charts and maps
Binoculars (2)
Tape recorders (2)
Equipment, spares and maintenance for laboratory equipment
Equipment, spares and maintenance for vehicles
Equipment, spares and maintenance for inflatable boats and outboard motors
Audiovisual materials

Non-expendable equipment

Hand-held salinity refractometers (2)
4-wheel drive vehicles (2)
Office equipment and furnishings (4 desks, 4 tables, 10 chairs, 4 filing cabinets, etc.)
Photocopiers (2)
Personal computers (2), printers (2) and software
Overhead projectors (4)
Slide projectors (4)
Fax machines (2)
Telephones (3)
Video cameras (2)
Video recorders/players (2)
Video monitors (2)
Inflatable boats (2)
Outboard motors (2)
Global Positioning Systems (GPS), such as Magellan (2)
Analytical laboratory and field equipment
- electronic top loading balances (2)
- stereo-microscopes (2)

- miscellaneous glassware
- seawater filtration units (2)
- zooplankton nets (2 medium mesh, 2 fine mesh)
- flow meters for zooplankton nets (4)
- miscellaneous chemical reagents
- spares for existing analytical equipment

Rental

Hire of boat for offshore survey
Hire of diving equipment.

F. RISKS

1. Delays in recruiting local staff could postpone field surveys and disrupt in situ and ex situ training and workshops.

   Estimated probability: Low.

   Possible corrective measure: Project management will identify counterparts prior to the arrival of short-term technical consultants.

2. Delays in the selection of trainees which would allow insufficient time to initiate language training prior to their departure for training courses.

   Estimated probability: Low.

   Possible corrective measures: Careful planning will be required to identify and prepare trainees well before application deadlines (many overseas institutions require language proficiency before acceptance).

3. Delays in the identification and hiring of consultants, and in the procurement of equipment.

   Estimated probability: Low.

   Possible corrective measures: Advance planning will be required in the identification and hiring of consultants. The procurement of equipment will be assigned to an efficient and reliable subcontractor.

4. Implementation and coordination difficulties due to the number of national agencies and organizations involved in the project.

   Estimated probability: Low to medium.

   Possible corrective measures: The involvement of the Project Steering Committee in project work and training is intended to ensure the necessary coordination.

5. Ineffective coordination between this project and the Egypt GEF project and regional bodies.

Estimated probability: Low.

Possible corrective measures: Substantial assistance from UNEP to PERSGA will be required to ensure frequent consultation with the Egypt GEF project and other environmental initiatives under the aegis of the UNEP Red Sea and Gulf of Aden Action Plan.

6. Local facilities and equipment (such as laboratory or boats) being unavailable or damaged.

Estimated probability: Low to medium.

Possible corrective measures: The terms of reference for the subcontractor and consultants will clearly assign them responsibility to ensure that the necessary equipment is available and functional.

7. Inappropriate short-term technical assistance.

Estimated probability: Low.

Possible corrective measures: The subcontractor will need to carefully review and, if necessary, amend the terms of reference for short-term consultants.

8. Unforeseen constraints in the Republic of Yemen.

Estimated probability: Low.

Possible corrective measures: The workplan and budget should be reviewed every six months and if necessary, revised.

9. Sustainability beyond project period is not guaranteed.

Estimated probability: Medium.

Possible corrective measures: Recurrent cost financing for post-project activities must be ensured, and the implementation of training programmes must be monitored closely.

10. Lack of commitment of national project personnel and concerned government authorities.

Estimated probability: Low to medium.

Possible corrective measures: As far as possible, staff hired for the project must be national experts and specialist consultants. It should also be ensured that training is viewed as a rewarding skill-building opportunity.

11. Lack of project impact at the policy level.

Estimated probability: Low.

Possible corrective measures: It is hoped that this risk will be minimized by the fact that the Project Steering Committee will be chaired by the national body entrusted with environmental policy making (EPC). National and regional workshops and seminars should also be organized to discuss and disseminate project achievements and conclusions.

G. PRIOR OBLIGATIONS AND PREREQUISITES

Prior Obligations

None.

Prerequisites

- The Government of Yemen will arrange for the timely release of national counterpart staff to ensure that project timing and schedules are not delayed.
- The government will arrange for the timely nomination and release of appropriate candidates for training.
- The government will arrange for the timely availability of appropriate office, laboratory and field facilities.
- The government will agree to facilitate the project by the timely provision of visas and other necessary permits.
- The government will ensure that the individual beneficiaries of project training will serve in the positions for which the training was intended for at least two years after the training is complete. Failing fulfillment of these conditions, the cost of training should be recovered from the individual or the government, as appropriate.

The project will be signed by UNDP, and UNDP assistance to the project will be provided subject to UNDP receiving satisfaction that the prerequisites listed above have been fulfilled. When fulfillment of any one or more prerequisites fails to materialize, UNDP may, at its discretion, either suspend or terminate its assistance.

H. PROJECT REVIEW, REPORTING AND EVALUATION

The project will be subject to a tripartite review (TPR) at least once every twelve months. This is a joint review by representatives of the government, the executing agent and UNDP. Given their role in the GEF, the World Bank and UNEP will be invited to attend as observers. The first such TPR meeting will be held within twelve months of the start of full implementation. The national project coordinator, with the assistance of the implementing agent/subcontractor #1, shall

prepare and submit to each TPR meeting a Project Performance Evaluation Report (PPER). Additional PPERs may be requested during the project if necessary.

A project terminal report will be prepared for consideration at the terminal TPR 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 meeting.

The project shall be subject to evaluation eighteen and thirty months after the start of full implementation. The organization, terms of reference, and timing will be decided after consultation between the parties to the Project Document, and any associated UN agencies. The evaluation shall also consider success in meeting the global objectives of the GEF related to the protection of international waters and biodiversity. NGO participation will be sought in the evaluation exercise.

Given the special nature of this marine ecosystem protection project, the participation of the World Bank and UNEP along with UNDP in the project review, reporting, and evaluation process is desirable. The World Bank and UNEP should specifically participate in the review of the inception report, the mid-term evaluation, and the terminal report.

I. LEGAL CONTEXT

This Project Document shall be the instrument referred to as such in Article 1 of the Standard Basic Assistance Agreement between the Government of Yemen and the UNDP, signed by the parties on 19 May, 1992. The executing agent shall, for the purpose of the Supplemental Provisions to the Project Document, refer to the government cooperating agency described in that agreement.

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

- Revisions in, or addition of, any of the annexes of the original Project Document
- Revisions which do not involve significant changes in the immediate objectives, outputs or activities of a 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 reflect increased expert or other costs due to inflation, or take into account agency expenditure flexibility.

J. BUDGETS

Five budget spreadsheets follow. The first is the government budget for the project, listing Yemeni contribution in kind. The second is the consolidated UNDP budget. This budget is further broken down to reflect the budget for the implementing agent (third budget) and subcontractor #1 (fourth budget). The fifth budget is for subcontractor #2 (UNEP).

PROJECT BUDGET COVERING GOVERNMENT CONTRIBUTION
(in kind)

Project Title: Protection of Marine Ecosystems of the Red Sea Coast
Project Number: YEM/92/G31

	TOTAL		1993		1994		1995	
ACTIVITY	P/M	RIYALS	P/M	RIYALS	P/M	RIYALS	P/M	RIYALS
10. Project Personnel								
10.01 Envir. info. (1.1)	11	55000	2	10000	5	25000	4	20000
10.02 Envir. monitoring (1.2)	52	260000	4	20000	24	120000	24	120000
10.03 Database (1.3)	8	40000		0	2	10000	6	30000
10.04 Protected areas (3.2)	12	60000		0	4	20000	8	40000
10.05 Public awareness (3.3)	12	60000		0	4	20000	8	40000
19. Subtotal personnel	95	475000	6	30000	39	195000	50	250000
30. Training (trainee salaries)								
31. Fellowships								
31.01 MSc	144	576000	36	144000	72	288000	36	144000
31.02 Diploma	180	720000	45	180000	90	360000	45	180000
31.99 Subtotal fellowships	324	1296000	81	324000	162	648000	81	324000
32. Short-term/study tours	48	192000	9	36000	30	120000	9	36000
33. In-service training								
33.01 Info/EIA/Pub. awareness	30	120000	20	80000	10	40000		0
33.02 CPU workshops	6	24000	2	8000	2	8000	2	8000
33.99 Subtotal in-service training	36	144000	22	88000	12	48000	2	8000
39. Subtotal training	408	1632000	112	448000	204	816000	92	368000
40. Equipment								
43. Premises								
43.01 Office space								
43.02 Laboratory space								
43.99 Subtotal premises								
49. Subtotal equipment								
GRAND TOTAL	503	2107000	118	478000	243	1011000	142	618000

Yemeni counterparts' staff average monthly salary = 5000

Yemeni trainees' average monthly stipend from ROY = 4000

PROJECT BUDGET COVERING TOTAL GEF CONTRIBUTION
(in US$)

Project Title: Protection of Marine Ecosystems of the Red Sea Coast
Project Number: YEM/92/G31

Source of Funds: GEF
Executing Agent: Ministry of Fish Wealth
Cooperating Agency: OPS

B/L	Item	Agency	Total	1993	1994	1995
	Personnel					
10.00	Duty travel	Govt.	75,000	25,000	25,000	25,000
11.51	IMO consultant	OPS	10,000	10,000	0	0
11.97	Mid-term eval. consultants	OPS	50,000	0	50,000	0
16.00	HQ mission costs	OPS	21,000	7,000	7,000	7,000
17.00	Short term natl. consultants	Govt.	83,788	30,000	30,000	23,788
19.99	Component total		239,788	72,000	112,000	55,788
20.00	Subcontracts					
20.21	Subcontractor 1 (company)	OPS	1,343,890	524,745	464,600	354,545
20.22	Subcontractor 2 (UNEP)	OPS	500,000	260,000	110,000	130,000
29.00	Component total		1,843,890	784,745	574,500	484,545
30.00	Training					
31.01	MSc Marine Ecosystems	OPS	40,800	0	20,400	20,400
31.02	MSc Coastal Management	OPS	40,800	0	20,400	20,400
31.03	MSc Ecosystems	OPS	40,800	0	20,400	20,400
39.00	Component total		122,400	0	61,200	61,200
40.00	Equipment					
42.01	Computer software	OPS	20,000	20,000	0	0
42.02	Vehicles	OPS	40,000	40,000	0	0
42.03	PC (2) and software	OPS	11,000	11,000	0	0
49.00	Component total		71,000	71,000	0	0

OPS SUB-BUDGET
(in US$)

Project Title: Protection of Marine Ecosystems of the Red Sea Coast
Project Number: YEM/92/G31

Source of Funds: GEF
Executing Agent: Ministry of Fish Wealth
Cooperating Agency: OPS

B/L	Item	Agency	Total	1993	1994	1995
	Personnel					
11.51	IMO consultant	OPS	10,000	10,000	0	0
11.97	Mid-term eval. consultants	OPS	50,000	0	50,000	0
16.00	HQ mission costs	OPS	21,000	7,000	7,000	7,000
19.99	Component total		81,000	17,000	57,000	7,000
20.00	Subcontracts					
20.21	Subcontractor 1 (company)	OPS	1,343,890	524,745	464,600	354,545
20.22	Subcontractor 2 (UNEP)	OPS	500,000	260,000	110,000	130,000
29.00	Component total		1,843,890	784,745	574,500	484,545
30.00	Training					
31.01	MSc Marine Ecosystems	OPS	40,800	0	20,400	20,400
31.02	MSc Coastal Management	OPS	40,800	0	20,400	20,400
31.03	MSc Ecosystems	OPS	40,800	0	20,400	20,400
39.00	Component total		122,400	0	61,200	61,200
40.00	Equipment					
42.01	Computer software	OPS	20,000	20,000	0	0
42.02	Vehicles	OPS	40,000	40,000	0	0
42.03	PC (2) and software	OPS	11,000	11,000	0	0
49.00	Component total		71,000	71,000	0	0

OPS SUB-BUDGET
(in US$)

Project Title: Protection of Marine Ecosystems of the Red Sea Coast
Project Number: YEM/92/G31

Source of Funds: GEF
Executing Agent: Ministry of Fish Wealth
Cooperating Agency: OPS

B/L	Item	Agency	Total	1993	1994	1995
50.00	Miscellaneous					
51.00	Operation & maintenance					
51.01	O&M jeeps	OPS	30,000	10,000	10,000	10,000
51.02	O&M inflatable boats	OPS	3,750	1,250	1,250	1,250
51.03	O&M outboard motors	OPS	7,500	2,500	2,500	2,500
51.04	O&M monitoring equipment	OPS	60,000	20,000	20,000	20,000
51.05	Contingencies	OPS	150,000	50,000	50,000	50,000
52.00	Reporting costs	OPS	15,000	5,000	5,000	5,000
53.00	Sundry	OPS	60,000	20,000	20,000	20,000
59.00	Component total		326,250	108,750	108,750	108,750
90.00	Sub-budget total		2,251,140	981,495	801,550	661,495
93.00	OPS support cost (6%)		146,672	58,890	48,093	39,690
99.00	GRAND TOTAL		2,397,812	1,040,385	849,643	701,185

BUDGET OF SUBCONTRACTOR #1
(in US$)
(See also Total GEF Budget b/l 20.01)

Project Title: Protection of Marine Ecosystems of the Red Sea Coast
Project Number: YEM/92/G31

Budget Line		P/M	Total	P/M	1993	P/M	1994	P/M	1995
11.50	Consultants								
11.51	Sen. marine expert	11.0	165,000	2.0	30,000	5.0	75,000	1.0	60,000
11.52	Asst. marine expert	4.5	67,500	2.0	30,000	2.5	37,500		
11.53	Sen. EIA/monit.	2.0	30,000			2.0	30,000		
11.54	Asst. EIA/monit.	2.0	30,000			2.0	30,000		
11.55	Cartographer	2.0	30,000						
11.56	Info./EIA training	5.0	75,000	5.0	75,000				
11.57	Public awareness	2.5	37,500			2.5	37,500		
11.58	Recurrent costs	2.0	30,000			2.0	30,000		
11.59	Prot. area mgmt.	4.0	60,000			1.0	15,000		
11.60	Public awareness	8.0	120,000			2.0	30,000		
15.00	Official travel		60,000		20,000		20,000		
19.00	Component total	43.0	705,000	9.0	155,000	19.0	305,000	12.0	245,000
30.	Training								
31.	Fellowships								
31.04	Diploma courses	90.0	90,000		0	45.0	45,000	45.0	45,000
32.	Study tours/Grp. Trn.								
32.01	Computer software	6.0	10,200	3.0	5,100	3.0	5,100		
32.02	Equip./maint.	6.0	10,200	3.0	5,100	3.0	5,100		
32.03	Instrument.	6.0	10,200	3.0	5,100	3.0	5,100		
32.04	Analyt. methods	6.0	10,200			6.0	10,200		
32.05	Maintenance	6.0	10,200			6.0	10,200		
32.06	Diving/photography	6.0	10,200			3.0	5,100	3.0	5,100
32.07	Video/pub. awareness	6.0	10,200			3.0	5,100	3.0	5,100
32.08	Cartography	6.0	10,200			3.0	5,100	3.0	5,100
39.99	Component total	138.0	171,600	9.0	15,300	75.0	96,000	54.0	60,300
40.	Equipment								
41.	Expendable		9,000		3,000		3,000		3,000
42.	Non-expendable								
42.01	Global positioning (2)		5,000		5,000				
42.02	Diving equipment (4)		10,000		10,000				
42.03	Analytic/monit.		200,000		200,000				
42.04	Inflatable boats (2)		10,000		10,000				
42.05	Outboard motors (2)		8,000		8,000				
42.06	Miscellaneous		50,000		50,000				
49.99	Component total		292,000		286,000		3,000		3,000
	Total	28.0	1,168,600	9.0	456,300	19.0	404,000	12.0	308,300
	Overhead Sub-contractor #1 (15%)		175,290		68,445		60,600		46,245
99.99	GRAND TOTAL	28.0	1,343,890	9.0	524,745	19.0	464,600	12.0	354,545

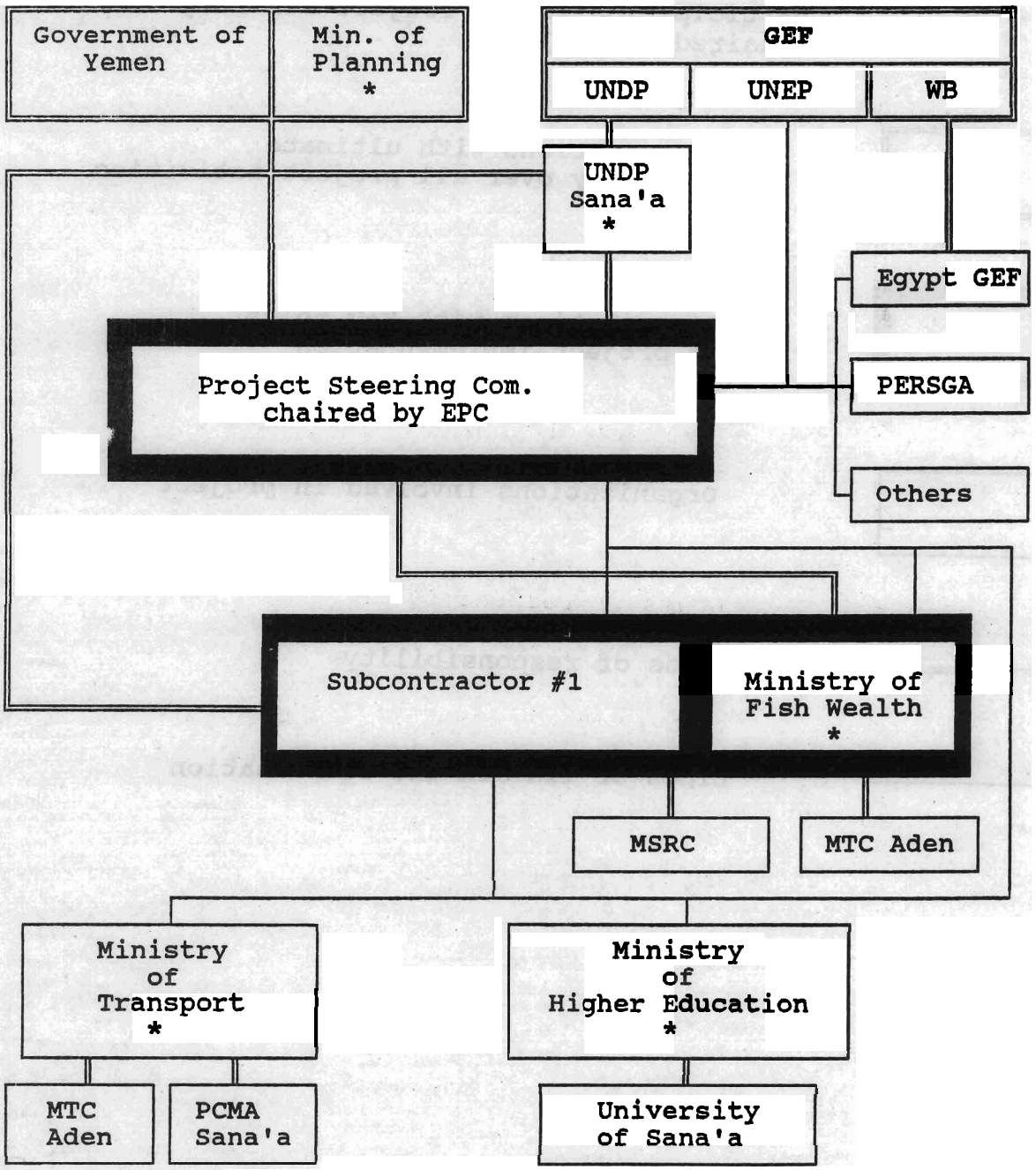
BUDGET OF SUBCONTRACTOR #2 (UNEP)
(in US$)

Project Title: Protection of Marine Ecosystems of the Red Sea Coast
Project Number: YEM/92/G31

B/L	Item	Total	1993	1994	1995
	Personnel				
11.01	Chief Technical Advisor	150,000	150,000	0	0
11.02	Assistant Coordinator	150,000	50,000	50,000	50,000
11.50	Assessment consultant	20,000	0	0	20,000
15.00	Travel project-funded experts	15,000	5,000	50,000	5,000
19.00	Component total	335,000	205,000	55,000	75,000
32.00	Workshops	135,000	45,000	45,000	45,000
51.00	Operation	30,000	10,000	10,000	10,000
99.00	Total	500,000	260,000	110,000	130,000

Annex 1

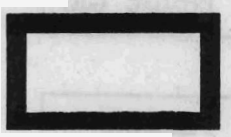
FRAMEWORK FOR REGIONAL AND NATIONAL COORDINATION



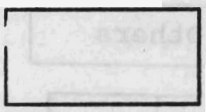
Legend:

* Participation in the Project Steering Committee (chaired by EPC)

Organizations with ultimate authority over all project activities



Organizations with key roles in project implementation



Organizations involved in project

Lines of responsibility

Lines of liaison and coordination

Annex 2

REGIONAL COORDINATION COMPONENT

Background

Two important elements of the Yemen GEF project are replicable in riparian countries worldwide—the protection of the marine ecosystem and the integration of the principle of sustainable use into the structure of the fishing industry.

The other GEF project in the region is the World Bank's Egyptian Red Sea Coastal and Marine Resource Management Project. Together these two projects are expected to revive PERSGA of the Regional Convention for the Conservation of the Red Sea and Gulf of Aden and its Action Plan (adopted by the Jeddah Conference of Plenipotentiaries in 1982), and to generate other programme related activities in the region.

Both these projects focus on the quality of the shared body of water and its main natural resource—the coral reefs, which are of direct relevance to sustainable development in the region. The shared assets of the Red Sea are of importance to Egypt and Yemen for tourism and fishing respectively.

A regional approach to the protection and management of the Red Sea environment, of which the two GEF projects are an integral part, will mitigate the degradation of the shared marine environment and enhance the benefits to be derived from common natural resources. Institutional reinforcement will play a critical role in this regional approach. PERSGA will be strengthened in order to coordinate the activities of both projects within the GEF Red Sea regional framework. UNEP, with the assistance of UNDP and the World Bank, will be responsible for strengthening the technical and management capacity of PERSGA through the design and implementation of a well-defined technical assistance programme. Parallel development of the two GEF projects, coupled with the enhancement of the regional structure, will provide a strong platform for coordinating environmental and development efforts in the Red Sea region.

Egypt—Red Sea Coastal and Marine Resource Management Project

The overall objective of the Egypt project is to protect marine biodiversity in the Red Sea. The specific objectives of the project are to:

- Develop and implement policies, plans, and regulations that ensure that development is consistent with the principles of sound environmental management
- Strengthen the capacity of government institutions to undertake integrated multi-sectoral management activities for coastal zones
- Develop and implement public-private partnerships to ensure the sustainability of common marine resources
- Develop and implement practical solutions for the establishment, management, and recurrent cost financing of marine protected areas and marine recreation resources

- Develop a database and inventory of the coastal and marine ecosystems of the Red Sea, as well as the private sector interests in the region, which can be used for future environmental activities.

The project will develop and implement an integrated Coastal Zone Management (CZM) programme in the Egyptian portion of the Red Sea between Ras Shukeir in the north and the Sudanese border in the south. This programme will have the following components:

- The development of a CZM plan
- The development of the environmental assessment capability of the Egyptian Tourism Development Authority (TDA) and the Egyptian Environmental Affairs Agency (EEAA) to evaluate, regulate, and monitor the impacts of coastal development, including tourism and oil and gas exploration
- The development of the capacity to monitor and enforce marine pollution control rules and regulations developed under the CZM plan among TDA, EEAA, and the Red Sea Governorate staff
- The management of recreational activities to protect the valuable and fragile coral reef habitats and promote training, public awareness, and sustainable tourism
- The establishment of marine protected areas, along with operational plans for their management and the training of necessary staff
- The monitoring, review, and evaluation of the CZM project to ensure that its goals of biodiversity protection and pollution prevention are met, and that the project is sustainable in the long run.

Regional coordination mechanism

Legislative authority. The establishment of a project coordinating mechanism for the two GEF projects is in fulfilment of the stipulation of the GEF initiative for the area that "a regional coordinating body will be chosen by mutual agreement among the implementing agencies and concerned governments" (GEF, *Report by the Chairman to the April 1992 Participants Meeting*, Part Two: Work Program, Third Tranche). Such a mechanism was also required by the 1982 Regional Convention for the Conservation of the Red Sea and Gulf of Aden and its Action Plan.

Establishment of a project coordinating mechanism. UNEP and UNDP undertook a GEF identification mission to Yemen and Egypt (24 November—8 December, 1991). During a project brief mission that followed (20 June—5 July, 1992), the proposal for the establishment of a regional coordination body for the two projects was discussed. UNEP presented an elaborated draft for discussion at a UNEP/World Bank consultation in Paris on 21 July, 1992. The draft was finalized at a UNDP/UNEP/WB meeting in Cairo in 1993.

As stated in the GEF project proposal that was endorsed by GEF Participants at their meeting in April 1992, "a regional coordinating body will be chosen by mutual agreement among the implementing agencies and concerned government." The institutional strengthening of PERSGA, the project coordinating mechanism, is an essential component without which the two projects would lack the support necessary for any positive impact on the region as a whole.

The Egypt and Yemen projects will establish focal points to monitor the progress of their regional elements and to liaise with PERSGA. These two focal points will provide PERSGA with regular status reports on project progress. Such information will be critical for identifying the steps necessary for replicating the activities in other countries of the region.

At its meeting in February 1992, the GEF Implementation Committee (IC) endorsed a proposal to allocate US $500,000 for the coordination of the GEF Red Sea Regional Framework.

Regional project coordination—role of PERSGA. It will be ensured that a coordinating mechanism is established for the regional components of the two GEF projects by the three GEF partners—UNDP, UNEP and the World Bank. The funding for this mechanism will be equally shared between UNDP/GEF and the World Bank/GEF.

With the assistance of UNDP and the World Bank, UNEP will be responsible for establishing the project coordinating mechanism within PERSGA. The technical and management capacities of PERSGA will be strengthened through the implementation of a well-defined technical assistance programme. PERSGA's role will also include coordination of the GEF projects with other regional activities. The specific objectives for this coordinating mechanism are given below.

The coordinating mechanism within PERSGA is intended to be a small and activity oriented unit that will function as a clearinghouse within the regional framework. It will consist of a Chief Technical Advisor acting as coordinator, assisted by an Assistant Coordinator who will function as an operational manager, and a regional counterpart to be selected by PERSGA in consultation with UNEP. Short-term specialists will be assigned to PERSGA for specific tasks related to the various activities. PERSGA will liaise with the project executing agencies in Egypt and Yemen who will provide PERSGA with regular status reports on project results.

Objectives, activities, inputs and outputs

Objective 1: Capacity building through regional training programmes for trainers.

Regional workshops: Both the Egypt and Yemen projects will implement training programmes for a variety of activities including EIA, protected area management, and public awareness enhancement. A programme to prepare national personnel to become trainers will be implemented through the three workshops listed below. It is expected that these trainers will implement the appropriate national training programmes as defined in the project documents for the two projects. It is also anticipated that individuals from other PERSGA member countries will participate and benefit from these courses. The workshops are designed to enhance the regional capacity in all PERSGA countries to manage the marine environment and facilitate the exchange of information.

(i) *Survey and monitoring workshop.* This one-week workshop will be held in the first year of the Yemen project to review environmental survey and monitoring techniques used in both the GEF projects, and to introduce other PERSGA member countries to appropriate techniques. This review and critique will include field survey and trials, and provide a basis for the development of standardized methodologies which are broadly acceptable at the regional level.

(ii) *EIA workshop.* This one-week workshop will be held in the second year of the Yemen project to review the problems associated with coastal area development, the prevalence and practice of EIA in the Red Sea region, and anticipated future requirements. Case studies will play a key role in the analysis. The workshop will address issues such as the identification of potential impacts, the prediction and measurement of impacts, the identification of monitoring requirements, and the communication of impact assessment results. General EIA guidelines for the region will be developed, although it is recognized that requirements may differ from country to country.

(iii) *Management of protected areas workshop.* This one-week workshop will be held in the third year of the Yemen project to review the extent of marine and coastal protected area networks in the PERSGA region, and to determine the need for more such areas. The following topics, among others, will be considered:

- Problems and opportunities for marine protected areas in the Red Sea region
- Development of a common analytical framework for the identification of key biophysical features and socioeconomic parameters for each PERSGA country
- Design of marine protected area networks, and related research and management plans
- Integration of marine protected area concerns in the national and regional process.

Inputs: Three consultancy months, one for each workshop.

Outputs: Training of approximately fifteen to twenty PERSGA country experts in the subject areas covered by the workshops.

Objective 2: Institutional reinforcement of PERSGA.

Activities:

(i) Establishment of a functional secretariat for PERSGA

(ii) Preparation of a three-year workplan for the identification of priority measures related to regional environmental issues in order to:

- Ensure the active participation of member countries in PERSGA and the Action Plan

- Leverage funds from international and regional financing institutions for the implementation of the Regional Convention for the Conservation of the Red Sea and Gulf of Aden.

(iii) Sensitization of member governments to the importance of implementation of the convention.

Inputs: Chief Technical Advisor (CTA) for PERSGA for one year to coordinate regional activities for the first year of the projects.

A full-time counterpart to the CTA provided by PERSGA for a period of three years.

Assistant Coordinator for three years to perform the function of an operational manager for regional project activities and to assist the CTA in discharging his duties and day-to-day responsibilities.

Outputs:

- A strengthened and fully operational PERSGA
- An updated Action Plan for the Red Sea and Gulf of Aden, and a three-year workplan formulated and implemented
- An increased understanding among PERSGA member countries of the importance of the Action Plan and its implementation
- Two to three programmes and project activities defined for implementation
- Committed funds for the implementation of these programmes and project activities.

Objective 3: Planning for future expansion of the Red Sea framework using the Yemen and Egypt models.

Activities:

- Assessment of the Egypt and Yemen project models in terms of lessons learned, cost-effectiveness, and replicability in other PERSGA countries
- Design of suitable pilot projects in two or three PERSGA countries on the basis of the above assessment
- Preparation of a regional project proposal to be submitted for funding to regional and international financial organizations, including GEF.

Inputs: A consultant for the last two months of the project to undertake the assessment.

Outputs:

- Assessment report on Egypt and Yemen projects including lessons learnt, cost-effectiveness and replicability
- Pilot projects for selected PERSGA countries
- Submission of phased regional proposal to potential donors.

Institutional framework, evaluation and budget

Institutional framework. The regional component will be implemented through a Letter of Agreement signed by OPS and UNEP under the Yemen GEF project. The regional activities will be undertaken by PERSGA according to a Memorandum of Understanding between UNEP and PERSGA. PERSGA will function under the general guidance of UNEP.

Evaluation. Regional activities will be evaluated periodically. PERSGA will submit progress reports to UNEP every six months. These reports will be reviewed by the World Bank and UNDP, and evaluated at interagency meetings.

Budget Estimate

GEF contribution		
Chief Technical Advisor (Coordinator)	US$ 150,000	12 months (first year)
Operational Manager (Assistant coordinator)	US$ 150,000	36 months (full duration)
Travel of project-funded experts	US$ 15,000	
Assessment consultant	US$ 20,000	2 months
Workshops	US$ 135,000	one workshop per year
Operations	US$ 30,000	36 months (full duration)
TOTAL	US$ 500,000	

PERSGA contribution	Cash (to be costed)	In kind
Coordinator counterpart		36 months
Office transport		36 months
Office facilities		36 months
Utility costs		36 months
Stationery and incidentals		36 months

Annex 3

PHYSICAL AND BIOLOGICAL CHARACTERISTICS OF THE YEMEN RED SEA COAST

The information presented here is drawn from surveys dated 1985[3] and 1991.[4]

Physical and biological setting

Along the Yemen coastline in the southern Red Sea, the continental shelf becomes very broad. Instead of the narrow and steep shelf typical of most of the Red Sea, the sea floor here slopes gradually, with shallow water extending many kilometres into the sea. This shelf collects land-derived sediments from the extensive Tihamah plains, and also generates large quantities of sediment from plant and animal remains. Sediments, mainly land-derived, dominate the subtidal and intertidal habitats of the Red Sea coast of Yemen.[5]

As the amount of fine sand and mud increases toward the north, mangroves are seen to increasingly dominate the Yemen coastline. Environments near the shore are mainly sedimentary, producing low-visibility water which is not favourable for coral reef growth or algal production on the sea bed. The most significant reefs are therefore found away from the shore. Reefs are mostly limited to the southern coastline, where they occur as patches in offshore locations. Although large expanses of limestone platform continue to be found, they are increasingly likely to be domes of pre-Holocene limestone uplifted by rising, underlying salt domes, rather than of growing reef. In many areas, fringing reefs have been replaced completely by broad and dense stretches of mangrove.

Farther south, the waves and currents are very strong, creating what is termed a high energy environment. Such waves move large amounts of sand, debris and other material. As a result, the shores are severely scoured and intertidal life is reduced. Coral reefs are found in greatest quantities in the southern third of the Yemen Red Sea coast. They usually occur around offshore islands, including those near the southern Farasan bank and toward the Bab el Mandeb. In these areas, outcrops of limestone can be found offshore. Few of these are actively growing reefs, and many are covered with algae instead of corals.

About a quarter of the coast of Yemen along the Red Sea and Gulf of Aden seems fringed with shallow reefs or limestone outcrops. These tend to exist mainly around headlands and certain straight sections of the coast. Mangroves are abundant only in well sheltered embayments. Most of the remaining coastline is made up of sandy, high energy beaches.

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3 IUCN, "Preliminary Coastal Zone Management Recommendations for YAR" pp. 70 and "The Distribution of Habitats and Species along the YAR Coastline" pp. 110. Yemen Arab Republic Marine Conservation Survey, IUCN/Red Sea and Gulf of Aden Environment Programme. Gland, Switzerland and Jeddah, Saudi Arabia, 1987.

4 Hydraulics Research (Wallingford) Ltd., Republic of Yemen: "Coastal Erosion and Siltation Study." Final report prepared for General Corporation of Yemen Ports (GCYP), Hodeidah, Ministry of Transport, 1992, pp. 250.

5 Sheppard, C.R.C., A.R.G. Price and C.J. Roberts, *Marine Ecology of the Arabian Area: Systems, Communities and Processes in Extreme Environments*, London: Academic Press, 1992, pp. 359.

The offshore areas near Yemen are richer in biodiversity than offshore waters anywhere else in the Red Sea. This biological wealth is not, for the most part, due to a healthy growth of plankton from within the Red Sea but from plankton blown in through the Bab el Mandeb from the Gulf of Aden, where it arises from nutrient rich upwellings. Most of this plankton drifts up slowly until the northern border, where it sinks. Some of it, however, is eaten by certain fish which form an important part of Yemen's fish resources.

Principal regions

The coast can be divided into three distinct biological zones that reflect the mobility of their sediments.

Northern zone. From the northern border of Yemen to approximately as far as As Salif (15°18'), the waves are less strong and move mainly the softer sediments. Such a low energy environment is similar to that of the offshore subtidal areas. Mangroves were present in most of the sites examined in this zone. They represent the most frequently found vegetation, and are particularly well developed in areas with good freshwater input. *Avicennia marina* (black mangrove) is the most common species, mixed occasionally with *Rhizophora mucronata* (red mangrove). Some extensive areas of mangroves represent fairly stable environments that have evolved over several decades.

Although these mangroves are stunted, they frequently prove a valuable resource for local coastal communities which utilize them either directly (for example, for fuel or construction) or indirectly, by depending on their productivity for fisheries. (This latter contribution remains unquantified.) Mangroves also play an important role in the stabilization of coastlines by reducing the energy of waves and currents and holding the lower sediments in place with roots. They also serve as windbreaks and protection from coastal storms.

The northern offshore areas are made up of mainly soft sedimentary environments. About a third of the sites possess seagrasses of nine species, which contribute further to stabilizing sediments. Only about 20 percent of the offshore habitat is composed of hard substrate, which is mainly limestone outcrops colonized by brown and red encrusting algae. In areas where seagrass beds are not well developed, the sea bed is usually dominated by muds containing communities of small species. Poor water clarity in this section of the coastline prevents the development of fringing coral reefs, although occasional patch reefs can be found further offshore.

Central zone. Mangroves are less common in the central area of the coastline, from south of As Salif to just south of Al Khawkhah (15°15' to 13°40'). Freshwater dependent vegetation is the most visually dominant at many sites. Sediments in this zone are generally more coarse and mobile, with occasional boulder/gravel formations. The sand on several beaches has consolidated to produce 1- to 3-metre wide steplike formations, indicating a higher energy environment than the northern zone. Palms extend inland to more than a kilometre in many locations, sometimes reaching the high water mark. They can frequently be undercut by coastal erosion processes.

Offshore environments tend to be barren, with few areas of well developed seagrass beds. As a consequence, substrates near the shore are more mobile. Few areas of fringing reef exist, and hard substrates were found at only 10 percent of the sites. These are colonized by brown algae, with only

occasional coral colonies. Half the offshore areas examined were principally extensions of the sand/gravel shoreline grading into the sea.

The productivity of this zone is believed to be caused by nutrients brought in through the Bab-el-Mandeb. Although the contribution of coastal processes to productivity has not been quantified, it is likely to be small.

Southern zone. The southern area, stretching from halfway between Al Khawkhah and Al Mukha to Dhubab (13°37' to 12°58'), still has mainly soft shorelines. The coastal vegetation is poor, dominated by salt tolerant plants which play a small role in consolidating coastal sediments. The rest of the vegetation is made up of occasional mangrove and palm communities, while the beaches are composed of medium grain sediments.

Much of the offshore environment is dominated by hard substrates, and 33 percent of the sites visited contained fringing reefs interspersed with seagrass beds. The remaining sites are hard limestone substrate colonized by mixed coral or brown algae. Water clarity in this zone is generally higher than in the other areas.

Critical habitats of Yemen's northern coast

A critical habitat, as defined by IUCN and UNEP, usually refers to an ecologically significant area that may be easily damaged or threatened. Emphasis is placed on critical habitats for two reasons. First, they are vulnerable. They contain living communities which require specific and sometimes narrow ranges of physical conditions for survival (for example, a narrow range of wave energy). Second, being highly productive in a biological sense, they provide valuable resources to man and are of great scientific value.

The use of the term critical habitat does not necessarily mean that the habitat is endangered; nor does the lack of the designation imply that it is not important. However, critical habitats are in general easily damaged, which invariably reduces or even eliminates their biological value and their value to humans. Many such habitats provide an important link in the chain of protein production.

The main critical habitats in Yemen are:

- Mangroves
- Seagrass beds
- Fringing coral reefs
- Offshore patch reefs
- Intertidal mud flats
- Wadi systems and freshwater dependent vegetation
- Areas of large algae attached to hard sea bed (for example, *Sargassum*)
- Mud flats.

The last category of mud flats, which can often be overlooked, probably represents the most productive sea floor habitat of Yemen. Mud flats are usually completely covered by mats of cyanobacteria and algae which fix nitrogen rapidly, and support rich invertebrate fauna used by migratory birds. Being located mainly in the intertidal region, mud flats are especially vulnerable to oil pollution.

All the critical habitats listed above must feature in any environmental protection plan for the coast, given their biological importance and their value to man.

Sediment movement

The mobility of sediments defines many features of the Red Sea coast. The quarter of the coastline containing fine sands and muds contains an abundance of life, unlike the remaining areas dominated or strongly affected by a regime of mobile sand which is abrasive to life.

At several locations, there is substantial net movement of sediment toward the north.[6] Many locations also show a marked progradation of the shoreline toward the sea. This has implications for harbours, water intake and other industrial structures. It also prevents the formation of biologically rich areas along the coast, since few species can tolerate the abrasiveness of mobile sand. Mobile sediments create a dynamic coastline that does not favour the growth of mangroves and reefs; even small movements of sediment can impede growth. Large movements move the position of the coastline itself by considerable distances and prevent the development of important habitats.

Despite the inhibiting effect of scouring, several sites exist where significant habitat development has occurred. These are especially valuable for Yemen both in biological terms, and because they represent only a small area compared to the stretches of sandy coasts.

Environmental problems characteristic of the coast

Taking into consideration the known range of habitats and critical habitats, and current and projected levels of coastal use, two main kinds of possible environmental problems can be predicted.

Dredging and shore construction. Sedimentation from dredging and shore construction commonly has adverse effects well beyond the area of direct activity. High energy conditions in certain areas along the Yemen Red Sea shoreline have led to the low occurrence of few species. In such areas, the direct harmful effects of dredging and shore construction may be expected to be low. However, several areas of fringing reefs, which could be affected by additional sedimentation, also occur in such high energy sites. Low energy areas support a greater wealth of a variety of species, and present a greater concern in this context. Although these are already sedimented areas, any large additional input of sediment, or disturbance of existing sediment, may cause a serious disruption of natural processes.

A third group of habitats are the clear water reefs, especially those offshore, which can suffer a severe reduction in species variety and abundance from increased sedimentation.

Natural changes in the pattern of sediment movement, erosion, and deposition also occur along the Yemen shoreline. Substantial lateral and longshore movements, which may in many cases be in an approximate annual equilibrium, have caused a substantial net longshore drift in several places. Excavation

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6 Hydraulics Research (Wallingford) Ltd., Republic of Yemen: "Coastal Erosion and Siltation Study." Final report prepared for General Corporation of Yemen Ports (GCYP), Hodeidah, Ministry of Transport, 1992, pp. 250.

or perpendicular constructions, combined with these natural movements, are likely to result in permanent changes in shoreline position in some areas. This could completely wipe out many productive habitats.

Oil. Oil has been identified as the main pollutant likely to cause the devastation of habitats on the Yemen Red Sea coast. Discussions of oil contamination in this area are to be found in some of the relevant literature.[7] The effects of oil damage on intertidal habitats in parts of the Arabian Gulf coast are well documented and provide an excellent model for what could be expected following a major oil spill off the Red Sea shoreline of Yemen, given the similarity of large expanses of intertidal habitats in the two areas.

Large oil spills are a serious concern. No effective oil spill contingency plan has been formulated despite the existence of bodies such as PERSGA, and the attempt to create an oil spill facility at Djibouti. Major spills anywhere off the Red Sea coastline require the freighting of equipment from the Arabian Gulf coast. One oil company active in Yemen even has a plan to freight equipment from Europe in the event of an emergency.

Low level and chronic oil contamination is also a problem. High energy beaches are most easily treated, but the low diversity habitats which usually fall outside environmental protection plans would be damaged, unless they also happened to be important recreational areas. Low energy habitats such as algal flats and mangroves are often badly affected even by moderate spills, and are difficult or impossible to treat. The prevention of localized contamination by the deployment of a few booms seems the only practical way to cope with this problem.

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[7] UNEP, "Management and Conservation of Renewable Resources in the Red Sea and Gulf of Aden Region," UNEP Regional Seas Reports and Studies, No. 64, 1985, pp. 83; IUCN, "Preliminary Coastal Zone Management Recommendations for YAR," pp.70 and "The Distribution of Habitats and Species along the YAR Coastline," pp. 110, Yemen Arab Republic Marine Conservation Survey, IUCN/Red Sea and Gulf of Aden Environment Programme, Gland, Switzerland and Jeddah, Saudi Arabia, 1987; and Sheppard, C.R.C., A.R.G. Price and C.J. Roberts, *Marine Ecology of the Arabian Area: Systems, Communities and Processes in Extreme Environments*, London: Academic Press, 1992, pp. 359.