

Strategic Action Programme
for the
Red Sea and Gulf of Aden

Regional Organization for the
Conservation of the Environment of the
Red Sea and Gulf of Aden

PERSGA

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Preface

The Red Sea and Gulf of Aden is a unique environment. Its waters have been used for thousands of years by people for fishing and trading, and for religious pilgrimages. Today the people of the Region share these waters with oil tankers and cargo ships, representing potentially serious risks to marine ecosystems. Coastal populations are increasing, posing new and increasing threats to the environment if this growth is not managed properly.

These ecosystems make the Red Sea and Gulf of Aden internationally significant—the extensive and very beautiful coral reefs are inhabited by many species which occur nowhere else in the world. Today these reefs are attracting tourists in ever-increasing numbers. However, if this growing tourism industry is not well managed we are in danger of losing a great and sustainable resource.

Fortunately, and unlike many other regional seas around the world, the Red Sea and Gulf of Aden are in a relatively pristine state. However, changes are rapidly occurring and it is imperative that we act now as a Region to prevent widespread degradation which is costly to repair.

The Red Sea and Gulf of Aden are shared by many countries, and a regional approach is therefore essential to conserve and protect our shared heritage. The Strategic Action Programme for the Red Sea and Gulf of Aden has been developed by the countries of the Region, in cooperation with the Global Environment Facility and its implementing agencies, the United Nations Environment Programme, the United Nations Development Programme, and the World Bank; a regional financial institution, the Islamic Development Bank; and the region's own environmental organization, the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden—PERSGA.

The Strategic Action Programme for the Red Sea and Gulf of Aden is based on the most recent information from throughout the Region, and in some cases provided previously unknown insights into our unique environment. It is my great hope that the results of the Programme will be an asset to the countries of the Region in their planning for the management and conservation of our unique coastal and marine environments.

Dr. Nizar I. Tawfiq
Secretary General

PERSGA

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The documentation for the Strategic Action Programme includes three complementary publications: (a) Strategic Action Programme – Volume 1 – Main Report (this volume); and (b) Strategic Action Programme – Volumes 2 and 3 – Supporting Studies. Volume 2 includes Country Reports for Djibouti, Egypt, Jordan, Saudi Arabia, northern coast of Somalia, and Yemen. Volume 3 contains the Navigation Risk Assessment and Management Plan for the Red Sea and Gulf of Aden and the Assessment and Status of the Living Marine Resources in the Red Sea and Gulf of Aden and Their Management. The Strategic Action Programme

has also prepared a wall map which shows major environmental features of the PERSGA Region.

Acknowledgments

Funding for preparation of the Strategic Action Programme has been provided by the Global Environment Facility (GEF) with implementation support from the United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP) and the World Bank, and execution by the United Nations Office for Project Services (UNOPS). Special support for the Navigation Risk Assessment and Management Plan has been provided by the Government of Norway through an agreement with the World Bank. Staff, office space and operating costs for the PERSGA Secretariat have been provided by GEF, UNEP and the Government of the Kingdom of Saudi Arabia.

Abbreviations and Acronyms

ACOPS	Advisory Committee on the Protection of the Seas
BOD	Biological Oxygen Demand
EEZ	Exclusive Economic Zone
EA	Environmental Assessment
Fund Convention	International Convention on the Establishment of a Fund for the Compensation for Oil Pollution Damage
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIS	Geographic Information System
GMDSS	Global Maritime Distress and Safety System
ICZM	Integrated Coastal Zone Management
IFC	International Finance Corporation
IMO	International Maritime Organization
IsDB	Islamic Development Bank
IUCN	World Conservation Union, formerly International Union for the Conservation of Nature
MARPOL	The International Convention for the Prevention of Pollution from Ships
MEMAC	Marine Emergency Mutual Aid Center
MIGA	Multilateral Investment Guarantee Agency
MPA	Marine Protected Area
NEAP	National Environmental Action Plan
PERSGA	Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden
PIP	Public Investment Plan
Region	Red Sea and Gulf of Aden Region
ROPME	Regional Organization for the Protection of the Marine Environment
RSCN	Royal Society for the Conservation of Nature of Jordan
SAP	Strategic Action Programme
SAR	International Convention on Search and Rescue

SOLAS	International Convention for the Safety of Life at Sea
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNOPS	United Nations Office for Project Services
VLCC	Very Large Crude Carriers
WWF	World Wide Fund for Nature

Executive Summary

Background

The Red Sea and Gulf of Aden contain some of the world's most important coastal and marine environments and resources. There is a great variety of reef types in the Red Sea with a structural complexity unmatched on Earth. The diversity of corals is greater than anywhere else in the Indian Ocean, and the number of species that are confined to the Red Sea and found nowhere else is extremely high. The Red Sea is one of the most important repositories of marine biodiversity on a global scale and features a range of important coastal habitats. The Gulf of Aden, one of the biologically least known branches of the Indian Ocean, holds fishery resources of international importance. The Socotra Archipelago contains unique aquatic and terrestrial ecosystems and species, with limited impact from human activities. The rich cultural heritage of the Region, especially in the narrow coastal zone, includes large numbers of significant archaeological, historical and sacred sites which are increasingly at risk from development pressure.

Although the Red Sea is still one of the least ecologically disturbed seas relative to other enclosed water bodies, it is in in-

creasing jeopardy. There is a growing risk of marine pollution, and environmental degradation from rapidly expanding maritime activities. Coastal habitat is being converted for urban and industrial development. Tourism and recreation usage are growing quickly. In the Gulf of Aden the fisheries are under great pressure from over-exploitation and illegal fishing, and there are reports of toxic waste dumping by foreign vessels.

Goals and Objectives

In view of the environmental uniqueness of the coasts and waters of the Region, the threats they are facing, and the necessity for actions, the preparation of the Strategic Action Programme (SAP) for the Red Sea and Gulf of Aden was initiated in October 1995. The SAP process, coordinated by the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA), has been undertaken with support from the countries of the Region, the Global Environment Facility (GEF), selected international development institutions and donor organizations.

The SAP supports and facilitates the primary goal of PERSGA, which is the

conservation of the environment of the Red Sea and Gulf of Aden. The aims of the SAP are to develop a regional framework for the protection of the environment and the sustainable development of coastal and marine resources. The Programme outlined in the SAP focuses on both *preventive* and *curative* measures required to maintain the rich and diverse coastal and marine resources of the Red Sea and Gulf of Aden.

The SAP is a significant *process* for reaching agreement concerning environmental trends, threats and priorities at a regional level. It is also a *product* in the form of an Action Programme which provides a framework for continued cooperation in reaching short-, medium- and long-term goals through a series of complementary actions at all levels. The SAP document will be implemented through a continuous, consultative and cooperative process.

The SAP Task Force

The development of the SAP has been overseen by a Task Force which includes representatives of the PERSGA Secretariat and Member States, the Islamic Development Bank, the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), and the World Bank. The Government of Eritrea has also been invited to join the Task Force and to work as a partner in the SAP process. Under the chairmanship of the Secretary General of PERSGA, the Task Force has developed and supervised the work programme, reviewed the results of the programme, and provided technical and administrative input. Four meetings of the Task Force have been held: in Jeddah (October 1995), Amman (April 1996), Sana'a (January 1997), and Jeddah (May 1997). During the first meeting, the Task Force's Terms of Reference were compiled and the work plan developed. The second meeting reviewed the technical

progress and agreed on the follow-up activities for the remaining stages of the SAP. The third and fourth meetings focused on technical discussion of recent findings, the preparation of the final report including recommendations, and associated projects.

Preparation of the SAP has been supported by regional studies on navigation and fisheries. A Navigation Risk Assessment and Management Plan has been prepared to examine regional, national and local issues. The Plan has been prepared with the support of a Working Group of regional experts on maritime and port management, which has held meetings in Egypt and Yemen. The regional study on living and marine resources has assessed their current status and has been prepared with the support of a meeting of regional experts held in Saudi Arabia.

Country Participation

The development of the SAP has been a collaborative process whereby national experts have cooperated to produce reports which analyze environmental issues of regional, national and local significance. National reports were prepared by all cooperating countries and field surveys were conducted in countries where baseline data are limited. To widen participation further and to facilitate consensus building, a pilot national workshop was held in Jordan in August 1996 to review the Country Report. This was followed by a series of national workshops in other countries to finalize the Country Reports and to develop priority actions required by each country to address the environmental threats identified.

The coastline of Eritrea occupies a considerable portion of the western Red Sea, and its diverse range of marine habitats contains species unlike those found in the central and northern Red Sea. For these reasons, Eritrea holds a significant

place in the overall marine biodiversity of the Red Sea and its participation in the SAP, as an active partner working alongside the other states, is critically important. This will be facilitated through the development of a strong and equal working partnership between the Government of Eritrea and PERSGA. The Secretary General of PERSGA, through the assistance of UNDP, is actively discussing the modalities for such a partnership with representatives of the Government of Eritrea, so that the Programme will be a regional process which reflects the needs of each country.

Regional Threats

The environment and resources of the Red Sea and Gulf of Aden are threatened by a variety of human activities. The rate of population and economic growth in the coastal zones of the Region has resulted in increased pressure on the environment, from dredging and filling operations, from the disposal of domestic and industrial effluent, and from the non-sustainable use of freshwater resources. A major contributor to growth in the coastal zone, and the consequent impacts, is the rapidly expanding tourism industry. Marine resources are being exploited in a non-sustainable way and also illegally.

The global importance of petroleum and the resulting maritime traffic in the Red Sea and Gulf of Aden pose a serious threat to the fragile coastal and marine environments. Routine operational leaks and spills from production in the Gulf of Suez and the transport of oil constitute the principal source of marine pollution in the Region. At the same time, the growing risk of oil traffic-related accidents creates a considerable demand for emergency response combined with management skills to minimize risks and control major spills. Emerging issues will need to be addressed in a preventive fashion.

These threats highlight the need for effective use of environmental management practices. Most of the threats and impacts which have been identified can be prevented by proper environmental planning and management, use of environmental assessments, and also through the enforcement of appropriate regulations, most of which are already in place.

The SAP process has identified a number of major threats to the environment, and to the coastal and marine resources of the Region:

WIDESPREAD HABITAT DESTRUCTION:

- Unplanned coastal development
- Extensive dredging and filling
- Destruction of coral reefs
- Destruction of mangroves
- Destruction of seagrass beds

NON-SUSTAINABLE USE OF LIVING MARINE RESOURCES:

- Overfishing for local and export markets
- Illegal shark fisheries for the East Asian shark fin market
- Turtle exploitation and egg collection
- Incidental capture of marine mammals in fishing nets

NAVIGATION RISKS, PETROLEUM TRANSPORT AND PETROLEUM PRODUCTION:

- Extensive risk of ship collision and grounding in major traffic lanes
- Discharge of sewage from vessels
- Ship discharge of solid waste
- Oil spills from exploration, production, and transport

IMPACTS OF URBAN AND INDUSTRIAL DEVELOPMENT:

- Excessive use of surface and ground-water resources
- Destruction of coastal and marine habitats during construction
- Discharge of partially treated and untreated municipal wastewater
- Industrial pollution
- Hazardous wastes
- Cooling water discharge
- Waste oil disposal

RAPID EXPANSION OF COASTAL TOURISM:

- Surface and groundwater extraction
- Destruction of coastal and marine habitats during construction
- Inadequate sewage and solid waste disposal
- Disturbance to wildlife and habitats by tourists
- Illegal collection of corals and mollusks for souvenir trade

OTHER CONCERNS:

- Illegal disposal of toxic substances by foreign vessels in the Gulf of Aden
- Sedimentation from agriculture and grazing in some locations
- Risks from pesticides and fertilizers in some locations

EMERGING ISSUES:

- Development of free zones
- Improperly managed expansion of small and medium industries
- Exploitation of offshore mineral deposits
- Shrimp and fish farming
- Ornamental fish collecting

Actions to Address Regional Threats

Many of the threats which have been identified are related to a lack of planning and management of development in the coastal zone, limited use of environmental assessment procedures in making investment decisions, and the inadequate enforcement of existing laws. Living marine resources need to be managed effectively so that their long-term sustainable use is assured. Reducing the risks of navigation accidents will eliminate an additional threat to the marine environment. The management of coastal tourism and increased public awareness about the value of the marine environment will promote habitat and resource conservation. Areas in which management is hampered by a lack of information can be addressed by appropriate applied research. The SAP process has identified the following actions to address these threats:

ENHANCING GOVERNMENT COMMITMENT AND PUBLIC AWARENESS:

- Long-term high level commitment to protection of the Red Sea and Gulf of Aden
- Ratification of MARPOL Convention
- Development and implementation of regional programme for environmental awareness

IMPROVING ENVIRONMENTAL PLANNING, MANAGEMENT, AND ENFORCEMENT:

- Strengthening the capacity for planning and management
- Strengthening the capacity for coastal zone management
- Strengthening the capacity for environmental assessment
- Strengthening the capacity for enforcement of existing regulations

- Strengthening regional environmental information systems through the standardization and updating of databases, including those maintained on geographic information systems (GIS), to facilitate data exchange

PROMOTING HABITAT CONSERVATION:

- Effectively implementing coastal zone management programmes
- Development of a regional network of Marine Protected Areas
- Development of conservation and management programmes for coral reefs
- Development of conservation and management programmes for mangroves
- Development of conservation and management programmes for seagrass beds
- Development of conservation and management programmes for coastal wetlands
- Rehabilitation of mangrove stands

MANAGING LIVING MARINE RESOURCES:

- Stock assessment programme for the development of a fisheries management strategy
- Development and implementation of a management programme for shark fishery
- Development of a regional research and management programme on coral reefs
- Development and implementation of a programme for marine turtle conservation
- Development and implementation of a programme for marine mammal conservation
- Development and implementation of a programme for seabird conservation
- Strengthening the enforcement capacity for existing fisheries regulations

- Development and implementation of environmental guidelines for fish and shrimp farming

- Development of mechanisms for controlling the collection of corals and mollusks

REDUCING NAVIGATION RISKS AND OIL SPILLS:

- Adoption and implementation of Port State Control
- Development and implementation of regional and sub-regional vessel traffic systems
- Upgrading existing marine navigation aids in the Red Sea and Gulf of Aden
- Upgrading existing navigation aids in narrow passage areas and high risk areas
- Development and implementation of a regional oil spill contingency plan
- Preparation or upgrading of national Oil Spill Contingency Plans
- Upgrading of the existing Marine Emergency Mutual Aid Centers and the establishment of similar facilities in other sub-regions

REDUCING IMPACTS FROM URBAN AND INDUSTRIAL DEVELOPMENT:

- Improving urban and industrial planning
- Improving coastal zone management
- Routine use of environmental assessment
- Development of control mechanisms for construction work, dredging and reclamation
- Increased priority for management of surface and groundwater resources
- Strengthening the capacity to manage municipal wastewater and industrial effluents

- Strengthening the capacity to manage solid and hazardous waste
- Conservation of the cultural heritage of the coastal zone
- Environmentally sound development of free zones
- Environmentally sound development of small and medium industries
- Elaboration of regional environmental guidelines for the development of non-petroleum offshore mineral deposits

IMPROVING MANAGEMENT OF COASTAL TOURISM:

- Development of control mechanisms for construction work, dredging and reclamation
- Strengthening the capacity to manage wastewater discharge from coastal resorts
- Development of mechanisms to prevent the over-exploitation of fish and shellfish for tourist consumption
- Enforcement of existing regulations prohibiting the collection of corals, mollusks, and other marine life
- Development of awareness programmes to reduce disturbance to wildlife and habitats by tourists
- Proper site selection and planning for tourism developments
- Establishing reasonable capacity limits for tourism developments

PROMOTING APPLIED RESEARCH:

- Preparation and dissemination of a species identification guide for fishery purposes and environmental management
- Strengthening the capacity for applied research and monitoring
- Strengthening of environmental laboratory capacity

- Biodiversity studies and species inventories

The SAP: A Framework for Action

The Strategic Action Programme process provides a framework and a mechanism to enhance regional environmental management through a series of complementary policy, institutional strengthening and investment actions. The Strategic Action Programme will be supported by projects designed to address the identified issues. These projects will be implemented on a short-, medium- and long-term basis according to the nature of the issue being addressed. The SAP may be periodically updated to reflect progress in implementation and to identify new measures to address emerging issues or unanticipated events. It is envisaged that the process will not end with the completion of the initial SAP document, but will continue through further cooperation between PERSGA and the Task Force, with the Task Force acting as an advisory body to PERSGA. The process will also continue through the establishment of selected Working Groups at the regional and sub-regional level, whose function will be to address transboundary issues. National Working Groups will also be established to deal with the implementation of projects and activities at the national and local levels.

The Strategic Action Programme Process

The Red Sea and Gulf of Aden: A Dynamic Region

OVERVIEW. In the last three decades, many countries in the Red Sea and Gulf of Aden (the Region) have had to address the consequences of war, civil strife, drought and famine, as well as the challenges of environmentally and socially sustainable development. In addition to these political, economic, environmental and social problems, demographic changes and pressures have remained major constraints. During this same period, the countries of the Region have included among the lowest in per capita income, while some have good rates of economic development, and one has a very high record of providing donor assistance. In spite of their significant economic, social and political differences, the countries of the Region share several common environmental problems and threats. These shared concerns have provided a firm justification for regional collaborative efforts.

ENVIRONMENT AND DEVELOPMENT TRENDS. Development activities in the Region are heavily concentrated in coastal areas and depend on a combination of fragile terrestrial and marine resources. While the

coastal and marine environments of the Region are globally among the least disturbed, its living and non-living resources are in increasing jeopardy. Coastal habitat is being converted to urban and industrial development, and limited freshwater resources are under intense pressure. Tourism and recreational use are growing quickly in coastal areas, especially adjacent to fragile coral reefs. There is a greater risk of marine pollution and environmental degradation from rapidly expanding energy development and maritime activities. Throughout the Region, fisheries are under significant pressure from over-exploitation and in large areas illegal fishing is having devastating results. In the Gulf of Aden, there are reports of foreign vessels illegally dumping toxic wastes. The social need for development of basic infrastructure in the Socotra Archipelago will create potential threats to the unique ecosystems of these islands. The Red Sea remains one of the busiest marine transport regions of the world, making this multi-national sea prone to major oil pollution.

A Framework for Regional Cooperation: Jeddah Convention, PERSGA and the SAP

THREE COMPLEMENTARY MEASURES. The environmental challenges brought about by developments in the Region have been recognized, and a series of cooperative initiatives taken at the regional, national and local levels. A framework for regional environmental cooperation is provided by three complementary elements: (a) the Jeddah Convention; (b) the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA); and (c) the Strategic Action Programme for the Red Sea and Gulf of Aden (SAP). Their common goal is to cooperatively identify and undertake a programme of well designed actions to assure long-term management and conservation of the coastal and marine resources of the Region, in order to support environmentally and socially sustainable development. These elements include a legal basis for cooperation, an official regional organization to coordinate activities, and development and implementation of a strategic programme of preventive and curative actions. The initiatives complement and build upon a range of actions at the national and local levels being taken by the cooperating parties; they include support for improved wastewater services in coastal areas, management measures for control of pollution from industries and ports, fisheries regulations and establishment of Marine Protected Areas at selected sites.

JEDDAH CONVENTION. The Jeddah Convention of 1982, formally titled "Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment," provides an important basis for environmental cooperation in the Region. It was the result of a Regional Intergovernmental Conference, supported by the United Nations Environment Programme. The Re-

gional Intergovernmental Conference also adopted a "Programme for the Environment of the Red Sea and Gulf of Aden (PERSGA)," and a Secretariat for the Programme was established in Jeddah. In addition, the Conference produced two important instruments: (a) an "Action Plan for the Conservation of the Marine Environment and Coastal Areas in the Red Sea and Gulf of Aden"; and (b) a "Protocol Concerning Regional Cooperation in Combating Pollution by Oil and Other Harmful Substances in Cases of Emergency." Currently, Djibouti, Egypt, Jordan, Palestine, Saudi Arabia, Somalia, Sudan and Yemen are parties to the Jeddah Convention. The provisions of the Jeddah Convention are complemented by those of MARPOL and the Basel Conventions.

PERSGA. PERSGA is an official regional organization responsible for the development and implementation of regional programmes for the protection and conservation of the marine environment of the Red Sea and Gulf of Aden, and was formally established in September 1996, with the signing of the Cairo Declaration by all cooperating parties to the Jeddah Convention. It is based in Jeddah. Major functions of PERSGA include the implementation of the Jeddah Convention, the Action Plan, and the Protocol. It has also been given responsibility for preparation and implementation of the SAP and related activities. PERSGA has played an active role in promoting regional cooperation and has recently supported regional workshops concerning environmental assessment (EA), Marine Protected Areas, navigation risks and living marine resources. In addition, a series of national workshops have been sponsored by PERSGA to facilitate the development and review of Country Reports prepared as part of the SAP process.

At the PERSGA Council of Ministers meeting in Jeddah on 26 October 1996, the countries of the Region, having considered

the Executive Summary before them, gave approval to the recommendations and results of the SAP preparatory phase and the process as a whole. The Council of Ministers resolved to heighten high level political commitment to national and international cooperation on the coastal and marine environments. The preparatory process for the SAP included PERSGA Council meetings, PERSGA Task Force meetings, Country Consultation workshops, a series of meetings on special topics and conduct of field surveys in four countries (see Appendices A and B). Furthermore, the Council decided to strengthen national and regional institutional capabilities, promote public awareness, and support integrated approaches to coastal zone management, environmental planning and impact assessments. The Council also agreed to adopt the necessary measures to reduce navigation risks at the national and regional levels, strengthen environmental legislation and enforcement capacities, reinforce regional cooperation to ensure effective participation in international environmental Agreements/Conventions, and strengthen environmental information systems.

THE STRATEGIC ACTION PROGRAMME FOR THE RED SEA AND GULF OF ADEN. The SAP provides a cooperatively developed framework for the long-term conservation and management of the coastal and marine resources of the Region as mandated by the Jeddah Convention of 1982. Preparation of the SAP has been coordinated by PERSGA and has been undertaken with the financial support of its members, the Global Environment Facility (GEF), selected international development institutions and selected donor organizations. The SAP is the product of a cooperative and consultative process undertaken by a Task Force which includes: PERSGA members, Islamic Development Bank (IsDB), United Nations Development Programme (UNDP), United Nations En-

vironment Programme (UNEP), and the World Bank. The SAP is complemented by a series of specially prepared background documents which include Country Reports, a Regional Navigation Risk Assessment and Management Plan, a Regional Study on the Status of the Living Marine Resources in the Red Sea and Gulf of Aden and Their Management, and an update of the bibliography of selected studies and background documents for the Red Sea and Gulf of Aden (see Appendix C).

The SAP: An Agenda for Regional, National and Local Action

THE SAP—PROCESS AND PRODUCT. The SAP process was initiated in October 1995 with the first meeting of the Task Force, held in conjunction with the “Sea to Sea Conference” in Jeddah. The SAP represents a significant “process” for reaching collective agreement concerning environmental trends, threats and priorities at a regional level, and a “product” in the form of a Strategic Action Programme which provides a framework for continued cooperation in reaching short-, medium- and long-term goals through a series of complementary actions at all levels. The SAP presents an overview of the environmental trends and threats on a regional basis and recommends a phased programme of complementary “preventive” and “curative” actions to address current and emerging issues. It delineates key measures for institutional strengthening, human resources development and expansion of public awareness at the regional, national and local levels. The SAP also reviews opportunities for the mobilization of domestic and international resources, both public and private, to undertake the Programme.

KEY MEASURES FOR REGIONAL ENVIRONMENTAL MANAGEMENT. The SAP identifies a series of key measures for regional environmental management to

support sustainable development, sound management and effective conservation of the coastal and marine environments. These measures include:

- *High Level Commitment.* Effective development of long-term high-level commitment to conservation of the coastal and marine resources of the Region;
- *Enhanced Public Awareness.* Enhancement of public awareness of the importance of these resources and the active role of the public in their conservation;
- *Integration into Development Planning.* Integration of environmental management into the public and private sector development planning and investment process, with the participation of stakeholders;
- *Identification and Evaluation of Trends.* Recognizing the dynamic and rapid development of the Region, the SAP supports identification and evaluation of environmental trends in the coastal and marine areas through periodic focused studies;
- *Strengthening of Institutions.* Sustained support for a diversity of measures for institutional strengthening and human resources development in public and private institutions at all levels;
- *Preventive Measures.* Support for preventive measures to avoid adverse environmental impacts through proper environmental planning, use of environmental assessment and targeted proactive investments;
- *Curative Measures.* Support for curative measures which can be implemented in a cost-effective manner to correct existing environmental and natural resource management problems;

- *Management Programmes.* Upgrading and expansion of current management programmes for critical resources in the coastal and marine environments;
- *Monitoring and Evaluation.* Establishment of an affordable system for monitoring and evaluation of the effectiveness of regional, national and local interventions for management and conservation of the coastal and marine environments; and
- *Resource Mobilization.* Adoption of measures at the regional, national and local level that facilitate effective and timely mobilization of domestic and international resources to undertake the Programme.

National and International Efforts

NATIONAL POLICIES AND STRATEGIES. In the Red Sea and Gulf of Aden, it is imperative that national efforts to improve institutional, policy and legislative capacity for environmental protection be fully supported. The cooperating parties have, in varying ways, included sustainable development as a key goal in most of their national development plans and strategies even though coastal and marine environmental considerations still need to be fully addressed in sectoral development programmes. The respective SAP-related Country Reports provide indications of the programmes, plans and actions as well as institutional arrangements put in place to protect the marine environment. A number of PERSGA members have developed National Environmental Action Plans (NE-APs), carried out country studies on the state of their environment and natural resources and/or prepared reports inspired by the United Nations Conference on Environment and Development (UNCED). The improvement of institutional capacities for environmental management remains a major goal and challenge of the governments

in the Region. Integrating environment and development in sectoral decisionmaking and economic planning is being accorded greater attention.

STRENGTHENING NATIONAL AND INTERNATIONAL ENVIRONMENTAL LEGISLATION. The nations of the Region have approved many new environmental laws and standards in the last decade and since the adoption of the Jeddah Convention and PERSGA. In their determination to strengthen participation in regional and international agreements, the cooperating parties have signed or ratified a number of Conventions (Appendix D).

GEF-SUPPORTED ACTIVITIES. A number of GEF-supported projects have been launched in some cooperating countries. Those listed below are of special relevance to the conservation of the environment of the Red Sea and Gulf of Aden:

- Egypt-Red Sea Coastal and Marine Resource Management Plan;
- Eritrea-Conservation and Management of Eritrea's Coastal Marine and Island Biodiversity;
- Jordan-Gulf of Aqaba Environmental Action Plan;
- Yemen-Protection of the Marine Ecosystems of the Red Sea Coast; and
- Yemen-Conservation and Sustainable Use of Biodiversity of the Socotra Archipelago.

INTERNATIONAL EFFORTS. International efforts and cooperation with the Region have focused on a number of critical areas, the highlights of which include:

- *Capacity Building and Institutional Development.* Efforts have concentrated on identification of issues and inventory of capabilities to deal with the Region's marine environment concerns.

In this regard priority considerations covered the following:

- ◇ Establishment of regional marine pollution response centers;
- ◇ Support for marine pollution response organizations;
- ◇ Support for oil spill responses through purchase of equipment, training of experts, development of tools such as oil spill trajectory models; and
- ◇ Development of regional networks to monitor the incidence of oil spills and other marine pollution incidents.

A number of projects are also being supported by the international community, including:

- ◇ State of the Marine Environment Report of the Red Sea and Gulf of Aden;
 - ◇ A Review of the Environmental Legislation in the Red Sea and Gulf of Aden;
 - ◇ Study for the establishment of ship reception facilities for wastes in the Red Sea ports;
 - ◇ Training in oil spill response techniques for regional experts; and
 - ◇ Directory of national capabilities in marine sciences in the PERSGA Region.
- *Environmental Baseline Data.* Actions have been directed to acquiring baseline data, with particular attention to field inventory of existing sources of pollutants, development of basic environmental information, and assistance to national environmental agencies in developing environmental management capabilities. International efforts include support for:

- ◇ Bibliography of Oceanographic and Marine Environmental Research: Red Sea and Gulf of Aden;
 - ◇ Evaluation of the status of marine mammals in the Red Sea and Gulf of Aden;
 - ◇ Review of the geology of coral reefs in the Red Sea;
 - ◇ Inventory and sustainable development of coastal habitats in the PERSGA Region; and
 - ◇ Environmental inventories of the coasts of Saudi Arabia and Yemen.
- *Information Services.* International support is being extended to the development and dissemination of information. These resources generally fall under the following categories:
 - ◇ Scientific and technical information on the baseline status of the marine environment;
 - ◇ Institutional/legal information regarding modalities for the successful establishment and operation of regional and national programmes of environmental management; and
 - ◇ Monitoring of the environment.

The Uniqueness of the Red Sea and Gulf of Aden

A Repository of Biodiversity

A SERIES OF UNIQUE ENVIRONMENTS. The Region contains some of the world's unique coastal and marine environments, in the Gulfs of Aqaba and Suez, the Red Sea, and the Gulf of Aden. Among the most notable is the extraordinary system of coral reefs and their associated animals and plants. Surrounded by arid terrestrial environments, which are themselves unique, these environments support rich biological communities and representatives of several endangered species. The natural resources have supported coastal populations for thousands of years, and nourished the development of a maritime and trading culture linking Arabia and Africa with Europe and Asia.

THE RED SEA. The Red Sea is one of the most important repositories of marine biodiversity in the world. Its relative isolation, and physical conditions which range from nearshore shallows to depths of over 2,000 meters in the central rift, have given rise to an extraordinary range of ecosystems and biological diversity. Its most renowned expression is the elaborate system of coral reefs. There are also mangroves,

seagrass beds, reefs constructed of algae and intertidal habitats. Species endemism in the Red Sea is extremely high, particularly among some groups of reef fishes and reef-associated invertebrates.

THE GULF OF ADEN. The Gulf of Aden is strongly influenced by the upwelling of cool, nutrient rich waters during the southwest and northeast monsoons and is characterized by a prevailing high energy climate. These pose major constraints on coral reef development, hence only 5 percent of the Yemeni Gulf of Aden coast is lined with fringing reefs. Rocky cliffs alternating with long stretches of littoral and sub-littoral sand along coastal plains dominate the coastline. Some of the sandy beaches, notably Ras Sharma and Dhobah (Ash Shihr) of Yemen, form major nesting sites for green turtles in the Region. Little is known about the coastal and marine resources of the Gulf of Aden coast of Somalia although recent visits have revealed the occurrence of previously unknown coral reefs and mangrove stands.

THE SOCOTRA ARCHIPELAGO. Situated at the eastern extreme of the Gulf of Aden, the Socotra Archipelago, which is part of

Yemen, is of global significance for island biodiversity and species endemism. Over one third of its plants are endemic to the archipelago, making it one of the top ten island groups in the world in terms of endemism. Many of these endemics are remnants of an ancient flora which long ago disappeared from the African–Arabian mainland. Unlike many island groups in the

world, Socotra has remained virtually untouched by modern development and there is no evidence of recent extinction or large–scale changes in the vegetation. The marine environments of Socotra Archipelago remain largely in a pristine state, unaltered by coastal pollution or over–exploitation (see Box 1).

Major Coastal and Marine Environments

MAJOR ECOSYSTEMS. The coastal and marine environments of the Region consist of a range of ecosystems: an arid coastal zone, coastal wetlands, mangroves, sea-grasses, and coral reefs. These contrasting

ecosystems are the basis of much of the Region's rich and unique biodiversity, its fisheries production, its conservation and recreational values. They are also vital to the livelihood of the coastal populations. They stabilize and protect the coastline, and buffer changes in water quality. These ecosystems are linked by the movement of

Box 1: Socotra Archipelago

Some 400 kilometers south of the Arabian Peninsula lies the Socotra Archipelago, which is part of the territory of the Republic of Yemen. The archipelago consists of Socotra and three outlying islands, Abd al-Kuri, Samba and Darsa. The islands are characterized by very high numbers of species found nowhere else on earth. Of the 850 plant species found on the island group, at least 277 are endemic. Six endemic bird species have been recorded on Socotra Island. Recent surveys revealed that the archipelago could be an extremely important area for marine biogeography. The archipelago has been described by the World Wide Fund for Nature (WWF) as an "Indian Ocean version of the Galapagos," based on the high degree of endemism and unique vegetation types on the islands.

The total population of the Socotra Archipelago is estimated at 50,000–80,000, with the vast majority on Socotra Island. The majority of the population on the island is dependent on livestock, with the coastal population relying more on fishing and date cultivation. Traditional management practices of land, livestock and fisheries play a major role in the conservation of the archipelago's natural resources. These practices need strengthening during the process of basic development to avoid irreversible damage of the natural ecosystems and resources upon which the local people depend for livelihood.

The Government of Yemen has shown keen commitment to conserve the natural resources of the Socotra Archipelago while supporting the basic development needs of the local people. In January 1996, a Government Decree declared the formation of the Inter-Ministerial High Committee for Development of Socotra, chaired by the Deputy Prime Minister and Minister of Planning. Soon after that, the Government announced an allocation of YR256 million (approximately USD2.0 million) for the initial costs of a Master Plan for Development of Socotra Archipelago. In September 1996, the Environmental Protection Council was designated as the Secretariat of the High Committee.

Upon requests by the Government of Yemen, UNDP approved in 1996 a Preparatory Assistance "Basic Needs Assistance for the People of the Socotra Archipelago" focusing on health, education, water and sanitation, and renewable energy. This was further developed into a full-scale project (USD2.0 million). Complementary to this development initiative is the USD4.9 million GEF project "Conservation and Sustainable Use of the Biodiversity of Socotra Archipelago." The five-year project seeks to conserve the unique biodiversity of Socotra Archipelago, by integrating resource management and development strategy, driven by the local communities, and building on sound ecological and socio-economic bases. The success of these newly developed initiatives relies not only on the commitment of the Government, the local people and UNDP, but also recognition and support from the global community for the islands' globally significant biodiversity.

water through them, and decline in the health of one will have impacts on the others. The aridity of the coastal zone has historically concentrated human settlement near available water supplies and created a traditionally heavy reliance on the marine environment as a source of food.

ARID COASTAL ZONE. Perhaps the most distinctive characteristic of the Region is the existence of an arid coastal zone which surrounds the Sea. The zone consists of a flat coastal plain of varying width which is often bordered inland by extensive mountain ranges. The coastal plain in many areas is dominated by large alluvial fans characterized by seasonal discharge of water in a limited series of flood flows. Close to the shore the coastal zone is dominated by salt-tolerant vegetation which grades into arid-adapted plant associations. Areas adjacent to springs or other sources of permanent water are traditionally characterized by oasis-type vegetation.

COASTAL WETLANDS. Brackish and freshwater ecosystems in the arid coastal zone are unique in their adaptation to stressful environmental conditions. They contain particularly high concentrations of flora and fauna with a biodiversity which far surpasses that of surrounding areas. They host high numbers of rare plants and animals, often including species endemic to the Region. Their areas of distribution are usually very limited and some of the species are relicts of taxa which were more widely distributed in the geological past. Open freshwater bodies are the breeding sites of insects that may venture deep into surrounding arid lands. The presence of freshwater attracts large numbers of reptiles, birds and mammals and some of the larger wetlands of the Region host bird populations of international importance. Coastal wetlands are often associated with oases which are of great importance for the local populations. The Aden Wetlands,

for example, are some of the most important wetlands in Yemen and the Arabian peninsula, regularly holding over 10,000 waterfowl, three globally threatened species, and twelve with regionally important populations.

MANGROVES. There are extensive mangrove stands in the Red Sea and Gulf of Aden, especially in the southern Red Sea. Mangroves are an extremely important form of coastal vegetation: their extensive root systems stabilize sediments and protect the coastline; they provide shelter for an array of marine animals, birds—enhancing overall biodiversity—and the juveniles of commercially important fish and crustaceans. The dead leaves and branches of mangroves are a source of food within the mangrove ecosystem and also offshore, such as in shrimp communities. However, environmental conditions in the Region, such as temperature and salinity, are near the upper limits for mangrove existence, which makes them very sensitive to disturbance and probably limits their ability to recover.

SEAGRASS BEDS. Seagrasses inhabit shallow and sheltered waters throughout much of the Region. The productivity of seagrass beds is greater than comparable areas of both coral reefs and mangroves. Seagrass roots stabilize sediments, and in conjunction with nearby mangroves, protect the coastline. Water currents are reduced in the vicinity of seagrass beds leading to the deposition of fine sediments and the clarifying of surrounding waters. Many marine animals rely upon seagrass beds for shelter and food, including water birds, fish and crustaceans, and the internationally important dugong and green turtles. Commercially important fish and crustaceans use seagrass beds as nursery grounds. There are strong connections between seagrass beds and nearby coral reefs: nocturnally active fish migrate at night from the reefs

to the seagrass beds to feed; dead seagrass leaves carried offshore in currents become food for animals inhabiting deeper marine habitats.

CORAL REEFS. The coral reefs of the Region are composed of approximately 200 species of stony corals, representing the highest diversity in any section of the Indian Ocean. The warm water and absence of freshwater input provide very suitable conditions for coral reef formation adjacent to the coastline. In the northern Red Sea the coast is fringed by an almost continuous band of coral reef, which physically protects the nearby shoreline. This beautiful environment is extremely attractive as a tourist resource and is currently visited by hundreds of thousands of people each year, who dive, walk, and swim in the waters adjacent to the reefs. Further south the coastal shelf becomes much broader and shallower and the fringing reefs gradually disappear to be replaced by shallow, sandy shorelines and mangroves. Coral reefs become more numerous offshore in this part of the Region.

CORAL REEF FRAGILITY. Coral reefs also occur as offshore patch reefs and reefs fringing islands. They provide food and shelter for a large and diverse fauna and flora. Most fishing activities in the Region occur in shallow waters in the vicinity of coral reefs. Corals require a range of physical conditions for healthy growth and reproduction, all of which are influenced by human activities. Physical destruction, changes in water quality—such as raised nutrient levels, and changes in salinity and temperature—high levels of sedimentation, and changes in water currents can all damage coral reefs. Recovery, through new growth and larval settlement, requires a considerable amount of time and freedom from chronic stress.

GLOBALLY IMPORTANT SPECIES. The waters of the Region support many interna-

tionally important species, notably marine mammals, sea turtles, and seabirds. Marine mammals in the Region are represented by cetaceans such as dolphins and whales, and dugong. Although dugong were hunted in the past by artisanal fishermen, this is no longer the case and where surveys of their populations have been done, such as in Saudi Arabian waters, the populations are healthy. In the absence of major human impacts, conservation of dugong is directed towards conservation of feeding habitats, the seagrass beds. Sea turtles feed and nest in the Region and at least three species—green, hawksbill and loggerhead—have been observed. They rely on seagrass, algae, and invertebrates for their food. Information on their status is generally lacking and hunting by humans continues in some parts of the Region.

RESIDENT AND MIGRATORY BIRD POPULATIONS. Coastal wetlands, the shallow waters adjacent to reefs and islands, and the numerous islands throughout the Region provide ideal habitat for a large number of seabirds. Some of the important resident species include the Lesser Flamingoes (*Phoenicopterus minor*) and the Yellow-vented Bulbul (*Pycnonotus xanthopygos*), while the important wintering species include the Greater Spotted Eagle (*Aquila clanga*), White-eyed Gull (*Larus leucophthalmus*) and the Greater and Lesser Sand Plover (*Charadrius leschenaulti*, *C. mongolus*). The Red Sea is a flyway for many species of birds which seasonally migrate between Europe and Africa, and the islands of the southern Red Sea, in particular the Farasan Islands, are utilized by many hundreds of thousands of birds in the spring and autumn migrations. Here there are internationally important populations of Saunders' Little Tern (*Sterna saundersi*), Bridled Tern (*Sterna anaethetus*) and the resident Egyptian Vulture (*Neophron percnopterus*).

Cultural Heritage

SITES UNDER DEVELOPMENT PRESSURE. The important cultural heritage of the Region, concentrated in the narrow coastal zone, includes many archaeological, historical and sacred sites which are increasingly at risk from development pressure through both direct destruction and disturbance. The Red Sea has served as a major route for communication and trade between Asia, Africa and Europe, as the result of which it has a large number of cultural heritage sites from a diversity of periods and cultures. The Region has long been the focus of international religious pilgrimage, especially to the Holy cities of Mecca and Medina, which are traditionally reached through the ports of Jeddah and Yanbu. This long tradition of pilgrimage and trade has diversified the kinds of sites and artifacts. A little examined aspect of the Region is the high potential for underwater sites of archaeological significance, such as prehistoric and early historic sites which were covered as the result of land movement or sea level rise, or stemmed from ancient as well as modern shipwrecks.

CONSERVATION OF CULTURAL HERITAGE. Conservation of this resource requires recognition of its value in the planning and development process. In many nations of the Region, archaeological and historical site surveys are often conducted as part of the environmental assessment process for a proposed project and are especially important given the limited surveys and excavations in the Region. In other cases cultural heritage values are integrated into the development process, such as the measures adopted for the conservation of the Islamic city of Aqaba, historic buildings of “Old Jeddah” and the programme supported by the United Nations Educational, Scientific and Cultural Organization (UNESCO) for the restoration of the important historic trading center of Suakin on the southern

coast of Sudan. Given the significant risk in most coastal areas within the Region that buried cultural heritage sites might remain unknown, the use of “archaeological chance find procedures” in projects provides clear guidance if cultural materials are encountered during excavation and construction activities. The economic importance of cultural heritage sites is expected to grow given the need to diversify activities for tourists in order to increase their length of stay in the Region.

TRADITIONAL MARITIME CULTURE. The inhabitants of the coastal areas of the Region have a rich history of association with the sea, and are an integral part of the diverse cultural heritage of each country. Artisanal fishermen have fished the Region’s waters for thousands of years in a sustainable manner and in many places continue to do so with little advancement in technology. These artisanal fishermen have established forms of traditional management of their resources, including the rotation of fishing activities among reefs to prevent over-fishing and decline of stocks. An extensive knowledge of the sea, fishing techniques, and habits of species caught by fishermen are retained by a few individuals who serve as leaders in each fishing community. In a few places the tradition of pearl diving continues, although the number of divers is dwindling. This part of the Region’s cultural heritage is at risk of disappearing in some localities as local fishermen are replaced by foreign workers, prices for fish fall, and competition with industrial fisheries grows.

Threats to Coastal and Marine Environments and Resources

A RANGE OF THREATS. The important coastal and marine environments and resources of the Red Sea and Gulf of Aden are subject to a series of individual and cumulative threats which have significant short- and long-term consequences for sustainable development of the Region. The threats include habitat destruction, over-exploitation of living marine resources, environmental degradation from petroleum development, significant risks from marine transportation, pollution from industrial activities, diverse environmental impacts from urban and tourism development and a series of emerging environmental issues associated with new types of economic developments and uses of new technologies. A summary of the threats to coastal and marine environments and resources is provided as Table 1.

Environmental Degradation

THREATS TO KEY ECOSYSTEMS. The unique environment of the Red Sea and Gulf of Aden rests on the interaction between five key ecosystems which form a continuum between the land and the sea.

The land is dominated by an arid coastal zone that is the traditional site of human settlement and economic activities. The coastal zone is bordered by four major ecosystems: coastal wetlands, which provide extensive habitat for resident and migratory bird species; mangroves, which extend from the water's edge across the tidal zone in many places, providing critical habitat for fishery resources and buffering the coast from erosion; seagrass beds, found in shallow waters adjacent to the coastline, which provide breeding habitat and refuge for marine life; and offshore coral reefs with a great diversity of life. These ecosystems are under variable pressure in the Region, with greatest stress adjacent to urban and industrial areas, near port facilities and major shipping lanes, and in the vicinity of coastal tourism areas.

DEGRADATION OF THE ARID COASTAL ZONE. Ecosystems in arid zones are delicately balanced and particularly sensitive to disturbance. An increasing number of nomads are moving into the coastal zone with their livestock, especially following long periods of drought in large parts of the Re-

gion. Grazing by goats and sheep, and to a lesser extent by camels, reduces the plant cover. As a result, dunes and sand sheets, which were formerly stabilized by vegetation, are being remobilized, smothering mangroves and other coastal vegetation. Plants are also being removed for fodder and firewood. An increase in cross-country driving destroys the plant cover and remobilizes the sand. Urban and industrial development result in the degradation and removal of coastal vegetation, introduction of exotic species, and ultimately in loss of biological diversity. Extensive use of limited freshwater resources places additional pressure on biota which already have to contend with a naturally irregular and limited water supply. Coastal wetlands and oases are particularly at risk.

DISTURBANCE TO COASTAL WETLANDS. Aquatic ecosystems in arid areas, which have limited and irregular freshwater supplies, are particularly fragile and sensitive to disturbance. Their small size makes them especially vulnerable to pollution. Those that are easily accessible or have a high concentration of birds and mammals, tend to attract large numbers of visitors, which often results in solid waste dumping and use of detergents. Wetlands also suffer from grazing by livestock, who destroy the vegetation cover through trampling, and pollute the water body with excrement. The lowering of the water level for agriculture and households poses the greatest threat, often resulting in a collapse of these fragile natural systems and the irreplaceable loss of biological diversity.

CLEARING AND DEGRADATION OF MANGROVES. Mangroves are prone to degradation and removal from a multitude of developmental and exploitative activities. Mangroves are destroyed by landfilling and cleared for the construction of shrimp ponds. In coastal areas where human population is increasing rapidly, mangroves

are cut for firewood and for construction. Grazing by camels reduces the height of mangrove trees, their productivity, and their reproductive capacity. The damming of rivers and wadis has reduced natural freshwater inputs to the coast and degraded mangrove stands. Causeways constructed across bays have reduced the tidal exchange of seawater leading to extensive mangrove death. Degradation in mangroves leads to impacts on fish and crustacean catches. These impacts are compounded by a lack of awareness about the importance of mangroves in the coastal and marine environments, especially the relationship between mangroves and fisheries, and by the limited use of environmental assessment procedures.

LOSS OF SEAGRASS BEDS. Their location in shallow waters close to the shoreline renders seagrasses very susceptible to activities related to unplanned and unmanaged urban, industrial, tourism, and fishing activities. Seagrasses are destroyed directly by dredging and landfilling. Productivity is degraded by changes in water flow caused by coastal constructions, by excessive sediment in the water reducing available light, and by the impacts of increased nutrients in the water from sewage disposal. These problems are compounded by a lack of environmental assessment procedures for developments, lack of awareness about the importance of seagrasses, and lack of information on their distribution. Although legally protected from trawling, seagrass beds are destroyed by illegal trawling because of difficulties in enforcement. Impacts on seagrass beds affect the fauna which depend upon them, most importantly turtles, dugong, commercial fish and crustaceans, and birds.

DESTRUCTION OF CORAL REEFS. Coral reefs throughout the Region are being damaged by a variety of coastal developments, and as a direct result of human ac-

tivities. Landfilling for urban expansion and tourism developments are destroying. Construction activities also alter the flow of clear seawater that corals need to survive. Corals are affected by the reduced light levels, and sometimes smothered by sediment from dredging. Release of semi-treated and untreated sewage directly onto coral reefs causes a proliferation of algae that can overgrow corals. Although coral reefs are attractive to tourists, unmanaged activities of divers and reef-walkers, and anchors from boats, destroy corals in high-use areas. Damaged areas become unattractive and the numbers of animals living there decline. Damage to coral reefs is further compounded by the limited use of environmental assessment for developments and low enforcement of the existing, adequate regulations. A lack of awareness about the importance of coral reefs and their sensitivity puts them further at risk.

Non-Sustainable Use of Living Marine Resources

OVER-EXPLOITATION OF RESOURCES. Over-exploitation of species, destruction of spawning, nursery and feeding grounds, improper resource management and inadequate fisheries regulations, in conjunction with a lack of law enforcement, are barriers to sustainable development of the Region's rich living marine resources. Ultimately, this poses a serious threat to the biological diversity and productivity of the Region, and puts at risk the livelihoods of people engaged in potentially sustainable activities, such as fisheries, aquaculture and tourism.

OVERFISHING. The status of fisheries in some nations of the Region is unknown, because of a lack of stock assessments and incomplete fisheries statistics. Reported declines in catches and average size of fish landed are possible indicators of overfishing. Besides finfish, catches of lob-

ster and strombids are rapidly declining. Cuttlefish stocks in major fishing grounds have completely collapsed. Although in some areas shrimp catches have grown recently due to an increase in fishing efforts, in other areas there are indications of stock depletion. The present situation is attributed to destructive fishing practices, possible exploitation beyond maximum sustainable yield, the absence of fisheries management plans, and a lack of surveillance and enforcement of existing regulations. Important nursery habitats, such as mangrove and seagrass beds, have been severely damaged or destroyed.

UNREGULATED SHARK FISHERIES. As top predators, sharks are critical to the health of the Region's marine ecosystems. Sharks are slow growing, begin reproduction relatively late in life, and produce only a small number of offspring. They are very vulnerable to stock collapse from overfishing, and recovery takes several decades. The traditional artisanal fishery in the Region catches only small numbers of sharks and the whole animal is utilized. However, there is a large-scale illegal fishery for the East Asian shark fin market involving fishermen working outside their normal territorial boundaries. Sharks are caught by lines and also by nets which damage the coral reefs. The fins are removed, often while the shark is still alive, and the body is thrown back into the sea or deposited on offshore islands. Fins are dried and sold to foreign vessels waiting in international waters, thus escaping control. Large amounts of bycatch from net fishing, including turtles, dolphins and finfish, are discarded, almost invariably dead.

CAPTURE OF MARINE TURTLES. Throughout the southern Red Sea and Gulf of Aden, turtles are caught either accidentally or intentionally by fishermen. Turtle oil, meat, and eggs are eaten, and the shells are sold to tourists. Capture of turtles, to-

gether with egg collection and disturbance or destruction of nesting sites and nesting beaches, has resulted in a decline in nesting populations. In areas with poor finfish resources, fishermen often depend on turtles for subsidiary food. Stray dogs that feed on turtle eggs and hatchlings aggravate the problem in some areas. The light coming from nearby urban areas and coastal roads and highways has a distortion effect on the navigation system of newly hatched turtles, causing massive casualties.

THREATS TO MARINE MAMMALS. Knowledge of species composition and population sizes of marine mammals in the Region is limited. Detailed studies of dugong, which are considered vulnerable to extinction on a worldwide scale, exist only for Saudi Arabia. The Red Sea population is estimated at up to 4,000 dugong. It seems that they are no longer hunted systematically, but are frequently taken as by-catch in trawls and nets. Their meat is used for human consumption. Destruction of seagrass beds poses an additional threat. As slow swimmers living in shallow water, dugong also suffer from the increasing use of motor boats, which may easily injure them near the water surface.

THREATS TO SEABIRDS. The status of seabirds of the Region is poorly known. In the portions of the Red Sea adjoining Saudi Arabia where systematic surveys have been undertaken, the number of seabirds present in summer may approach 200,000. Seabirds are threatened by hunting, disturbance at their breeding sites and habitat destruction. During the breeding season, egg collecting occurs wherever there are fishermen. Seabirds are particularly sensitive to oil spills. When considering development of rocky coasts and offshore islands, special attention is required throughout the Region to avoid and/or minimize potential adverse impacts to seabird populations and their habitats. This mandates site

specific ornithological surveys when preparing environmental studies in these sensitive areas.

SHRIMP AND FISH FARMING. Currently, shrimp and fish farming play a minor role in the Region, but growth is expected in the near future. Fish farming in floating rafts has a minor impact from addition of nutrients into the ecosystem. Fish ponds in coastal areas, if poorly planned, may result in destruction of coastal habitats and a decline in water and soil quality. Shrimp ponds, which are usually built in or near mangrove areas, lead to a modification of the coastline, irreversible conversion of coastal habitats, mangrove destruction and degraded water quality. Water quality is also adversely affected by the use of chemicals, hormones and nutrients in the ponds. Shrimp farms are a source of short-term profit, but can result in the permanent loss of some of the most sensitive and precious habitats.

Maritime Traffic, Oil Production and Transport

A WORLD TRANSPORTATION ROUTE. In the Red Sea and Gulf of Aden Region, exploration, production, processing and transportation of more than half the world's proven oil reserves take place. Most of the oil produced from both inland and offshore wells is exported, transforming the Red Sea into an oil tanker highway. Entering the Gulf each year are some 20,000–35,000 tankers which load their cargoes of oil for shipment to the far East and Europe. Many tankers proceed from the Gulf around the Arabian peninsula into the Red Sea, where they either continue north through the Suez Canal to the Mediterranean, or deposit their cargo at the entrance to the Sumed pipeline at Ain Sukhna in Egypt. Besides oil cargoes, many ships transit the Red Sea and Gulf of Aden fully or partly loaded with hazardous or toxic

substances that pose an added threat to the coastal and marine environments.

PETROLEUM AND MARITIME TRAFFIC. The global importance of petroleum and the resulting maritime traffic pose a serious threat to the fragile coastal and marine environments of the semi-enclosed waters of the Region. Routine operational leaks and spills from the production and transport of oil constitute the major source of marine pollution. At the same time, the growing risk of oil traffic-related accidents urgently requires emergency response plans combined with management skills, to minimize risks and control major spills.

MAJOR SOURCES OF MARINE POLLUTION. In contrast to other regional seas around the world where most pollution comes from land-based activities, the main source of marine pollution in the Region is from ship-based sources, oil exploration and offshore oil production. While production and transport of oil continue to play a critical role in the Region's economy, they also constitute the major source of marine pollution. Over 100 million tons of oil are transported through the Red Sea annually, nearly half of which enters the Region via the Yanbu Petroline from the Gulf. This high volume of transport traffic results in chronic marine pollution from discharges of oily ballast water and tank washings by vessels, operational spills from vessels loading or unloading at port, accidental spills from foundered vessels, and leaks from vessels in transit.

OTHER TYPES OF MARINE POLLUTION. Other forms of ship-generated waste include oily sludge, bilge water, garbage and marine debris. The risks of oil well blow-outs, spills and other production accidents associated with the offshore oil industry in the northern Red Sea constitute another significant threat to human and wildlife resources. Routine oil leaks, gas flaring, and dumping of oily sludge and muds containing

hazardous materials from drilling operations are chronic sources of pollution. These risks will increase with the anticipated development of gas reserves and offshore oil resources in the southern Red Sea and Gulf of Aden. The marine and coastal environment of the Region is constantly threatened by the possibility of vessels foundering while carrying harmful materials other than oil. Though some measures have been taken and others are planned to deal with oil spills, preparedness to deal with chemical and other hazardous materials is almost non-existent.

NAVIGATION RISKS. In the Red Sea, insufficient and poorly maintained navigational aids, and unregulated maritime traffic in most parts, have created several high risk zones. These include the southern part of the Red Sea at Bab-al-Mandab and the Huneish Archipelago area, further north at the loading points for the Yanbu Petroline in Saudi Arabia and the Sumed pipeline at Ain Sukhna in Egypt, at the entrance to the Gulf of Suez and the Suez Canal, and through the Straits of Tiran at the entrance to the Gulf of Aqaba. There are other points in the Red Sea where south and northbound traffic converge to change course and where risks of collision are high and Traffic Separation Schemes should be established. Shipwrecks and cargo spills occurring in these high risk zones result in significant oil pollution and marine debris. Special risks are created in the Gulf of Suez by offshore platforms and well caps. In the southern Red Sea hazards are associated with the increasing numbers of commercial and fishing vessels, including many small local vessels. Additional risks to navigation in the Region include inaccurate navigation charts in some areas, and difficulties in radio communication. The potential for resumption of full-scale export of oil from the Gulf region and plans to increase the volume of oil transported via the Yanbu Petroline in Saudi Arabia and the

Sumed pipeline in Egypt, along with the possibility of expanding the capacity of the Suez Canal to accommodate fully laden very large crude carriers (VLCCs) of up to 250,000 tons pose increased risks for major oil spills in the Region.

Urban and Industrial Development

LAND USE AND COASTAL ZONE PLANNING. The lack of proper land use planning, including effective zoning and environmental review procedures in the coastal zone—particularly with regard to urban development, industrial expansion and investment for domestic and foreign tourism expansion—is a growing problem in many parts of the Region. Development often proceeds without benefit of adequate planning or evaluation of potential environmental impacts. In some cases local authorities allow construction activities to proceed which are inconsistent with land use plans and which do not make adequate provision for the collection and treatment of liquid and solid wastes. Poorly controlled development has especially been a problem associated with medium- and small-scale industries outside planned industrial areas and for a wide range of tourism developments in the northern section of the Red Sea. If steps are not taken to conserve and protect the unique environments of the Region through planning activities within a framework for integrated coastal zone management (ICZM), the high costs of remediation and possibly irreversible impacts from development could quickly undermine the ecological integrity of the coastal environment and prospects for further economic growth.

MUNICIPAL WASTEWATER. The discharge of municipal wastewater continues to present considerable management problems, despite the significant progress made over the last decade through investments to control pollution from this source. In the

Region, especially on the west coast of the Red Sea south of Suez, the discharge of domestic sewage contributes, through nutrient loading and high biological oxygen demand (BOD), to the eutrophication of coastal waters around selected population centers, major ports and tourist facilities. Considerable progress has been made in the Region in the collection and treatment of municipal wastewater; however, investments continue to be required for extension of collection networks, expansion and upgrading of treatment facilities, and development of safe wastewater reuse and disposal systems. Serious efforts are also needed to ensure proper operation and maintenance and reliable performance of existing treatment facilities. While levels of discharge into the waters of the Region are not as acute as in other regional seas given the limited number of major population centers, results are cumulative and add to the stress already imposed on fragile coastal habitats by oil and other forms of marine pollution.

INDUSTRIAL EFFLUENTS. Industrial effluents, in the form of thermal pollution from power and desalinization plants, hypersaline brinewater from desalinization plants, particulate matter and mineral dust from fertilizer and cement factories, and chemicals and organic wastes from food processing factories, contribute to the land-based sources of pollution affecting coastal waters. Environmental standards regulating industrial effluents are not uniformly prescribed or enforced. Institutional capacity needs to be strengthened in the area of regulatory policy and environmental oversight. Technical capacity also needs to be strengthened in terms of providing options to industry to monitor, evaluate and reduce harmful effluents through efficient use of energy, raw materials and production technologies that incorporate waste minimization approaches. In many cases industrial complexes and facilities continue to be de-

veloped without adequate environmental assessment. There is also insufficient application of land use planning and zoning procedures to assure that industrial complexes and facilities are sited in a manner consistent with long-term urban development objectives and proper coastal zone management.

DREDGING AND FILLING. Dredging and filling operations associated with urban expansion, industrial development and tourism along the coast are a significant source of environmental degradation in the Region. Sedimentation from these operations suffocates the surrounding coral reef communities and has an adverse effect on other ecosystems to which currents transport the suspended sediment. The net results are the irreversible loss of the most productive coastal ecosystems — mangroves, sea-grass beds, and coral reefs, dependent marine communities — and the potential for local extinction of endemic species, along with declines in the productivity of surrounding areas such as shrimping grounds and other demersal fisheries. Dredging and filling also alters shorelines, leading to erosion in some sites and accretion in others.

DEPLETION OF WATER RESOURCES. In the Region, the depletion of groundwater resources as a result of over-consumption and over-extraction, pollution of aquifers, insufficient recycling and inadequate reuse of treated wastewater may seriously hamper development of coastal areas. Water scarcity is a major constraint, at the national level and in coastal areas, to security and development in many parts of the Region. The principal consumptive uses of water are agricultural, municipal and industrial. The total annual water use in Egypt is about 97 percent of the net annual renewable water resources, whereas in Saudi Arabia and Yemen, total annual use is thought to already exceed the net annual renewable resources. Pollution from indus-

tries, municipalities and agricultural sources further constrains the use of already scarce resources. Priority should be given to the adoption of alternative approaches such as demand management and development of non-traditional sources of water such as restricted wastewater reuse and expanded use of brackish water. In addition, greater emphasis should be placed on integrated approaches to pollution control to protect the quality of available renewable and non-renewable sources of potable water.

REDUCTION OF FRESHWATER FLOWS. The reduction of seasonal freshwater flows into the Red Sea and Gulf of Aden from on-shore water resource developments has local, long-term impacts on coastal and marine ecosystems, especially coastal wetlands and mangroves. Pressure to divert limited freshwater flows for urban, industrial and tourism development in the northern Red Sea and for agricultural development in the central and southern Red Sea will continue to affect these fragile habitats unless their importance is recognized and measures taken to balance needs between competing uses for scarce resources. Developments which reduce freshwater flows, both seasonal surface water and permanent shallow groundwater, may result in saline intrusion into coastal aquifers and limited areas of coastal wetlands. In Sudan and Yemen reports exist of potential adverse effects on coastal ecology from the use of pesticides, application of dated pesticides and the improper disposal of their used containers.

Rapid Expansion of Coastal Tourism

IMPACTS FROM TOURISM. The negative impacts of coastal tourism are evident in many parts of the Region, especially in the northern Red Sea. These impacts include physical destruction of coastal habitats by construction works, dredging, and reclama-

tion; anchor damage to corals by tourist boats and coral breakage by divers; pollution from wastewater discharge from coastal resorts; over-exploitation of fish and shellfish to meet increased demand of the food and souvenir markets; disturbance to wildlife such as nesting turtles and seabirds leading to higher mortality and decreased fecundity. The planned massive expansion of tourism for both domestic and foreign visitors in coastal areas throughout the Region creates a significant demand for effective integration of environmental concerns into the planning of government-supported infrastructure and private sector-supported tourism facilities. Actions should be taken over the short and medium term to avoid potentially significant adverse impacts which undermine the stability of the coastal and marine environments that attract tourists to the Region.

TOURISM IN SUPPORT OF CONSERVATION. Although tourism impacts in the southern Red Sea and Gulf of Aden are not as prominent as in the north, growing tourism investment plans will potentially cause environmental impacts on a regional scale. The pressures from tourism are spreading to new areas as popular sites become over-used and as foreign tourists continue to seek new, exotic destinations. However, when carefully managed, marine tourism can provide substantial revenue for conservation projects. In Ras Mohammed National Park in Egypt, fees collected from visitors and diving tourists exceed the operational cost of the marine park. In Jordan, there is the potential to absorb part of the growing revenue from the tourism industry in Aqaba to support conservation efforts.

Emerging Issues

NEW ENVIRONMENTAL CHALLENGES. Current and anticipated economic and social developments in the Region are ex-

pected to result in new environmental pressures and threats to coastal and marine resources. The management of emerging issues should be addressed through adoption of preventive actions to avoid unnecessary environmental degradation or resource depletion. Major emerging issues that require action are discussed below.

ENVIRONMENTAL IMPACTS OF FREE ZONES. The proposed development of free zones with combined port, production, warehousing and transfer facilities will provide welcome opportunities for economic growth and employment generation. The use of environmental planning studies and environmental assessments as an integral part of free zone siting, design and implementation will support their development in an environmentally sound manner. Site selection for free zone development should recognize the potentially extensive direct and indirect environmental impacts, and measures should be taken to address planning needs both within and outside the free zone.

FREE ZONE ENVIRONMENTAL UNITS. The establishment of special environmental units within each free zone will allow for "on-site" management of environmental issues by local staff and make environment part of "good practice." These environmental units should conduct "day-to-day" environmental functions on the basis of formal delegation of responsibility from the national environmental authority. The work of these environmental units should be complemented by oversight activities by the national environmental authority. The development of free zones should include specific guidelines for the management of emissions and of hazardous and solid waste, including the requirements for associated residential and commercial areas. Environmental management plans for free zones should include the use of economic instruments such as fees and fines for

emissions, incentives for waste minimization, and pricing of inputs, especially water, that encourages conservation.

EXPANSION OF SMALL AND MEDIUM INDUSTRIES. Although the industrial sector in the Region has historically been dominated by large enterprises, it is anticipated that significant growth will occur in small and medium industries in the medium and long term. In order to avoid serious environmental problems, including coastal degradation and groundwater pollution, measures should be taken to develop an environmental management framework for licensing and operation of these facilities. Key environmental concerns include: siting of industrial estates; siting of individual industries outside of industrial estates; establishment and implementation of environmental guidelines for industries at this scale; provision of water, wastewater and solid/hazardous services; and environmental monitoring and enforcement. Recognizing the key role that will be played by private investors in these investments, special measures need to be taken to provide small and medium investors with a clear understanding of environmental requirements and to create incentives for cost-effective compliance.

DEVELOPMENT OF OFFSHORE MINERAL DEPOSITS. The Red Sea has extensive offshore non-petroleum mineral deposits that are of considerable long-term economic interest. Economically, it may be highly desirable from a regional and national perspective to develop these resources; however, measures should be developed and adopted to ensure that these activities do not cause significant or irreversible damage. Given the unique nature of the Red Sea and limited worldwide experience with the offshore recovery of manganese nodules and other forms of marine mineral wealth, measures should be taken to establish environmental guidelines for the devel-

opment of these resources on a regional level.

ORNAMENTAL FISH COLLECTING. In recent years, the collection of reef fishes for the aquarium trade has gained increasing importance as a foreign currency earner. However, the maximum sustainable yields of the species collected are unknown and there is no monitoring of collecting methods. The survival rate of captured ornamental fish is often very low due to imperfect handling and transport. This low survival rate, together with demands from foreign markets and the depletion of species in many parts of Asia, escalates the pressures for exploitation. This practice can also be harmful to the reef environment if it involves the breaking of corals or the use of cyanide. There is need for further research into the effects of this activity and its management.

An Agenda for Action at the Regional, National and Local Levels

AN AGENDA FOR ACTION. The Strategic Action Programme supports and endorses an “Agenda for Action” at the regional, national and local levels, the objective of which is the conservation of the environment of the Red Sea and Gulf of Aden. The SAP includes a series of complementary actions to be implemented in a phased manner over a decade or more (see Box 2). This Agenda recognizes the critical need for high level commitment and improved public awareness for successful long-term management and conservation of the coastal and marine resources of the Region. It emphasizes the integration of these these concerns into the development process through the use of environmental planning, environmental assessment and review procedures and adoption of coastal zone management.

A DIVERSITY OF ACTIONS. The Agenda supports the strengthening of institutions and development of human resources required for environmental management. Importantly, the Agenda proposes a series of preventive policy and technical interventions to avoid potential damage to resources; curative measures to address current problems; and resource management

programmes for sustained use and conservation of resources. The development of applied monitoring programmes, use of environmental indicators and conduct of evaluations are recommended to provide routine assessments of progress made in the implementation of the SAP.

FINDINGS AND RECOMMENDATIONS. Key findings and recommendations of the Task Force are presented as a series of tables to allow for comparative review of issues and actions at the regional, national and local level. The transboundary analysis, which evaluates “thematic issues” and “common concerns” shared on the sub-regional and national level, is provided in Tables 2, 3, 4 and 5. The recommendations of the SAP Task Force for actions at the regional level are provided in Table 6; these are complemented by a range of actions identified by the Country Reports and endorsed by the Task Force. They are provided on a country-by-country basis in Tables 7–13.

Long-Term, High Level Commitment and Public Awareness

HIGH LEVEL COMMITMENT. The effective conservation and management of the

unique coastal and marine environments and resources of the Region will primarily depend on long-term, high level commitment by governments. Government support is required to ensure that the priorities established under the SAP are supported through policy measures, effective implementation of laws and regulations, investment activities and capacity building of regional, national and local institutions. Government support for the SAP will be critical given the need to take preventive actions that require control of development in sensitive areas, enforcement of existing regulations, and investments to avoid potential adverse impacts.

ENHANCED PUBLIC AWARENESS AND PARTICIPATION. Environmental awareness is key to obtaining and maintaining public support for environmental protection and nature conservation. The large number of stakeholders involved in the coastal zone requires multi-level awareness programmes targeting different groups. The SAP anticipates broad-based participation by representatives of the general public, private sector associations, academic and applied research institutions and local nongovernmental organizations. The active participation of these parties will promote effective dissemination of information to a wide audience, allowing the programme to benefit from the experience of others.

TYPES OF ACTIVITIES. At the national level, frequent environmental workshops and meetings can be held to trigger interest among decisionmakers in the government and different sectors such as fisheries, industry and tourism. Integration or strengthening of environmental subjects in existing academic curricula is crucial in building awareness among the younger generations. The public media, educational displays and well designed aquaria will reach an even wider audience. At the local level, environmental awareness activities may be fa-

cilitated through existing fisheries extension networks. The water conservation outreach programme undertaken in Jordan by the Ministry of Water and Irrigation, with the cooperation of the Jordan Environment Society, is an excellent example of an effective public awareness programme involving government and nongovernmental organizations.

Transboundary Environmental Issues

OPPORTUNITIES FOR REGIONAL COOPERATION. The SAP provides a framework for PERSGA and the cooperating parties to address management of transboundary environmental issues as an opportunity for regional cooperation. The Task Force prepared a transboundary analysis that identified both thematic issues (Tables 2 and 3) and common concerns (Tables 4 and 5). The thematic issues encompass marine pollution, vessel traffic, and many types of fishery resources, among others, that can be effectively addressed only if understood and managed on a broader transboundary basis. Common concerns, on the other hand, are primarily those environmental impacts felt at a national level, but which can also result in significant long-term and cumulative secondary impacts at the regional or sub-regional level. They are most effectively managed by joint activities or adoption of complementary approaches.

SUB-REGIONAL ANALYSIS. In preparing the transboundary analysis, the Task Force evaluated the issues from a sub-regional perspective, recognizing the diversity of environments within the Region, and from a national perspective, given the range of common problems shared by the countries. The sub-regions adopted for use in the SAP are based on scientifically recognized geological and biogeographical units which reflect distinct natural differences of significance for environmental management.

APPLICATION IN SAP IMPLEMENTATION. The transboundary analysis will be used to support planning and organization of SAP-related preventive and curative measures and outreach activities, to allow for more effective cooperation between parties who share an interest in management of environmental issues that transcend borders at the regional and sub-regional level. In designing SAP activities to address specific concerns in the various parts of the Region, the findings of the analysis will promote use of a consistent strategy, effective development of joint actions, transfer of experience and opportunities for collective training.

Preventive Measures

KEY PREVENTIVE ACTIONS. In the Region, especially where environmental degradation is still limited to specific locations associated with coastal development, the timely introduction of enforceable preventive measures can be an extremely cost-effective approach to reducing the risk of major environmental impacts in the future. Suggested measures for prevention include the following:

EMPHASIS ON INTEGRATED COASTAL ZONE PLANNING AND MANAGEMENT. The use of integrated coastal zone planning combined with implementation of approved plans could significantly reduce the degradation of the coastal environment occurring in many parts of the Region. The experience of Egypt, Jordan and Saudi Arabia in the inventory of coastal and offshore habitats and the preparation of integrated coastal zone management plans should be reviewed for application elsewhere. It should be noted that a number of practical guidelines are available to support efforts within the Region.

EXPANDED USE OF ENVIRONMENTAL ASSESSMENTS. At the regional, national

and local level, the Programme gives high priority to promoting expanded use of environmental assessments in the planning and review of proposed projects. This is a significant preventive action, which although mandated by many countries in the Region, is not being used on a systematic basis to support environmentally sound development decisions. It is especially important that environmental assessments be prepared for all actions concerning coastal dredging and landfilling, port and harbor development and expansion, siting and construction of major industrial and energy facilities, large tourism developments, and aquaculture.

ADOPTION OF MEASURES TO CONSERVE CULTURAL HERITAGE. All countries in the Region have legislation protecting archaeological, historical and sacred sites. This legislation is normally implemented by government agencies responsible for antiquities, or religious affairs in the case of sacred sites and graves. These organizations, given the limited staff and budgets, are often unable to fully implement the provisions of the laws. Steps should be taken to integrate measures to conserve cultural heritage into the planning and development process. This includes addressing cultural heritage issues in integrated coastal zone management plans. The evaluation of potential impacts to cultural heritage values should be a routine element of all environmental assessments conducted for proposed projects. Given the often high risk of unknown buried sites being encountered during the course of construction activities, the use of archaeological chance find procedures should be a standard part of construction contracts.

REPLICATION OF SUCCESSFUL REGIONAL MODELS IN THE INDUSTRIAL SECTOR. The Region has some successful models of environmental management that should be considered for replication elsewhere. An

example is the effective integration of environmental protection measures into the design and management of the industrial port cities of the Royal Commission for Jubail and Yanbu in Saudi Arabia. The measures used by the Commission and other organizations to promote the use of integrated pollution control, energy- and water-efficient industrial processes and waste minimization approaches in industrial facilities of all scales, should be promoted.

ADOPTION OF MEASURES TO CONTROL EXPLOITATION OF COASTAL AQUIFERS. In the Region, as in the case of the Mediterranean, improved management and protection of coastal groundwater aquifers is a high priority. Measures should be taken by all nations to establish firm regulatory control over the extraction of groundwater and all wells should be licensed. Efforts should be made, especially for non-renewable groundwater, to ensure that the water is being appropriately used, that proper conservation measures are being applied, and that pollution is prevented. Land use planning should include measures to avoid the placement of industrial facilities and waste disposal sites on aquifer recharge zones.

ACTIONS TO REDUCE RISKS OF MARINE ACCIDENTS. The Programme supports actions to reduce the risk of marine accidents, a major threat to environmental quality in the Region. Establishment of Traffic Separation Schemes and improved navigational aids, especially in high risk areas, should be given priority. The adoption of a system of Port State Control will allow for effective enforcement of marine pollution control and safety standards. The following actions, to be undertaken by the appropriate marine and port authorities, should be viewed as significant contributions to environmental protection:

- *Improved Navigational Systems and Aids.* An important opportunity for preventive action in the Region lies in im-

provement of navigational systems and aids to lower the risk of maritime accidents. The large volume of vessel traffic, increasingly dominated by oil tankers, warrants significant improvements in navigational services at the regional, sub-regional, national and local levels. At the regional level, an effective coordination mechanism for management of navigational issues should be adopted, complemented by specific arrangements between concerned parties on a sub-regional basis. The development of new and improved Traffic Separation Schemes is a key regional measure, while at the sub-regional level cooperative agreements on vessel traffic management should be given priority for Bab-al-Mandab and the Straits of Tiran. National and local actions include improved navigation management in the Gulf of Suez, the loading points for the Yanbu Petroline and Sumed pipeline, and in the vicinity of all major regional ports. Special measures should be considered for the current and planned free zone ports in Djibouti, Sudan, and Yemen. The Navigation Risk Assessment and Management Plan for the Red Sea and Gulf of Aden, prepared as an element of the SAP, provides detailed recommendations on these issues.

- *Adoption of Port State Control.* The Paris Memorandum of Understanding on Port State Control, operating in Europe, provides a potential model for establishment of a similar system in the Region. Because of ships' right of free passage while transiting through waters that may fall within the Exclusive Economic Zone (EEZ) of sovereign states, the only opportunity for coastal states to ensure that vessels are complying with international agreements that are in force in the Region is through inspections and certification of vessels at port. A systematic and well executed inspec-

tion programme should be operationalized in every major port in the Region, so that vessels will not resort to calling at ports where regulations are lax and reception facilities inadequate. Such a regional system will enable governments to pool scarce resources and ensure that as many ships as possible are inspected for their compliance with International Maritime Organization (IMO) regulations regarding safety and marine pollution prevention. Under the memorandum of understanding, the Port State has the right to inspect vessels entering its national jurisdiction and could detain vessels that did not meet their certification requirements until deficiencies were corrected. The enforcement of such a system in the Region will go a long way to reducing the risks posed by unseaworthy or sub-standard vessels with respect to accidents and spills, and will facilitate the imposition of penalties or fees for violations.

- *Adoption of Complementary Conventions and Protocols.* There are a number of complementary legal instruments that reinforce regional conventions and, if subscribed to on a regional basis, could advance the objectives of the PERSGA agreements. Some of these, such as the International Convention on Civil Liability for Oil Pollution Damage (CLC) of 1969, have already been ratified by selected contracting parties to the Jeddah Convention. The purpose of the CLC is to provide insurance to ship owners for liability for oil spills from their vessels in the territorial waters of a sovereign state. A parallel agreement is the 1971 International Convention on the Establishment of a Fund for Compensation for Oil Pollution Damage (Fund Convention). The purpose of this Fund is to provide compensation to coastal states for damages in excess of the sums provided for by the CLC Con-

vention. The Fund is financed by oil importing countries or oil industries in these countries. Port states that do not import oil, but are vulnerable to pollution because of their location along transport routes, are afforded free and full coverage in the case of an oil spill, provided they are contracting parties to the Convention. In 1992, the CLC and Fund Conventions were amended to significantly increase compensation that coastal states can receive under them for damages caused by oil spills and for the first time, damage by other harmful substances was included. Despite this, only one country in the Region is a Fund member.

- *Radio Communications.* The Global Maritime Distress and Safety System (GMDSS) has come into force and is related to the International Convention for the Safety of Life at Sea (SOLAS 1974), as amended, and the International Convention on Search and Rescue (SAR 1979). Under GMDSS, all ships must be fitted with certain radio communication equipment and coastal states must properly equip coastal stations to communicate with vessels which ply in waters that fall under their responsibility. Such radio communication systems should be established and organized on a regional level to give full coverage to the Red Sea and Gulf of Aden.

STRENGTHENED MANAGEMENT OF OIL SPILLS. Oil is one of the major polluters in the Region, and various surveys of the state of the marine environment indicate that the most significant forms of pollution include pollution by oil. Furthermore, the Red Sea is one of the most important marine routes in the area. Consequently, oil pollution resulting from tank washing and discharges from passing ships is increasing, and as new oil exploration and production

activities take place, the Region is more and more susceptible to major oil incidents. A number of such incidents have already been reported in certain coastal waters.

IMPACTS FROM OIL. At the local level, oil pollution is evidently more severe in the oil-producing areas of the Region. Chronic oil pollution has been observed in the immediate vicinity of some major ports as a result of operations at oil terminals or discharges from power plants. Oil spills and incidents have constituted serious threats and have visible and invisible impacts. The greatest danger to coral reefs from an oil spill is probably the indiscriminate use of dispersants. There is also a threat to all forms of marine life as a result of oil spills. Such spills affect the dugong that are frequently found in shallow inshore waters. There is evidence of significant damage to bird populations, which are normally dependent on the seas and coastlines for feeding and reproduction, and also to fisheries production from impacts on the vulnerable larval stages.

REGIONAL PROGRAMMES TO CONTROL OIL SPILLS. Given these threats and the importance of the Region as an international shipping lane for oil transportation, regional programmes to promote monitoring of oil spills and oil pollution should be established or strengthened. In particular, such programmes should promote enforcement standards for limiting oil spills. Greater attention should be accorded to issues such as coordinating oil pollution monitoring; carrying out pollution studies; undertaking surveillance by ships, aircraft, and satellites within national and international waters; strengthening enforcement procedures; and developing comprehensive Oil Spill Contingency Plans.

CURRENT REGIONAL EFFORTS. Current efforts to address oil spills should be the subject of increased national and international support. A significant contribution in this

regard is the current UNEP-funded PERSGA project, entitled "Protection of the Red Sea and Gulf of Aden Environment: Initiation of Marine Pollution Control Policies and Development of Tools for Coastal Area Management." As part of this project, it has been agreed that the first phase of a trajectory model for oil spills in the Red Sea will be developed. This constitutes an important step in the preparation of regional Contingency Plans for oil spills. The development of the model will also assist oil spill working groups in the Region to make the decisions necessary to minimize oil spill impacts and to use available resources to combat oil pollution in a cost-effective manner. Such a model can aid in predicting the spread and fate of oil spills. It also includes calculations regarding the dispersal of oil on water as well as in the water column, oil evaporation, and its spread on the coast. The project is expected to be completed within two years.

OIL SPILL CONTINGENCY PLANS. When an oil spill takes place the most important factor is time. A spill can spread over a large area very quickly depending on the strength of wind and surface currents and therefore no time should be wasted in dealing with it. This can only be achieved if a proper Contingency Plan is in effect and all participants, through regular exercises, accept the proper chain of command and perform their respective roles for spill response. Therefore National Contingency Plans are essential for all countries of the Region. On the other hand, oil spills do not recognize political boundaries and an oil spill in one country could cause far more damage in a neighboring country depending on the strength and direction of prevailing winds and surface currents. Therefore Regional and Sub-Regional Contingency Plans are essential.

MARINE EMERGENCY MUTUAL AID CENTERS. Very few countries in the world

have the full capacity to combat a major oil spill on their own. All the major oil spills that happened recently such as the “*Torrey Canyon*” in the UK, the “*Amoco Cadiz*” in France or the “*Exxon Valdez*” in Alaska, USA, required the resources of more than one country. Mutual Aid Centers are therefore most appropriate. At present only one such center exists in the Region. It was established in Djibouti with the help of the International Maritime Organization and financed by the Government of Norway to serve the countries bordering the Gulf of Aden only. The reunification of Yemen with a coastline on the Red Sea as well as the Gulf of Aden and the establishment of PERSGA in Jeddah, call for the revision of the Agreement of the Djibouti Center to make it a Regional Center under the umbrella of PERSGA. Measures should also be taken for establishment of the planned Sub-Regional Mutual Aid Center in Hurgada, Egypt. The Government of Egypt has indicated that it would be prepared to support this initiative through the provision of land and infrastructure for the facility. In addition, a review should be conducted to determine if an additional Sub-Regional Mutual Aid Center is required to provide adequate coverage of the Red Sea.

JOINT MANAGEMENT OF TRANSBOUNDARY FISHERIES RESOURCES. In order to achieve sustainable use of transboundary fish stocks, the management and exploitation of this resource should be regulated in a regional agreement. Joint efforts among the littoral nations are needed to carry out stock assessment of major migratory species, including data on their routes of migration and seasonality, followed by adoption of regional management plans for the concerned species. Sustainable management could include monitoring, surveillance and control of fishing, based on a regionally coordinated licensing and quota system. Special attention is needed

to control the export of highly priced fisheries products, such as shark fins.

Curative Measures

KEY CURATIVE ACTIONS. Within the Region a series of key curative actions are needed to address current sources of pollution and resource degradation. These problems tend to be focused in the coastal urban and industrial areas, in the vicinity of ports and major maritime traffic lanes, and in areas with coastal and offshore exploitation of oil. Key issues that need to be addressed through curative measures include the following:

WATER RESOURCES MANAGEMENT. The availability of water is a serious constraint to development in the Region and a major environmental management issue in the coastal zone. Surface water sources occur only on a seasonal basis and play a critical role in the recharge of groundwater aquifers and in the ecology of mangroves, freshwater-dependent vegetation and coastal wetlands. Groundwater resources are being depleted in the cooperating countries through over-consumption, which reduces the quantity of the resource, and pollution of aquifers, which reduces quality. In order to address this issue, priority measures need to be taken in all littoral nations to promote the efficient use of these limited water resources through improved management actions and investment activities.

From a management perspective the most critical issue is to effectively regulate development and allocation to ensure efficient use. Key interventions include a formal permit process for use, demand management programmes to assist users in making a transition to more effective use of water, water charges that promote conservation, and specialized waste reduction programmes in all sectors. Support should also be provided for innovative investments to develop non-traditional sources of wa-

ter, including restricted reuse of treated domestic wastewater and expanded use of brackish water for irrigation. In conjunction with these measures, actions should be taken to control pollution in order to protect the quality of potable water sources and ensure that basic allocations are maintained to support the needs of critical aquatic ecosystems such as mangroves and coastal wetlands.

WATER SUPPLY AND WASTEWATER TREATMENT. Actions to improve water quality through upgrading of water and wastewater services remain a priority at the regional level to protect public health, reduce ecological damage and control adverse economic impacts. Successful development and implementation of projects in this sector requires the commitment of national/local governments and utilities to undertake institutional, financial and technical measures. Such measures should promote the long-term development of autonomous and self-financing institutions that provide reliable services to their customers. Investments in wastewater treatment should focus on technologies that are reliable under local conditions and provide opportunities for full or partial restricted reuse of treated wastewater. Care should be taken in the design of projects to ensure that investments are balanced between water supply and wastewater management. The absence of balanced investments, especially provision of extensive household water services without complementary investments in wastewater collection and treatment, has led to rising groundwater tables, street flooding and standing pools of raw sewage in many cities of the Region.

SOLID WASTE MANAGEMENT. The management of solid waste from household, commercial, industrial and construction activities is a major problem for coastal urban areas, industrial facilities and ports. It is also an increasing problem in the smaller

settlements along the coast that often lack formal systems for waste collection and disposal. In many cases, the existing solid waste disposal facilities have been developed and are operated without adequate concern for environmental factors. Often selected sites endanger groundwater aquifers or involve disposal of waste at the margins of mangroves and coastal wetlands. In some instances solid waste disposal has been used as a technique for small-scale land reclamation in coastal areas. Measures should be adopted to support properly located and developed disposal sites in the Region. A special issue is the marine disposal of solid waste from ships in both national and international waters. This is especially a problem in areas that have heavy ferry service traffic. Ship operators should be held accountable for the proper disposal of solid wastes and adequate onshore facilities should be provided to accept these wastes at an affordable cost.

INDUSTRIAL POLLUTION CONTROL. Industrial pollution—thermal pollution, hypersaline brines, particulate matter and chemicals—contributes to land-based sources of pollution affecting the shoreline and coastal waters of the Region. In many cases major industrial facilities, both estates and individual plants, have been sited without regard to their potential environmental impact on groundwater quality, air quality or coastal environments. Within the Region environmental standards regulating industrial facilities are not uniformly prescribed or enforced. Institutional and technical capacity is weak and policy incentives for private sector compliance are inadequate. Activities to strengthen and enforce regulatory standards for industry should be supported; new plants should be subject to environmental assessments and existing plants should have environmental audits conducted on a regular basis; cost-effective control technologies should be adopted

where absent; and support should be provided for the implementation of waste minimization programmes. The success of Saudi Arabia's Yanbu industrial city in integrating environmental concerns into all phases of project development, implementation and operation should serve as a model for major industrial ports and free zone investments. National and local authorities, in particular special environmental units established for industrial ports and free zones, should promote regular environmental auditing by industries and implementation of management-oriented applied monitoring programmes.

PORT RECEPTION FACILITIES. The lack of adequate port reception facilities to collect and process ship waste is a leading cause of illegal dumping and marine pollution by vessels in the Region. A number of major ports do not have adequate waste reception facilities and in others the existing facilities require significant rehabilitation due to inadequate maintenance. Recognizing the ecological sensitivity of coastal and marine resources to these discharges and the impacts on tourist facilities, measures should be taken to ensure that ship waste reception facilities are available at all major ports in the Region and that their use is effectively enforced. This problem should be coordinated on a regional basis, with implementation at the national and local level. The construction of ship waste reception facilities should be mandated for all new industrial port and free zone developments. At established ports that lack facilities or require rehabilitation of existing facilities, priority should be given to these investments. User fees should not be set so high as to discourage operators from using the facilities. Effective enforcement will require cooperation among ship operators, environmental authorities and maritime authorities, including the coast guard and naval vessels operating in the Region.

CONTROL OF POLLUTION FROM OIL EXPLORATION AND PRODUCTION. Operational spills, periodic blow-outs, oil well leakage, gas flaring and oily sludge from drilling operations all contribute to the cumulative impacts of marine pollution in the Region. Little regulatory oversight exists to mitigate these impacts. The Gulf of Suez is particularly vulnerable given its enclosed nature and large number of oil fields. In conjunction with the Jeddah Convention, a protocol should be adopted and implemented that provides clear measures for control of pollution resulting from exploration and exploitation of coastal and offshore oil reserves. **PERSGA** and national authorities should undertake a dialog with the oil companies, both national and international, to establish an understanding on good environmental practices and to support their cooperative implementation. In addition, the oil companies should undertake environmental audits and, in cooperation with national environmental authorities, establish programmes to address routine operational problems and development of special measures for emergency and accident situations. Applied monitoring programmes should be developed by the operators that evaluate their performance and are subject to review by environmental authorities.

DREDGING AND FILLING. Dredging and filling of coastal areas are permanently eliminating many of the most productive and diverse coastal and marine habitats in the Region, often filling in mangroves and coastal wetlands and suffocating nearby coral reefs. Given the extensive areas of undeveloped coastline in many littoral nations of the Region, these operations are often environmentally unjustified and continue in many places despite government restrictions. Existing legislation prohibiting these activities should be enforced; all proposed dredging and filling operations should require a formal permit and be conducted

consistent with land use and coastal zone management plans; all large operations and those adjacent to environmentally sensitive areas should require the preparation of an environmental assessment; and clear standards should be adopted for environmental management and monitoring of authorized dredging operations. Measures should be developed in the planning process to avoid, to the fullest extent possible, dredging and filling operations that adversely impact mangroves, coastal wetlands and coral reefs unless they are fully justified and have been subject to proper analysis and review. In addition, set backs should be required for all coastal construction to reduce the tendency in many locations to expand existing facilities incrementally by dredging and filling.

Resource Management Programmes

STRENGTHENING RESOURCE MANAGEMENT. A major challenge in the Region is the strengthening of resource management in the coastal and marine areas. This includes adoption and implementation of coastal zone management, a broad range of measures to support conservation of terrestrial and marine ecosystems and habitats, and development of effective programmes for sustainable management of living marine resources.

IMPROVING COASTAL ZONE MANAGEMENT. The use of integrated coastal zone management plans provides an effective mechanism for sustainable long-term use of the coastal zone that forms the interface between land and sea. Throughout the Region adoption of ICZM to support development decisions could significantly decrease unnecessary degradation of coastal and marine environments. This is especially important for long-term development of high value local and international tourism and for maintenance of the rich and diverse cultural heritage of the

coastal zone. Coastal zone management concerns can be addressed in a cost-effective manner through integration into land use planning; preparation of environmental assessments and environmental audits; processes for issuing licenses and permits for activities in the coastal zone; decisions on the siting of public and private facilities; and monitoring of development trends and environmental impacts.

NATIONAL AND LOCAL PLANS. It is strongly recommended that priority be given to the development of coastal zone management plans in all littoral countries, as appropriate for the various types of issues that currently or potentially exist in different areas of the coastal zone. In this context, it is anticipated that national plans will be developed to provide an overall framework for coastal zone management, complemented by more specific plans for urban and industrial areas, zones around industrial ports and free zones, and special plans for management of tourist areas and ecologically sensitive areas including coastal and marine reserves. To be effectively implemented, these plans should be developed in cooperation with all the concerned users of the coastal zone and should provide agreed mechanisms for all parties to support sustainable development of these areas. Experience throughout the world has demonstrated that the cooperative process used in development and implementation of ICZM plans provides an important mechanism to achieve consensus on the use of coastal areas and avoids major conflicts between user groups which can be highly disruptive to the development process.

KEY FEATURES OF PLANS. ICZM plans should emphasize siting of new developments and resource exploitation activities in areas that do not adversely affect fragile and non-renewable resources or disrupt coastal processes such as currents, and

that avoid creation of physically unfavorable conditions such as embayments with poor circulation. The plans should give special attention to properly locating coastal urban infrastructure such as power plants, desalinization plants, and wastewater treatment plants. They should support environmentally sound development of industrial ports and free zones by ensuring that construction and operation maximize effective use of the coastal zone and minimize impacts on key coastal resources and industrial facilities. In developing plans, priority should be given to areas of rapid urban, industrial and tourism growth. PERSGA can play a key role in this process by facilitating the sharing of experience between the cooperating parties and by identifying regional experts from the public and private sector.

HABITAT CONSERVATION. The protection and, where necessary, restoration of coastal and marine habitats is of highest priority for biodiversity conservation. Spawning grounds and critical nursery areas of key species are of particular importance. The integrity of the Region must be taken into consideration and areas that are of regional significance should receive special attention. Both national and regional regulatory systems need to be improved to enhance habitat conservation. Specific schemes for key habitats, such as coastal wetlands, salt marshes, mangroves, seagrass beds and coral reefs must be developed. An efficient means of habitat conservation is establishment of a network of coastal and marine protected areas supported by effective ICZM and planning. Management of existing conservation areas should be improved and new areas designated. Public awareness programmes for selected target groups will support habitat conservation efforts. Where appropriate, they should be coordinated at the regional level, so that conservation of migratory species can be achieved and experi-

ence and lessons learned shared among countries.

PROTECTION OF THE ARID COASTAL ZONE. The incremental costs of soil erosion are usually much higher than the benefit from livestock husbandry. Therefore the carrying capacity of coastal areas for goats, sheep and camels should be established and livestock access regulated, preferably by promoting traditional conservation schemes. The introduction of exotic species of plants or animals should be banned entirely. In certain cases, the removal of exotic species that are in the process of replacing indigenous flora or fauna may be considered. Vehicle traffic in the coastal zone has to be restricted to clearly marked tracks. Special consideration should be given to the fragile nature of terrestrial and freshwater ecosystems in arid zones when preparing environmental assessments for urban, industrial or tourism development. Sufficiently large terrestrial sectors should be included in coastal and marine protected areas, in order to serve as buffer zones and to protect plant and animal communities indigenous to the area. Re-stabilization of mobile dunes by restoration of the plant cover may be undertaken where necessary.

PROTECTION OF COASTAL WETLANDS. The diversion of water from coastal wetlands should only be allowed where there is good scientific evidence that the amount taken will not adversely affect the ecosystem. Measures to protect quantity and quality of water entering coastal wetlands should be taken, with special attention to critical periods of water availability for aquatic and terrestrial species in these areas. Access to coastal wetlands by tourists and livestock must be regulated. Use of coastal wetlands as disposal sites for liquid and solid wastes must be avoided. The wetlands should also be protected from filling for land reclamation, a common threat

in many areas. Surrounding areas should be protected from overgrazing, to prevent damage to wetlands by wind-blown sediments. The more important coastal wetlands should be included in protected areas and traditional conservation systems should be revived and supported. Direct and indirect impacts to the ecological values of coastal wetlands should be considered in all environmental assessments prepared for water resources development programmes in the drainage area of the Red Sea and Gulf of Aden. Studies for coastal agriculture and aquaculture developments should include systematic evaluation of potential impacts to these fragile and important ecosystems.

MANAGEMENT AND CONSERVATION OF MANGROVES. Because of their value as spawning grounds and nurseries of commercially important fish and shrimp species, the protection of mangrove ecosystems needs special attention. National schemes for forestry management and conservation should be extended to mangroves. Grazing access should be controlled and selected mangrove areas must be set aside for complete protection. It is essential that alternative sources of building materials and fuel for communities living near mangrove areas be explored. The diversion of freshwater from mangrove areas needs strict regulation, to guarantee at least a minimum supply to the mangrove stands, and to prevent sea water intrusion and increased salinity. Environmental assessments for development, especially for construction of shrimp farms, must give special attention to the protection of mangrove areas. Where mangroves have been severely damaged or destroyed, natural recovery must be enhanced, supported as necessary by replantation schemes and establishment of local mangrove nurseries. It is imperative that within these replantation programmes, special attention be given to the genetic source of the seedlings.

PROTECTION OF SEAGRASS BEDS. Because of the value of seagrasses to endangered species and a host of commercially important finfish and shellfish, their conservation and protection must be a high priority in coastal zone management planning. Activities which are particularly detrimental to seagrasses—dredging, landfilling, wastewater disposal, illegal shrimp trawling—need to be effectively managed and existing regulations enforced. Impacts on seagrass beds must be considered in environmental assessments. Especially important seagrass beds, such as those used by dugong, need to be included in Marine Protected Areas. Links between seagrass beds and the value of commercial and artisanal fisheries should be an element in awareness programmes, and the locations of seagrass beds throughout the Region mapped.

CONSERVATION OF CORAL REEFS. Conservation of coral reefs in the face of rapidly growing coastal development requires preparation and implementation of coastal zone management plans. The plans should specifically address the activities that are particularly damaging to coral reefs, including dredging, physical destruction, landfilling, wastewater disposal, and disturbance from excessive tourism activities. This can be accomplished by requiring environmental assessment for all developments. Reefs that are representative and of particularly high value for conservation require protection through the establishment of Marine Protected Areas, ideally as part of a regional network. Laws relating to coastal zone management and Marine Protected Areas must be effectively enforced. A large number of people use coral reefs in a variety of ways that are potentially damaging; these impacts can be limited through controlled access, quotas on the number of visitors, and awareness campaigns addressing the commercial value and ecological significance of coral reefs.

MARINE PROTECTED AREAS. The Region has many sites of unique beauty, that support populations of globally important species or contain ecologically critical habitats. These require protection from human activities, to maintain their ecological importance and their availability to be appreciated and enjoyed by the Region's inhabitants. If protected, they can also serve as areas for scientific research and as valuable assets for raising public awareness. Such sites should be designated as Marine Protected Areas and form an important component of national coastal zone management programmes. A network of Marine Protected Areas throughout the Region will ensure conservation of important representative sites, including sites in the Gulf of Aqaba, the Straits of Tiran, the Sinai Peninsula, the Wejh Bank, the Sanganab Atoll, the Farasan Islands, the Dhahlak Archipelago, and the Socotra Archipelago. The establishment of Marine Protected Areas requires management planning, public awareness, enforcement, supporting legislation, trained personnel, and monitoring and evaluation programmes.

MANAGEMENT OF LIVING MARINE RESOURCES. Proper management of living marine resources is important to sustain the livelihoods of people dependent on the resources, to maintain the ecological integrity of marine communities, and to conserve biodiversity. This is generally the responsibility of national governments; however, in the Region there are a number of important species that migrate across national boundaries, posing additional challenges to management agencies. Management capabilities are further stretched by the impacts of foreign fishermen in national waters, and trends in seafood consumption in international markets. This is exemplified by the demand for shark fins that are increasingly being supplied from the Region. Although it is understood that there is a great reliance for subsistence by coastal populations on

marine resources, the extent, intensity, and types of human uses vary throughout the Region. Information about use as well as socio-economic values is inadequate. In some instances there is also very little scientific information available on the species targeted. Tools for management include legislation, specific management programmes (e.g. stock quotas, seasonal closures and gear restrictions), training, applied research, stock assessments, and public awareness.

MANAGEMENT OF COMMERCIAL FISHERIES. Commercially exploited living resources are an integral part of the marine and coastal ecosystems. The sustainable use of these resources depends on proper management of fishing activities and protection of resources essential to the fisheries. Spawning and nursery areas, such as mangroves and seagrass beds, need special protection, or rehabilitation where already damaged. Stock assessment of transboundary species requires collaborative efforts among littoral countries. Where necessary, field guides should be updated and adapted for use as a tool for stock assessment, and training provided to fisheries workers. Based on the results, fishing efforts and methods will be reviewed, fisheries management policies defined, and catch quota assigned to the user groups in mutual agreement. The implementation of a fisheries management programme, and the enforcement of regional and national fisheries regulations will largely depend upon strengthening the enforcement capacity in the Region. Public awareness programmes should stress the linkages between healthy ecosystems and the sustainability of fisheries resources.

SHARK FISHERIES MANAGEMENT. Since many shark species are migratory, both regional and national management systems are required to prevent the collapse of shark populations—as has happened in

many other parts of the world—and to attain a sustainable level of use of this important resource. Management systems should include stock assessments, protection of areas used by sharks for breeding and nurseries, gear restrictions, a coordinated national fishing licensing system for all shark fishing vessels, and a quota system. Greater enforcement of existing regulations will limit exploitation through illegal fishing for the non-sustainable shark fin market outside the Region.

CONSERVATION OF MARINE TURTLES. Thus far, only Saudi Arabia has established a comprehensive conservation and monitoring programme for marine turtles. Such a programme should be extended to the regional level. It should include a survey of nesting areas and feeding grounds; annual tagging of adult turtles and collection of recapture data; protection of nesting sites from egg collecting and other forms of disturbance; and annual monitoring of nesting success. The use of turtle exclusion devices should be compulsory in trawl fisheries. The ban on trade in turtle shells, which already exists in most countries, must be strictly enforced. The success of these activities will be enhanced by a public awareness programme and a rural development programme to improve local food supply and diet, reducing the need for turtle meat as a supplementary food.

CONSERVATION OF MARINE MAMMALS. A survey of the diversity and distribution of marine mammals in the Region is required for sound conservation. Case studies from other regions should be considered to formulate management strategies for individual species in the Region. Consideration should be given to modifying fishing practices that affect marine mammals, as by-catch, during normal operations. Seagrass beds with heavy concentrations of dugong should be included as high priority in Marine Protected Areas.

CONSERVATION OF SEABIRDS. To adequately manage the conservation of seabirds, their status must be assessed regionally, including a mapping of breeding colonies, a census of the number of breeding birds, evaluation of breeding success, and documentation of breeding and feeding biology. These studies should be combined with a ringing programme. Birds must be protected from direct threats, such as non-sustainable hunting, egg collecting, and feral cats. During the breeding season, tourists and fishermen should be kept away from islands with breeding colonies. Major breeding sites should be included in Marine Protected Areas. Nesting and feeding sites of seabirds must be given a high priority in oil spill contingency planning.

CONTROL OF CORAL AND SHELL COLLECTION. In most of the Region, collection of corals and reef-associated invertebrates is illegal, but marine curios are still offered for sale throughout the Region. Existing regulations are in need of revision in a regional context. Control mechanisms and enforcement of regulations should be strengthened and accompanied by an extensive public awareness programme. Existing initiatives in Egypt, Jordan, Saudi Arabia, and Sudan may serve as a basis for the development of a comprehensive programme.

MANAGEMENT OF THE AQUARIUM FISH TRADE. Reef fishes for the aquarium trade can be collected at a sustainable level if properly managed. This requires the identification of suitable reef areas, assessment of fish stock and determination of catch quota and size ranges. Collection should be restricted to suitable aquarium species. Destructive collecting methods and the use of poison or anesthetics must be banned entirely. Divers should be trained to collect fishes with hand nets without damaging the reef. Proper transport and adaptation of fishes to aquarium conditions will assure

high quality, keeping fish mortality low and promoting credibility on international markets.

Outreach Activities

PUBLIC EDUCATIONAL AQUARIA AND NATURAL HISTORY MUSEUMS. Museums and public aquaria play an important role in informing and educating the general public on environmental issues. There is a clear need to improve taxonomic knowledge and plant and animal species inventories, based on well curated scientific collections. Taxonomic research institutes and natural history museums are essential to biodiversity research and conservation. Museum collections provide evidence of organism diversity with documented geographical data and are a major source of comparative information. Well managed museums can provide the needed venue and materials to train local scientists in biodiversity conservation.

PUBLIC PARTICIPATION AND CONSULTATION. Evidence around the world demonstrates that the use of broad-based consultation and participation can, in many instances, improve the quality, effectiveness and sustainability of programmes and projects. Consultation provides opportunities for interested parties to make input into the development, review and approval of proposed projects. The participation process involves a dialogue with interested parties in the review of key issues and decisions related to the programmes and projects under development and/or implementation. The development of the SAP has benefited from both these approaches and they will be continue to be used at a variety of levels to support the programme.

An important element of SAP preparation was the use of a consultation process for development and review of the Country Reports, Navigation Risk Assessment and

Management Plan, and the Study on the Status of the Living Marine Resources in the Red Sea and Gulf of Aden and Their Management. This process demonstrated that both regional and national level consultations can contribute significantly to the development of a better strategy that is more firmly based on “facts on the ground” and can be more readily implemented due to “broad-based support” for the recommended interventions. They also showed that effective dialogue can be held between representatives of PERSGA, national and local governments, academic and applied research institutions and nongovernmental organizations in development and implementation of programme and project activities in support of the SAP. Expanded use of these approaches will provide widespread information about the fragility of coastal and marine resources and measures for their efficient use and protection to decisionmakers, user groups and the public.

COOPERATION WITH NONGOVERNMENTAL ORGANIZATIONS. The participation of international, national and local nongovernmental organizations will be important for realization of the long-term goals of the SAP. Development of the SAP has benefited from environmental information developed at the regional and national level by international nongovernmental organizations such as the World Conservation Union (IUCN), Bird-life International and the World Wide Fund for Nature (WWF). The preparation of the Country Reports benefited from participation of national nongovernmental organizations in the provision of data, review of threats and identification of recommended actions. Representatives of these organizations also participated in many of the PERSGA-sponsored workshops on the Country Reports.

National nongovernmental organizations are currently playing important roles in implementation of SAP-related activities in the Region. In Jordan, the Royal Society for the Conservation of Nature (RSCN) supports a number of government organizations in planning, development and management of protected areas in several locations. Also in Jordan, the Royal Jordanian Ecological Divers' Society has begun a programme of monitoring coral reefs in the Gulf of Aqaba with the support of a small grant from the GEF. The Sudan Nature Conservation Society, with 5,000 members, plays an extremely important role in promoting public awareness of environmental and conservation issues in the country. The Yemeni branch of Birdlife International has conducted studies of critical habitats for resident and migratory birds and collects data collection on bird migration.

Monitoring, Indicators and Evaluation

MEASURING PROGRESS. The SAP includes support for development and implementation of cost-effective applied monitoring

and evaluation of programmes at the regional and national level. Following a review of experience from other regional environmental programmes such as those for the Baltic, Black and Mediterranean Seas, PERSGA will work with the cooperating parties in the development of applied monitoring programmes. Priority will be given to establishment of an affordable programme that includes routine and reliable monitoring of parameters to evaluate environmental management activities. The monitoring programme will complement ongoing scientific programmes that have a research objective. In order to support effective evaluation of the Programme, PERSGA plans to establish environmental indicators for assessment of trends and evaluation of progress in addressing environmental management issues at the regional and national levels. These indicators will be designed to include measures of progress in establishment of a regional framework for cooperation, performance of key preventive and curative actions, and assessment of cumulative and specific impacts from operational activities.

Box 2: An Agenda for Action

The SAP supports and facilitates the primary goal of PERSGA, which is the conservation of the environment of the Red Sea and Gulf of Aden. The aims of the SAP are to develop a regional framework for the protection of the environment and the sustainable development of coastal and marine resources. The Programme outlined in the SAP focuses on both preventive and curative measures required to maintain the rich and diverse coastal and marine resources of the Red Sea and Gulf of Aden.

Long-Term, High Level Commitment and Public Awareness

- High Level Commitment.
- Enhanced Public Awareness and Participation.
- Types of Activities.

Transboundary Environmental Issues

- Opportunities for Regional Cooperation.
- Sub-Regional Analysis.
- Application in SAP Implementation.

Preventive Measures

- Integrated Coastal Zone Planning and Management.
- Expanded Use of Environmental Assessments.
- Measures to Conserve Cultural Heritage.
- Replication of Successful Regional Models in Industrial Sector.
- Measures to Control Exploitation of Coastal Aquifers.
- Actions to Reduce Risks of Marine Accidents.
 - ◊ Improved Navigational Systems and Aids.
 - ◊ Port State Control.
 - ◊ Complementary Conventions and Protocols.
 - ◊ Radio Communications.
- Strengthened Management of Oil Spills.
- Regional Programmes to Control Oil Spills.
- Oil Spill Contingency Plans.
- Marine Emergency Mutual Aid Centers.
- Joint Management of Transboundary Fisheries Resources.

Curative Measures

- Water Resources Management.
- Water Supply and Wastewater Treatment.
- Solid Waste Management.
- Industrial Pollution Control.
- Port Reception Facilities.
- Control of Pollution from Oil Exploration and Production.
- Control of Dredging And Filling.

Resource Management Programmes

- Strengthening Resource Management.
- Improving Coastal Zone Management.
- National and Local Plans.
- Habitat Conservation.
- Protection of Arid Coastal Zone.
- Protection of Coastal Wetlands.
- Management and Conservation of Mangroves.
- Protection of Seagrass Beds.
- Conservation of Coral Reefs.
- Marine Protected Areas.
- Management of Living Marine Resources.
- Management of Commercial Fisheries.
- Shark Fisheries Management.
- Conservation of Marine Turtles.
- Conservation of Marine Mammals.
- Conservation of Sea Birds.
- Control of Coral and Shell Collection.
- Management of Aquarium Fish Trade.

Outreach Activities

- Public Educational Aquaria.
- Natural History Museums.
- Public Participation and Consultation.
- Cooperation with NGOs.

Monitoring, Indicators and Evaluation

- Measuring Progress.

Resource Mobilization

Introduction

FROM PLANNING TO IMPLEMENTATION. The most important challenge for all parties concerned with sustainable development and conservation of the unique environment of the Region is to successfully make the critical transition from the “planning stage” of the Programme in which goals and priorities are established, to the “implementation stage” during which the objectives are incrementally reached on a regional, national and local basis. To achieve this transition, resources from domestic and international sources, both public and private, must be mobilized. The diverse range of actions identified in the SAP cannot all be undertaken at once; however, with the commitment of the cooperating parties, resources can be identified for key activities to launch the implementation phase of the SAP. Additional activities can begin as success is achieved in the first phase of the Programme and as more funding becomes available. Resource mobilization should be viewed as a continuous process for realization of SAP objectives that will require coordination by PERSGA and national governments over the long term. In this con-

text, it is important to clearly limit expectations concerning the pace at which actions can be funded, as environment and natural resources management are not the only priorities for scarce resources within the Region.

A RANGE OF RESOURCES. Successful implementation of the SAP requires mobilization of a range of resources—human and financial—to support Programme priorities. The work of existing regional, national and local organizations should be effectively directed to address SAP objectives; this can be accomplished by making current staff and budget resources available to support priority actions. Integration of Programme priorities into public investment plans is a critical measure to facilitate allocation of domestic and international resources for investment activities. In implementing Programme investments, a balance between preventive and curative measures must be part of long-term development strategies. Domestic funding, at the national and local level, should be anticipated in most nations to be the primary source for investment activities. These funds can be supplemented by loans and grants from international financial institu-

tions and bilateral donors to support the implementation of priority investments.

NEW SOURCES OF SUPPORT. Environment and natural resource management programmes and investments in the Region has traditionally been funded by national governments, often with support from international and bilateral organizations. In implementing the SAP, consideration should be given to the new types of resources being used in many countries to support such measures. Especially in municipal services and industry, the private sector should be viewed as a potential partner in investments to provide environmental services on a commercial basis, with appropriate measures to ensure that their activities are environmentally responsible. Full or partial self-financing of management costs for protected areas used by tourists can also be considered. Other non-traditional sources may also be mobilized for selected SAP activities.

Linking the Programme to Public Investment Plans

Many governments have adopted Public Investment Plans (PIPs) to effectively use their available domestic budget, international loans and foreign grants to support development objectives. To ensure timely implementation of regional environmental programmes such as the SAP, priority activities should be integrated into national PIPs. Representatives of the environmental ministry, which normally coordinates participation in such programmes, must work regularly and closely with the ministries of planning and finance to include priority Programme actions at the national and local level in the PIP. To accomplish this, basic information should be available concerning the projected investment and operation/maintenance cost, length of implementation period, and clear identification of the parties responsible for

implementation and long-term operation. Investments for environmental improvements should be well justified and should be expected to compete with other priority sectors for the use of the limited funds available to any government from both domestic and international sources. This should be viewed as a continuous and interactive process that must be conducted regularly during the course of the Programme to assure adequate access to financial resources.

Domestic and International Financing

Normally in regional environmental programmes, the higher income countries provide self-financing for Programme activities, while the lower-income countries use a mixture of domestic resources, long-term and concessional loans, and grants. In some cases limited international grant funding is available to support institutional strengthening, human resources development, and cooperative applied research activities on a regional basis. With rare exceptions, all types of loans and most types of grant funds from international sources for investment activities are only available on a "bilateral basis" rather than from a pooled regional fund. The availability of concessional loans and grants is "means tested" whereby a country's financial need is assessed by international financial institutions and bilateral donors so that funds are targeted to the lower-income countries. In addition, local governments, major ports and industrial complexes should be expected to play a role in the investment programme to assure their facilities meet the environmental objectives of the Programme in a cost-effective and timely manner. For effective mobilization of resources, it important to adopt a phased approach to Programme implementation, with investments to be made over several years, consistent with an established schedule that allows budget support for other priority in-

vestments required for economic and social development.

Role of International Funding Organizations

In addition to the donor coordination role of UNDP and catalytic role of UNEP, specific provisions have been made in the development of the SAP for direct participation of potential international, regional and bilateral funding organizations in programme design, implementation, monitoring and evaluation. It is recognized by PERSGA and the cooperating parties that these organizations can provide financial support and specialized expertise gained from their participation in other regional environmental programmes and individual development projects. PERSGA and the cooperating parties plan to seek the active participation of these organizations, at the regional and national level, in the identification of investment activities, development of institutional strengthening programmes and cooperative preparation of implementation plans and cost estimates for these measures.

Private Sector Participation

Implementation of the SAP provides an excellent opportunity for strong collaboration between PERSGA, the cooperating parties and the private sector in improved management of the coastal and marine environments. The private sector has a significant role to play in both preventive and curative actions in all sectors in which it is involved and the formation of an effective “public–private partnership” at the regional and national level is important to the success of the Programme. Major elements of the SAP in which the private sector can play an important role include:

- Expansion and management of water and wastewater services;

- Solid waste collection and disposal services;
- Industrial pollution control measures;
- Development of tourism facilities that are environmentally friendly;
- Improved environmental management of ports and free zones;
- Adoption and implementation of good practices in the oil industry;
- In cooperation with regional and national authorities, identification and implementation of measures to reduce navigation risks; and
- Development of sustainable fisheries practices, including reduction of by-catch.

The private sector can also play an important role in providing opportunities and facilities for training experts from regional, national and local organizations concerned with environmental management. Public and private partnerships can also be a major source of support for public awareness and environmental education activities. The World Bank, working through its affiliates, the International Finance Corporation (IFC) and the Multilateral Investment Guarantee Agency (MIGA), can support the participation of the private sector in selected aspects of the Programme.

Sustainable Financing of Coral Reef Conservation

The wide range of coral reefs and their ecological and economic importance to the Region mandate that special attention be given to development of sustainable financing mechanisms for their conservation. Recent reviews prepared by the World Bank provide examples of the worldwide range of experience in addressing this complex issue. Key to success is establishing the principle that coral reefs are economic re-

sources and that their users should pay fees, where appropriate. Measures to assure their sustainable use by a range of user groups must also be taken. This is especially important in the Region, given the increased demand from the rapidly expanding tourism industry to use the coral reefs for recreational purposes. The innovative work undertaken by Egypt in the South Sinai for the conservation of these resources, which includes the use of an “Environmental Cost Recovery Charge,” may provide a model that could be replicated elsewhere in the Region.

Alternative Sources of Funding

Given the limited financial resources of national and local governments, international organizations, international financial institutions and bilateral donors, it is necessary that non-traditional financial resources be mobilized to support implementation of the SAP at the regional and national level. These alternative approaches could include the use of environmental fees and fines; tourism taxes; user fees for parks and protected areas; application of lottery proceeds for SAP activities; debt for nature swaps; public-private cooperation for special activities; and use of funds from private foundations from within and outside the Region. The Saudi Environmental Awareness Programme, funded jointly by government and the private sector, provides a model of non-traditional funding that should be considered for extension to other nations in the Region.

Tables

Table 1. Threats to Coastal and Marine Environments and Resources

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Scale	Severity
Habitat Destruction:					
Coastal development	Extensive dredging and filling; change of currents and coastal processes; destruction of coral reefs, intertidal areas, lagoons, seagrass beds and sabkhas	Large-scale urban and industrial development; port development and maintenance dredging; tourist development	Inadequate environmental planning guidelines for coastal development; lack of enforcement; limited use of environmental assessment; limited awareness	Localized, throughout the Region; concentrated in urban, industrial, tourism areas and free zones	Moderate to severe
Beach mining and quarrying	Disturbance of sandy beaches, increased sedimentation, smothering of seagrass and corals	Sand collecting and quarrying for coral rock	Lack of regulations, and lack of enforcement	Localized	Low to moderate
Mangrove destruction	Deterioration of mangrove habitats; decreased fish and shrimp catches; reduced water quality; coastal erosion	Landfill, camel grazing, wood collection, shrimp farm construction, decreased freshwater supply	Mangroves exist under sub-optimal conditions; lack of regulations and management, lack of awareness, damming of wadis and rivers; increased population pressure	Regional	Moderate to severe
Destruction of seagrass beds and other sub-tidal habitats	Signs of physical disturbance; loss of seagrass-associated species	Trawling, including illegal trawling by foreign vessels; coastal dredging and filling; release of untreated waste waters from municipalities and shrimp/fish farms	Lack of adequate regulations and enforcement; limited awareness; limited knowledge of seagrass distribution	Localized, adjacent to urban and industrial areas; trawling impacts severe in Gulf of Suez, southern Red Sea and Gulf of Aden	Moderate to severe
Physical damage to coral reefs	Loss of coral habitat by collision and removal; indirect impacts through siltation; declining reef-associated fauna	Anchor damage, coral mining, ship groundings	Poor navigational control systems and error; lack of moorings; lack of awareness; inappropriate mining operations; inadequate training	Regional	Moderate to severe
Damage to coral reefs by visitors	Coral breakage by visitors; decrease in live coral cover; decline in reef-associated fauna; presence of solid waste	Trampling of shallow reef flats, breaking of corals, collecting of marine souvenirs; anchor damage	Lack of education about sensitivity of marine ecosystems; lack of management; lack of enforcement	Northern Red Sea and western Gulf of Aden; problem anticipated to spread Region-wide	Moderate to severe

Table 1. Threats to Coastal and Marine Environments and Resources

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Scale	Severity
Exploitation of Living Marine Resources:					
Overfishing of finfish for local and export markets	Decline in landings, decrease in average size	Increased fishing efforts, landing beyond Maximum Sustainable Yield	Lack of stock assessment and reliable statistics hampers fisheries management; mangroves destroyed; lack of surveillance and enforcement of existing regulations	Regional	Moderate to severe
Capture of sharks for shark fin market, frequently in areas beyond territorial waters	Decline in shark stocks; Other impacts include bycatch of turtles, dolphins and finfish	Increased fishing effort, use of nets in shark fisheries, high profits	Lack of surveillance and enforcement of existing regulations; expanding demand outside the Region for shark fins	Regional	Severe
Overfishing of shrimp and lobster for export markets	Decline in catches, decrease in average size	Increased fishing effort, illegal fishing	Lack of monitoring and enforcement of existing regulations; lack of stock assessment hampers resource management; destruction of nursery habitats (mangroves and seagrasses); illegal trawling	Gulf of Aden and southern Red Sea	Severe
Overfishing of cuttlefish for export markets	Decline in catches	Fishing effort beyond Maximum Sustainable Yield, improper fishing practices	Lack of monitoring and enforcement of regulations; lack of trained staff for surveillance	Gulf of Aden	Severe
Overfishing of <i>Strombus</i> for local markets	Decline in landings	Increased fishing efforts	Lack of stock assessment hampers resource management	Southern Red Sea	Severe
Overfishing of sea cucumber for export markets	Decrease in average size	Increased fishing efforts in limited areas	Lack of stock assessment hampers resource management	Southern Red Sea and Gulf of Aden	Low to moderate
Turtle capture and egg collection by local fishermen and communities; sale of shells to tourists and for export	Decrease in nesting populations	Need for subsidiary food supply in areas of poor fish resources; Economic returns from sales to tourists; Bycatch of turtles in fisheries; Lack of turtle-excluding devices	Lack of public awareness, lack of alternative food sources; lack of enforcement and stock assessment; lack of protection of eggs from stray dogs	Southern Red Sea and Gulf of Aden	Severe
Collection of corals and mollusks for souvenir trade	Breakage of corals and decline of live coral cover; decline in reef-associated fauna	Unregulated collection of corals and mollusks	Expansion of tourism; lack of awareness; lack of regulations and enforcement	Regional, especially the central and southern Red Sea	Moderate to severe

Table 1. Threats to Coastal and Marine Environments and Resources

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Scale	Severity
Ornamental fish collection for export	Potential decrease in reef fish populations, damage to the reef	Potential overfishing of individual species, destructive fishing methods	Lack of stock assessment, monitoring and management; lack of collector training	Localized, throughout the Region	Presently low
Conservation of marine mammals (especially dugong)	Potential decline in populations (dugong as an endangered species)	Accidental capture in fisheries	Lack of awareness	Regional	Moderate to severe
Spearfishing	Decline in size and stocks of reef fish; reef fish avoid divers	Indiscriminate spearing of many species of reef fishes, of all sizes; often in dive sites	Lack of enforcement of existing regulations; lack of relevant legislation in some countries	Localized, throughout the Region	Locally severe
Shrimp and fish farming	Irreversible conversion of coastal habitats; mangrove destruction; declining water quality; modification of coastline	Pond construction; mangrove destruction resulting in reduced water quality; use of chemicals, hormones and nutrients	Lack of regulations and poor planning	Currently localized with a growing potential throughout the Region	Severe
Navigation Risks and Maritime Transport:					
Regional navigation risks	Extensive and routine risks of ship collisions and groundings in major international traffic lanes	Limited navigational devices and poorly separated traffic; weak regional coordination on navigation issues; inaccurate navigational charts	Complex navigational hazards combined with heavy maritime traffic, including large-scale movement of oil and other cargoes	Regional, with serious issues in the Gulf of Suez, Gulf of Aqaba and the Bab-al-Mandab	Moderate to severe
Local navigation risks	Extensive and routine risks of ship collisions and groundings in approaches to major and minor ports, oil loading facilities and near coral reefs	Limited navigational devices and poorly separated traffic; weak regional and national coordination on navigation issues; inaccurate navigational charts; increasing local traffic by small vessels	Complex navigational hazards due to limited depth of shipping channels and approaches to ports; large volumes of maritime traffic which includes a variety of vessels operating with a wide range of safety standards	Significant problems in areas of major ports and key oil loading facilities; Anticipated to become a concern in areas adjacent to proposed free ports and free zones;	Moderate to severe

Table 1. Threats to Coastal and Marine Environments and Resources

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Scale	Severity
Petroleum and Mineral Development and Transport:					
Oil and gas exploration and production	Construction debris; tar balls and slicks on beaches and in water	Capped wells as a navigation hazard; seepage of oil; production emergencies including blow – outs; pipeline breakages	Normal risks associated with oil exploration and production, made worse by poor operator performance and poor field procedures	Gulf of Suez, northern Red Sea and southern Red Sea	Moderate to severe
Small oil spills (< 20 tons)	Beach contamination, damage to coastal and marine biota	Discharge of ballast and bilge water, bunker oil spill	Lack of reception facilities at ports; inadequate control, lack of enforcement	Localized, throughout the Region	Moderate
Medium oil spills (< 100 tons)	Beach contamination, damage to coastal and marine biota	Discharges from pipelines or terminals, small accidents at sea	Inadequate control and monitoring of procedures, equipment and personnel; Inadequate training	Localized, throughout the Region	Moderate to severe
Potential large oil spills and disasters	Destruction of coastal and marine habitats and biota, devastation of beaches	Rupture of oil tanks in collision or wreckage	Insufficient tanker safety specifications; Poor navigation aids	Localized, throughout the Region	Severe
Industrial Activities:					
Surface and groundwater use	Excessive exploitation for industrial use and cooling; re-allocation to industrial uses; draw –down of limited groundwater resources; saltwater intrusion into coastal aquifers	Use of industrial technology often with inadequate concern for water conservation and excessive pumping of groundwater resources	Allocation of limited surface and groundwater sources for industrial use with limited regard for overall usage needs and inadequate pricing; lack of incentives for water conservation; poor regulation of water exploitation	Regional, especially in coastal urban areas	Moderate to severe
Industrial chemical spills	Health risk, potential damage to marine life	Accidental spill during transport, storage or use of chemicals	Inadequate monitoring and control of hazardous substances	Localized, vicinity of chemical industrial installations	Moderate to severe
Cooling water discharges	Increased temperatures, alteration of marine environment	Release of high temperature cooling waters from power plants, industries and desalinization plants	Inadequate thermal pollution control standards	Localized in the vicinity of power plants, industries and desalinization plants	Low
Hypersaline water discharges	Increased salinity near outfalls, alteration of marine environment	Release of hypersaline water from desalination plants	Inadequate salinity control standards	Localized, in vicinity of seawater desalination plants	Low

Table 1. Threats to Coastal and Marine Environments and Resources

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Scale	Severity
Phosphate dust emissions	Decreased coral growth	Release of phosphate dust during port operations	Inadequate pollution control standards, monitoring and enforcement	Local	Low
Industrial pollution	Decline in water quality, marine life affected	Chronic release of pollutants	Lack of regulations and enforcement; Inadequate technology	Localized in the vicinity of industrial zones and at individual facilities	Currently moderate
Pollution from cement factories	Consolidation of beach sands; Altered coastal and marine sediments; Hampered turtle nesting	Deposition of cement dust	Lack of controls and inadequate technology	Localized	Severe
Waste oil disposal	Soil and groundwater impacts	Improper disposal of used motor oil, use of oil as dust suppressant	Lack of proper oil disposal or recovery options; lack of effective regulations and enforcement	Localized, throughout the Region	Moderate to severe
Urban and Tourism Development:					
Surface and groundwater	Excessive exploitation of surface and groundwater for municipal use; re-allocation of surface water to municipal uses; draw-down of limited groundwater resources; saltwater intrusion into coastal aquifers	Use of water distribution and household systems often with inadequate concern for water conservation and excessive pumping of groundwater resources	Allocation of limited surface and groundwater sources for municipal use with inadequate regard for conservation measures including maintenance of distribution systems and household plumbing; inadequate pricing of water; lack of incentives for water conservation	Regional, in municipal areas	Moderate to severe
Urban land use	Destruction of coastal areas and adjacent marine habitats	Extensive development of coastal areas often with limited regard to availability of water resources; inadequate infrastructure and development in areas with fragile coastal ecology	Inadequate development planning and coastal zone management; lack of coordination between ministries; limited enforcement of regulations	Regional	Moderate to severe

Table 1. Threats to Coastal and Marine Environments and Resources




Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Scale	Severity
Discharge of untreated or insufficiently treated sewage (municipal, hospital, slaughter house)	Raised water table, groundwater impacts, eutrophication and alteration of marine environment, threats to public health	Lack of sewage treatment plants or lack of maintenance of existing sewage treatment plants	Inadequate pollution control regulations, monitoring and enforcement	Localized in the vicinity of coastal urban areas and large tourist developments	Severe
Disposal of solid waste	Deterioration of aesthetics, alteration of coastal habitats, physical damage to coastal and marine life; contamination of groundwater from landfill	Improper garbage disposal, beach litter	Lack of adequate waste disposal regulations and enforcement, inadequate public awareness	Localized in the vicinity of coastal urban areas, coastal villages, tourism developments and adjacent to major shipping lanes	Moderate
Tourism development	Destruction of coastal areas and adjacent marine habitats	Intense tourism development; over-exploitation of available water resources; poor infrastructure linkages; excessive use of marine habitat; landfilling	Limited use of coastal zone planning and infrastructure planning; limited awareness of adverse tourism impacts; unregulated tourism activities and access	Regional; with current problems in the Gulf of Suez, Gulf of Aqaba and northern Red Sea; Problems are developing in the central and southern Red Sea	Low to severe
Degradation of Cultural Heritage	Direct and indirect adverse impacts to archaeological, historical and sacred sites; destruction of unique and non-renewable cultural heritage sites in coastal areas with serious pressure on historic urban areas	Inadequate evaluation of potential impacts to cultural heritage in the planning, design, construction and operation of investments; Limited use of chance find procedures to address the discovery of unknown buried artifacts during construction	Lack of adequate recognition of the importance of cultural heritage, limited application of Antiquities Laws in the cooperating countries and poor integration of these concerns into the planning process	Regional, especially in coastal urban areas and along traditional transportation routes	Moderate to severe
Special Concerns:					

Table 1. Threats to Coastal and Marine Environments and Resources

Issue	Symptoms / Impacts	Immediate Causes	Root Causes	Scale	Severity
Illegal disposal of harmful substances	Threat to marine biota and human health	Intentional disposal of hazardous waste at sea	Lack of control mechanisms and enforcement	Southern Gulf of Aden	Severe
Sedimentation from agriculture and grazing	Depletion of vegetation cover resulting in mobilization of formerly stabilized sand sheets and dunes; smothering of seagrass and corals	Overgrazing by livestock, especially sheep and goats	Inadequate management of coastal grazing areas; increased, unregulated access to imported feed supplements; use of tankers for supplemental water supplies	Central and southern Red Sea and Gulf of Aden	Low to moderate
Discharge of pesticides and fertilizers	Detection of pesticides in sediments and biota, fish kills, eutrophication	Occasional runoff from agricultural areas after torrential floods; dust storms	Lack of control and management of agrochemicals	Southern Red Sea	Low
Coral die-off	Large areas of dead coral reefs, decrease in coral-associated organisms and fisheries	Unknown	Unknown, but could be natural and related to unusual sea temperatures; no apparent human cause	Southern Red Sea	Severe
Pollution from shrimp and fish farming	Declining water quality	Mangrove destruction; use of chemicals and nutrients	Lack of planning, regulations and enforcement	Localized	Moderate
Marine vessel sewage	Localized marine and beach pollution	Direct discharge from ships	Inadequate on-board treatment, lack of port reception facilities	Regional	Moderate to severe
Ship discharge of solid waste	Solid waste on shoreline, mangroves, seagrass and coral reefs; aesthetic impacts on recreation and tourism; risks from ingestion to marine animals	Discharge of solid waste from ships	Inadequate disposal facilities; excessive fees for onshore disposal; lack of awareness; inadequate surveillance and enforcement	Regional	Low to severe

Table 2. Transboundary Analysis – Thematic Issues on a Sub-Regional Basis

THEMATIC ISSUES	Gulf of Suez	Gulf of Aqaba	North and Central Red Sea	South Red Sea & Bab-al-Mandab	Gulf of Aden	Socotra Archipelago
<i>A. Management of Marine Protected Areas (MPAs)</i>	**	***	***	**	***	***
1. Establish a system of MPAs						
2. Strengthen understanding and experience in principles of MPAs						
3. Support stakeholder involvement in planning and implementation						
4. Facilitate the mobilization of resources from international and domestic sources						
<i>B. Sustainable Use of Living Marine Resources</i>	***	**	**	***	***	**
1. Avoid and mitigate coastal impacts from current and proposed shrimp and fish farming						
2. Improve regional data on transboundary stocks						
3. Address regulation of exploitation of high profile species (including sharks & lobster)						
3. Reduce threats to marine turtles, seabirds and marine mammals						
4. Strengthen surveillance and enforcement mechanisms for existing fisheries						
5. Support regional cooperation in management of shared stocks						
<i>C. Reduction of Navigation Risks and Marine Pollution</i>	***	***	**	***	**	*
1. Continuation of PERSGA Navigation Working Group						
2. Implementation of International Conventions and adoption of Port State control measures						
3. Development of improved traffic separation schemes and other routing systems in coordination with IMO						
4. Development and implementation of Sub-Regional Vessel Traffic Systems for Gulf of Suez, Gulf of Aqaba and Bab-al-Mandab						
5. Establishment of a radio communications network to support Global Maritime Distress and Safety Systems (GMDSS)						
6. Upgrading of existing maritime navigation aids in Main Red Sea, Gulf of Aqaba and Bab-al-Mandab						

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





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Table 2. Transboundary Analysis – Thematic Issues on a Sub–Regional Basis

THEMATIC ISSUES	Gulf of Suez	Gulf of Aqaba	North and Central Red Sea	South Red Sea & Bab-al-Mandab	Gulf of Aden	Socotra Archipelago
<i>D. Emergency Management</i>	***	**	**	***	**	*
1. Development and implementation of a Regional Oil Spill Contingency Plan						
2. Development of a Sub–Regional System for Emergency Mutual Aid Centers						
3. Expand system of Sub–Regional Marine Emergency Mutual Aid Centers by establishing the planned center at Hurghada, in Egypt						
4. Strengthen existing Sub–Regional Marine Emergency Aid Center in Djibouti						
<i>E. Environmental Education Public Awareness and Participation</i>	**	**	***	***	***	***
1. Support for training and public awareness in resource use						
2. Increase awareness and priority within existing government structure						
3. Increase expertise within countries for environmental education						
4. Increase participation of community groups						
5. Increase emphasis on environmental education and awareness in school curriculum						
6. Increase financial resources for community groups concerned with the environment						

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





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Table 3. Transboundary Analysis – Thematic Issues by Country

THEMATIC ISSUES	PERSGA	Egypt	Jordan	Saudi Arabia	Sudan	Yemen	Djibouti	Somalia
A. Institutional Strengthening	***	**	**	**	***	***	***	***
1. Reinforce institutional capacity of PERSGA Secretariat								
2. Strengthen environmental planning and management capacity								
3. Introduce of new policies and legislation								
4. Establishing and reinforcing better linkages between national and regional goals								
5. Strengthen national legislation and administrative support for Integrated Coastal Zone Management								
B. Management of Marine Protected Areas (MPAs)	***	***	**	**	***	**	**	*
1. Establish a system of MPAs.								
2. Strengthen understanding and experience in principles of MPAs.								
3. Support stakeholder involvement in planning and implementation								
4. Facilitate the mobilization of resources from international and domestic sources								
C. Sustainable Use of Living Marine Resources	***	**	**	**	**	**	**	***
1. Avoid and mitigate coastal impacts from current and proposed shrimp and fish farming								
2. Improve regional data on transboundary stocks								
3. Address regulation of exploitation of high profile species (including sharks & lobster)								
4. Reduce threats to marine turtles, seabirds and marine mammals								
5. Strengthen surveillance and enforcement mechanisms for existing fisheries								
6. Support regional cooperation in management of shared stocks								
D. Reduction of Navigation Risks and Marine Pollution	***	***	***	**	***	***	**	*
1. Continuation of PERSGA Navigation Working Group								
2. Implementation of international Conventions and adoption of Port State Control measures								
3. Development of improved Traffic Separation Schemes and other routing systems in coordination with IMO								
4. Development and implementation of Sub-Regional Vessel Traffic Systems for Gulf of Suez, Gulf of Aqaba and Bab-al-Mandab								

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





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Table 3. Transboundary Analysis – Thematic Issues by Country

THEMATIC ISSUES	PERSGA	Egypt	Jordan	Saudi Arabia	Sudan	Yemen	Djibouti	Somalia
5. Establishment of a radio communication network to support Global Maritime Distress and Safety System (GMDSS)								
6. Upgrading of existing maritime navigation aids in Main Red Sea, Gulf of Aqaba and Bab-al-Mandab								
<i>E. Emergency Management</i>	***	***	**	**	**	***	**	*
1. Development and implementation of a Regional Oil Spill Contingency Plan								
2. Development of a Sub-Regional System for Emergency Mutual Aid Centers								
3. Expand system of Sub-Regional Marine Emergency Mutual Aid Centers by establishing the planned center at Hurghada, in Egypt								
4. Strengthen existing Sub-Regional Marine Emergency Aid Center in Djibouti								
<i>F. Environmental Education Public Awareness and Participation</i>	***	**	**	***	***	***	***	***
1. Support for training and public awareness in resource use								
2. Increase awareness and priority within existing government structure								
3. Increase expertise within countries for environmental education								
4. Increase participation of community groups								
5. Increase emphasis on environmental education and awareness in existing school curriculum								
6. Increase financial resources for community groups concerned with the environment								
<i>G. Monitoring and Indicator Evaluation</i>	***	***	***	***	***	***	***	***
1. Establish Working Group								
2. Establish Monitoring System								
3. Prepare Annual Reports								
4. Dissemination of Lessons Learned								

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









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Table 4. Transboundary Analysis – Common Concerns on a Sub-Regional Basis





COMMON CONCERNS	Gulf of Suez	Gulf of Aqaba	North and Central Red Sea	South Red Sea & Bab-al-Mandab	Gulf of Aden	Socotra Archipelago
<i>A. Habitat Destruction</i>	***	***	***	***	*	*
1. Coastal development						
2. Beach mining and quarrying						
3. Mangrove destruction						
4. Destruction of seagrass beds and other sub-tidal habitats						
5. Physical damage to coral reefs						
6. Damage to coral reefs by visitors						
<i>B. Living Marine Resources</i>	***	***	**	***	***	**
1. Current and potential overfishing of finfish for local and export markets						
2. Capture of sharks for shark fin market, frequently in areas beyond territorial waters						
3. Current and potential overfishing of shrimp and lobster for export markets						
4. Current and potential overfishing of sea cucumber for export markets						
5. Turtle capture and egg collection by local fishermen and communities; sale of shells to tourists and for export						
6. Collection of corals and mollusks for souvenir trade						
7. Ornamental fish collection for export						
8. Conservation of marine mammals (especially dugong)						
9. Spearfishing						
10. Shrimp and fish farming						
<i>C. Navigation Risks</i>	***	***	**	***	*	*
1. Review current navigation charts, conduct hydrographic re-surveys and prepare updated charts in vicinity of major ports						
2. Expanded use of emergency anchors						
3. Expanded use of harbor tugs						

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COMMON CONCERNS	Gulf of Suez	Gulf of Aqaba	North and Central Red Sea	South Red Sea & Bab-al-Mandab	Gulf of Aden	Socotra Archipelago
<i>D. Emergency Management</i>	**	**	**	**	*	*
1. Update or prepare National and Local Oil Spill Contingency Plans						
<i>E. Oil and Gas Development</i>	***	***	**	***	**	n.a.
1. Use of environmental management practices in oil and gas development, including major pipelines and marine terminals						
<i>F. Industrial Activities</i>	***	***	**	**	*	n.a.
1. Surface and groundwater use						
2. Industrial Pollution						
<i>G. Urban and Tourism Development</i>	***	***	*	*	*	*
1. Surface and groundwater use						
2. Disposal of solid waste						
3. Tourism Development						
<i>H. Special Concerns</i>	*	*	**	**	***	*
1. Illegal disposal of harmful substances						
2. Sedimentation from agriculture and grazing						
3. Discharge of pesticides and fertilizers						

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COMMON CONCERNS	PERSGA	Egypt	Jordan	Saudi Arabia	Sudan	Yemen	Djibouti	Somalia
A. Habitat Destruction	***	***	**	**	***	**	***	*
1. Coastal development								
2. Beach mining and quarrying								
3. Mangrove destruction								
4. Destruction of seagrass beds and other sub-tidal habitats								
5. Physical damage to coral reefs								
6. Damage to coral reefs by visitors								
B. Living Marine Resources	***	**	*	**	**	***	**	**
1. Current and potential overfishing of finfish for local and export markets								
2. Capture of sharks for shark fin market, frequently in areas beyond territorial waters								
3. Current and potential overfishing of shrimp and lobster for export markets								
4. Current and potential overfishing of sea cucumber for export markets								
5. Turtle capture and egg collection by local fishermen and communities; sale of shells to tourists and for export								
6. Collection of corals and mollusks for souvenir trade								
7. Ornamental fish collection for export								
8. Conservation of marine mammals (especially dugong)								
9. Spearfishing								
10. Shrimp and fish farming								
C. Navigation Risks	**	***	**	**	**	**	**	*
1. Review current navigation charts, conduct hydrographic re-surveys and prepare updated charts in vicinity of major ports								
2. Expanded use of emergency anchors								
3. Expanded use of harbor tugs								

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




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Table 5. Transboundary Analysis – Common Concerns by Country								
COMMON CONCERNS	PERSGA	Egypt	Jordan	Saudi Arabia	Sudan	Yemen	Djibouti	Somalia
<i>D. Emergency Management</i>	***	**	**	**	**	**	**	*
1. Update or prepare National and Local Oil Spill Contingency Plans								
<i>E. Oil and Gas Development</i>	**	***	*	***	*	***	*	*
1. Use of environmental management practices in oil and gas development, including major pipelines and marine terminals								
<i>F. Industrial Activities</i>	*	***	***	***	**	**		
1. Surface and groundwater use								
2. Industrial pollution								
<i>G. Urban and Tourism Development</i>	***	***	***	***	*	**	***	*
1. Surface and groundwater use								
2. Urban land use								
3. Discharge of untreated or insufficiently treated sewage (municipal, hospital, slaughter house)								
4. Disposal of solid waste								
5. Tourism Development								
<i>H. Special Concerns</i>	**			*	**	**		***
1. Illegal disposal of harmful substances								
2. Sedimentation from agriculture and grazing								
3. Discharge of pesticides and fertilizers								

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


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Table 6. Priority Actions: REGIONAL

Environment Issue	Priority Action	Scale	Emphasis	Urgency
Long-term commitment	High-level commitment by governments to achieve long-term goal of conservation and sustainable use of the Red Sea and Gulf of Aden	Regional National Local	Commitment Public awareness	***
Public awareness	Development and implementation of a regional programme for environmental awareness, including educational materials, media information, training	Regional National Local	Capacity building Public awareness	***
International agreements	Ratification of MARPOL Convention Civil Liability Convention (CLC) 1969 and 1992 Protocol The Fund Convention 1971 and 1992 Protocol	International Regional National	International framework Preventive action	***
Maritime transport	Adoption of Port State Control by countries in the Region	Regional National	National framework for maritime supervision Preventive action	***
Environmental management	Strengthened capacity of governments to regularly use environmental assessments in development decisions and project implementation	Regional National Local	Preventive action Capacity building Planning studies	***
Environmental management	Strengthened regional capacity for development and implementation of coastal zone management programmes	Regional National Local	Preventive action Capacity building Planning studies	***
Environmental management	Preparation and dissemination of guidelines for standardization and routine updating of Geographic Information Systems data collection , input and display to allow for a compatible spatial data base	Regional National	Management information Capacity building Technical development	**
Habitat conservation	Development of a regional programme for the conservation of key bird habitats, turtle nesting sites and conservation of other ecosystems in the coastal and marine zones	Regional National Local	Management programme Capacity building Enforcement	***
Habitat conservation	Development of institutional capacity and framework for a regional network of Marine Protected Areas	Regional National	Management programme Capacity building	***
Living marine resources	Regional stock assessment of pelagic species and development of regional management programme	Regional National	Management information Management programme	***
Living marine resources	Development and implementation of management programme for shark fisheries	Regional National Local	Management information Management programme	***
Living marine resources	Development and implementation of management programme for turtles	Regional National Local	Management information Management programme	***
Living marine resources	Strengthened enforcement capacity for fisheries regulations	Regional National Local	Management programme Technical development	***

*	=important
**	=very important
***	=extremely important

Table 6. Priority Actions: REGIONAL

Environment Issue	Priority Action	Scale	Emphasis	Urgency
Living marine resources	Development and implementation of marine mammal management and conservation programme	Regional National Local	Management information Management programme	**
Living marine resources	Development and implementation of management programme for reef fisheries	Regional National Local	Management information Management programme	**
Living marine resources	Development of a regional research programme on coral reef management, including coral die-off, fisheries dynamics and environmental monitoring, using indicator species	Regional	Management information Capacity building	*
Living marine resources	Development of regulations and control mechanisms for the collection of corals and shells for souvenir trade	National	Enforcement Public awareness	*
Living marine resources	Development of regulations and control mechanisms for collection of and trade in ornamental fish	Regional National	Legislative framework/ Enforcement Public awareness	*
Navigation risk	Development of improved Traffic Separation Schemes in coordination with IMO	Regional Sub- Regional National	Preventive action Capacity building Management information	***
Navigation risk	Development and implementation of sub-regional vessel traffic systems for Gulf of Suez, Gulf of Aqaba , Bab-al-Mandab	Sub- Regional National	Preventive action Capacity building Technical development	**
Navigation risk	Review of current navigation charts, conduct hydrographic surveys and prepare updated charts for key areas along shipping routes and in vicinity of major ports	Regional Sub- Regional National Local	Capacity building Technical development Management information	***
Navigation risk	Establishment of a radio communication network to support GMDSS	Regional Sub- Regional National Local	Preventive action Capacity building Technical development Management information	**
Navigation risk	Upgrading of existing marine navigation aids in main Red Sea, Gulf of Aqaba and Bab-al-Mandab	Regional, Sub- Regional National	Preventive action Technical development Management information	**
Petroleum development and transport	Development and implementation of a regional oil spill contingency plan	Regional Sub- Regional National Local	Capacity building Technical development	***
Petroleum development and transport	Expand system of Sub-Regional Marine Emergency Mutual Aid Centers by establishing the planned center at Hurghada, in Egypt, strengthening the existing MEMAC in Djibouti and upgrading national capacities in emergency response	Regional Sub- Regional National	Capacity building Technical development Management information	***

*	=important
**	=very important
***	=extremely important

Table 6. Priority Actions: REGIONAL

Environmenta l Issue	Priority Action	Scale	Emphasis	Urgency
Urban and industrial development	Increased priority for management of surface and groundwater, through technical and non-technical interventions, to promote water conservation and reuse of treated wastewater	Regional National Local	Capacity building Technical development Public awareness	***
Urban and industrial development	Increased priority for management of solid waste, through technical and non-technical interventions, including public awareness activities	Regional National Local	Capacity building Technical development Public awareness	**
Urban development	Development and implementation of measures for conservation of the rich cultural heritage of the coastal zone, including archaeological, historical and sacred sites	Regional National Local	Management information Management programme Enforcement Public awareness	***
Applied research	Preparation and dissemination of species identification guides to living coastal and marine resources of the Region in a variety of languages	Regional National	Basic scientific information Capacity building Management information Public awareness	**
Applied research	Strengthening of environmental laboratory and monitoring capacity, including standardization of sample collection, testing and reporting procedures on a regional basis	Regional National	Management information Capacity building Technical development	**

*	=important
**	=very important
***	=extremely important

Table 7. Priority Actions: DJIBOUTI

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Legislation	Development of national maritime law and revision of related laws	National	Legal framework	**
Environmental management	Strengthened enforcement of legislation related to management of coastal and marine areas	National	Capacity building Technical development	***
Environmental management	Development and implementation of management plan for Marine Protected Areas (Parc Territorial de Musha, Réserve Intégrale de Maskali-Sud)	Local	Legal framework Management information Management programme	***
Environmental management	Feasibility study for conservation and management of additional Marine Protected Areas (including Iles des Sept Frères, Ras Bir, Mangrove de Godoriya)	National Local	Legal framework Management information Technical development	**
Environmental management	Preparation and implementation of a coastal zone management plan, mangrove management plan and coral reef management plan	National	Legal framework Capacity building Planning framework	**
Habitat conservation	Rehabilitation of coral reefs from damage by visitors	National Local	Legal framework Management information Management programme Public awareness	***
Habitat conservation	Rehabilitation of mangroves from damages caused by landfilling and camel grazing and identification of alternative sources of fuel	National Local	Legal framework Management information Management programme	**
Tourism management	Development of a framework and programme for visitors to coral reef areas, including guidelines for boats and moorings	National Local	Legal framework Management programme Technical development Public awareness	***
Living marine resources	Development and implementation of fisheries production and marketing plan, based on results of recent stock assessments	National	Management information Production programme	**
Living marine resources	Development and implementation of turtle protection and management programme	National Local	Enforcement Management information Management programme Public awareness	**
Living marine resources	Stock assessment of reef fish population, development and implementation of management programme for collection of ornamental fish	Local	Legal framework Management information Management programme	*
Community development	Development and implementation of poverty alleviation programmes in fishing communities, including provision of basic fishing gear	National Local	Feasibility studies Technical assistance Technical development	***
Navigation risk	Review of current navigation charts, hydrographic re-surveys and preparation of updated charts for key areas along shipping routes and in vicinity of key ports	Regional National Local	Capacity building Technical development Management information	**

*	=important
**	=very important
***	=extremely important

Table 7. Priority Actions: DJIBOUTI

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Navigation risk	Improved navigational aids and radio communication, especially along major shipping lanes	National Local	Capacity building Technical development	*
Petroleum development and transport	Revision and implementation of oil spill contingency plan in the framework of the Marine Emergency Mutual Aid Center (MEMAC) in Djibouti	National Local	Capacity building Technical development	**
Industrial development	Preparation of feasibility study and development of port reception facilities	Local	Feasibility study Capacity building Technical development	**
Urban development	Upgrading of wastewater collection and treatment in coastal areas, especially Djibouti town	Local	Feasibility studies Capacity building Technical development	***
Urban development	Upgrading of solid waste management and disposal in coastal areas, especially in the vicinity of Djibouti town	Local	Feasibility studies Capacity building Technical development	***
Institutional strengthening	Establishment of a marine biology department and training of marine biologists and marine ecologists	National	Capacity building Technical development	***
Applied research	Development of data base for biological resources and environmental information; establishment of a monitoring programme to support operations and enforcement activities	National	Management information	***

*	=important
**	=very important
***	=extremely important

Table 8. Priority Actions: EGYPT

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Legislation	Review and update existing regulations for the protection of natural resources	National Local	Legislative framework	***
Legislation	Review and update existing pollution control regulations	National Local	Legislative framework	***
Institutional strengthening	Training programmes for strengthening institutional capacities of agencies involved in management of Red Sea coastal areas	National Local	Capacity building	**
Institutional strengthening	Establishment of water pollution monitoring units for Red Sea linked to the national level	National Local	Management information Capacity building Technical development	**
Environmental Management	Development of National Coastal Zone Management Plan for Red Sea coast, including the Gulfs of Aqaba and Suez	National Local	Legal framework Management information Management programme	***
Environmental management	Strengthened enforcement capacity of Egyptian Environmental Affairs Agency	National Local	Capacity building	***
Habitat conservation	Effective enforcement of Law 4/94 for protected areas	National; Local	Capacity building Enforcement	***
Living marine resources	Review and update of current fishery legislation	National Local	Legal framework	***
Living marine resources	Establishment of a stock assessment data base	Regional National	Management information Capacity building	**
Living marine resources	Development and adoption of improved fishing techniques	National Local	Capacity building Technical development	**
Living marine resources	Establishment of Marine Protected Areas at priority sites	Regional National Local	Preventive action Capacity building Technical development	***
Navigation risk	Development and implementation of sub-regional vessel traffic systems for the Gulf of Aqaba and Gulf of Suez	Sub- Regional National Local	Preventive action Capacity building Technical development	***
Navigation Risk and Pollution Control	Establishment of a Regional Emergency Aid Center in Hurghada, with Egypt providing the land and infrastructure	Regional Sub- Regional National Local	Preventive action Capacity building Technical development	**
Navigation Risk and Pollution Control	Provision of adequate reception facilities for oily wastes in Egyptian Red Sea ports consistent with MARPOL (1973–1978)	Sub- Regional National Local	Preventive action Capacity building Technical development	***
Petroleum development and transportation	Development of an Oil Spill Contingency Plan	National Local		**
Petroleum development and transportation	Preparation of guidelines for the use of dispersants for use in oil spills given the ecological vulnerability of the Red Sea	National Local	Technical development	**

*	=important
**	=very important
***	=extremely important

Table 8. Priority Actions: EGYPT

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Urban and industrial development	Development of an evaluation of point source pollution from urban and industrial sites	National Local	Environmental information Capacity building	**
Urban development	Development of a National Plan for Solid Waste Management in coastal cities in the Red Sea	National Local	Planning studies Capacity building Technical development	***
Urban development	Public awareness programme for recycling of wastes in coastal areas	National Local	Feasibility studies Capacity building Technical development	**
Urban development	Shoreline profiling programme and identification of "hot spots"	Local	Technical studies	**
Urban development	Evaluation and implementation of flood control measures to protect coastal zone and marine environment	Local	Management information Capacity building Technical development	
Urban development	Establishment of flood prediction and warning centers	Regional Local	Capacity building Technical development	**
Urban development	Support for the expanded use of flood water in agriculture	Local	Capacity building Technical development	**
Environmental Information	Creation of an inventory of land resources of the coastal areas as an element of a National GIS Data Base	National Local	Management information Capacity building Technical development	**

*	=important
**	=very important
***	=extremely important

Table 9. Priority Actions: JORDAN

Environment Issue	Priority Action	Scale	Emphasis	Urgenc y
Environmental management	Recruitment and training of staff to implement Gulf of Aqaba environmental protection policies and regulations	National Local	Capacity building Management programme	***
Environmental management	Development of an improved computer and GIS database capability for environmental management of the Gulf of Aqaba	Local	Management information Capacity building	*
Habitat conservation	Implementation of GEF Project-supported Advance Coastal Zone Management and Environmental Assessment procedures	National Local	Management programme Enforcement	***
Habitat conservation	Establishment and implementation of a management plan and regulations for a Gulf of Aqaba Marine Park, including fisheries management	Regional National Local	Legal framework Capacity building Management programme Enforcement	***
Habitat conservation	Recruitment and training of staff to implement regulations for new coastal development to reduce physical threats to coral reef ecosystems	Local	Capacity building Management programme Enforcement	**
Navigation risk	Improvement of navigational aids and radio communications in Jordanian waters, especially on major shipping channels	Sub- Regional National Local	Capacity building Technical development	**
Maritime transport	Development and implementation of pollution prevention for ship-based sources, control standards and regulations	Local	Legal framework Capacity building Enforcement	***
Maritime transport	Development and implementation of a management programme to control disposal of solid waste and litter from ships and ferry boats	Regional National Local	Legal framework Enforcement Public awareness	***
Maritime transport	Preparation of a feasibility study for bilge and ballast water reception facilities at the Port of Aqaba and implementation of priority recommendations	Local	Feasibility study Technical development	***
Petroleum development and transport	Preparation of a pre-feasibility study on mechanisms to reduce the risk of catastrophic oil spills	Regional National Local	Management information Management programme	***
Industrial development	Design and implementation of a demonstration project for marine waste oil recovery	Regional Local	Demonstration activity Technical development	***
Industrial development	Adoption and implementation of regulations, standards, coastal zone management and environmental auditing procedures for coastal industries	National Local	Strengthening standards Enforcement	***

*	=important
**	=very important
***	=extremely important

Table 9. Priority Actions: JORDAN

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Industrial development	Recruitment and training of staff for implementation of industrial pollution prevention regulations	National Local	Capacity building Strengthening standards Enforcement	***
Industrial development	Waste oil contamination monitoring and demonstration project in waste oil recovery from land-based sources	Local	Management information Technical development	**
Industrial development	Programme to monitor marine water quality for pollution from industries	Local	Information gathering	**
Industrial development	Implementation of measures to further reduce phosphate dust emissions	Local	Technical development	*
Urban and industrial development	Cooperative actions to manage transboundary marine pollution in the upper Gulf of Aqaba	Sub-Regional Regional National Local	Regional cooperation Management programme Technical development	**
Urban development	Development and implementation of a plan for municipal wastewater conservation and reuse	Local	Technical development	***
Urban development	Development and implementation of a groundwater quality management programme	Regional Local	Management information Management programme	**
Urban development	Development and implementation of a solid waste collection, recycling and disposal plan	Local	Technical development Regional cooperation	**
Applied research	Strengthening of current programme for development of data base for biological resources and environmental information; further strengthening and expansion of programmes to support operations and enforcement activities	National Local	Capacity building Management information	*

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Table 10. Priority Actions: SAUDI ARABIA

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Legislation	Enforcement of legislation related to management of coastal and marine areas	National	Capacity building Technical development	***
Environmental management	Final approval and effective implementation of the coastal zone management plan	National	Legal framework Capacity building	***
Environmental management	Implementation of management programme for the Farasan Islands Marine Protected Area	National Local	Legal framework Management information Management programme	***
Environmental management	Development and implementation of management programme for Marine Protected Areas at Wejh Bank, sites in Straits of Tiran and other areas on the Red Sea	National Local	Legal framework Management information Management programme	***
Habitat conservation	Rehabilitation of mangroves from damages caused by landfilling and camel grazing	National Local	Management programme Public awareness	**
Living marine resources	Stock assessment and management programme for finfish and shrimp with an evaluation of catch and effort	National	Management information Management programme	***
Living marine resources	Measures to control intensive collection of fish and invertebrates on reef flats and spearfishing	National Local	Enforcement Public awareness	**
Living marine resources	Development and implementation of a conservation and management programme for breeding birds and nesting turtles on offshore islands	National Local	Legal framework Management information Management programme	**
Living marine resources	Update of current fisheries management programme	National	Management information Management programme Production programme	*
Tourism management	Enforcement and public awareness activities for coral reef conservation, including control of overfishing, trampling of corals, anchor damage, littering and souvenir collection	National Local	Legal framework Management programme Public awareness	**
Navigation risk	Review current navigation charts, conduct hydrographic re-surveys and prepare updated charts for key areas along shipping routes and in vicinity of key ports	Regional National Local	Capacity building Technical development Management information	**
Navigation risk	Improvement of navigational aids and radio communication in Saudi waters, especially on major shipping channels	National Local	Capacity building Technical development	**
Petroleum development and transport	Implementation of current Oil Spill Contingency Plan, including development of local response plans	National Local	Capacity building Technical development	**
Maritime transport	Review of port reception facilities and upgrade of measures as appropriate	Local	Technical review Technical development	**

*	=important
**	=very important
***	=extremely important

Table 10. Priority Actions: SAUDI ARABIA

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Industrial development	Improved management of air pollution, brine disposal and thermal discharges from desalination plants at urban areas and industrial ports	National Local	Technical development	**
Industrial development	Improved control of emissions from cement plants in coastal areas, especially Ras Baridi	National Local	Technical development	*
Urban development	Effective control of dredging and filling for urban and industrial development, port construction and maintenance dredging of navigation channels	Local	Enforcement Environmental planning Monitoring Public awareness	***
Urban development	Upgrading of wastewater collection and treatment in coastal areas, especially Jeddah	Local	Feasibility studies Capacity building Technical development	***
Urban development	Development and implementation of a special programme for the management and reduction of elevated groundwater tables in the Jeddah urban area	Local	Management programme Technical development	***
Urban development	Strengthening of environmental planning and management of urban development in the Jeddah Region	Local	Environmental planning	**
Applied research	Strengthening of current programme for development of database for biological resources and environmental information, and further strengthening and expansion of monitoring programmes to support operations and enforcement activities	National	Capacity building Management information	*
Environmental Education	Expand activities of Saudi Public Awareness Programme implemented by public and private sector parties	National Local	Public awareness Environmental education	***

*	=important
**	=very important
***	=extremely important

Table 11. Priority Actions: GULF OF ADEN COAST OF SOMALIA

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Special issue	Introduction of control measures against illegal dumping of hazardous waste by foreign vessels	Gulf of Aden Coast	Enforcement	***
Environmental management	Establishment of a joint Coastal and Marine Environment Commission	Gulf of Aden Coast	Capacity building Technical assistance Technical development	**
Environmental management	Preparation and implementation of a coastal zone management plan	Gulf of Aden Coast	Legal framework Capacity building Planning framework	**
Environmental management	Feasibility study for establishment of Marine Protected Areas	Gulf of Aden Coast	Legal framework Management information Management programme	*
Environmental management	Development and implementation of conservation and management plans for Mait Island and Saadadin Island	Gulf of Aden Coast	Capacity building Management information Management programme	**
Habitat conservation	Development of a mangrove conservation programme and identification of alternative sources of fuel	Gulf of Aden Coast	Management programme	*
Living marine resources	Introduction of measures against illegal fishing activities by foreign vessels	Gulf of Aden Coast Local	Enforcement	***
Living marine resources	Stock assessment for shark fishery	Gulf of Aden Coast	Management information Management programme	***
Living marine resources	Stock assessment for finfish and lobster fisheries	Gulf of Aden Coast	Management information Management programme	***
Living marine resources	Development of a management programme for fisheries, including marketing	Gulf of Aden Coast	Technical study Management information Management programme Production programme	***
Community development	Development and implementation of poverty alleviation programmes in fishing communities, including provision of basic fishing gear	Gulf of Aden Coast	Feasibility studies Technical assistance Technical development	***
Navigation risk	Review current navigation charts, conduct hydrographic re-surveys and prepare updated charts for key areas along shipping routes and in vicinity of key ports	Gulf of Aden Coast Local	Capacity building Technical development Management information	*
Navigation risk	Improvement of navigational aids and radio communications in northern Somali waters, especially on major shipping channels	Gulf of Aden Coast Local	Capacity building Technical development	*

*	=important
**	=very important
***	=extremely important

Table 11. Priority Actions: GULF OF ADEN COAST OF SOMALIA

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Petroleum development and transport	Development and implementation of oil spill contingency plan, in the framework of the Marine Emergency Mutual Aide Center (MEMAC) in Djibouti	Gulf of Aden Coast Local	Capacity building Technical development	**
Industrial development	Preparation of feasibility study and development of port reception facilities for Berbera port, in the medium term	Local	Feasibility study Capacity building Technical development	*
Urban development	Development of wastewater collection and treatment facilities in Berbera and Boosaaso, in the medium term	Local	Feasibility study Capacity building Technical development	*
Applied research	Establishment of database for biological resources and environmental information; preparation of a programme for environmental monitoring	Gulf of Aden Coast	Capacity building Management information	**
Applied research	Development of a proposed sub-regional maritime law and proposed revision of legislation for application in the Gulf of Aden Coast management area	Gulf of Aden Coast	Legal framework Capacity building	*

Note: Information provided in this table covers proposed priority activities on the Gulf of Aden Coast of Somalia which is included as a portion of the PERSGA Region.

*	=important
**	=very important
***	=extremely important

Table 12. Priority Actions: SUDAN

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Legislation	Strengthened enforcement of legislation related to management of coastal and marine areas	National	Capacity building Technical development	***
Legislation	Issuance of National Maritime Law and revision of related laws	National	Legislative framework	**
Environmental management	Declaration of all mangrove stands as Reserved Forest, development and implementation of a management programme	National Local	Legal framework Management information Management programme	***
Environmental management	Preparation and implementation of a coastal zone management plan	National	Legal framework Capacity building Planning framework	**
Environmental management	Development of management programme for Marine Protected Areas (including Sanganab Marine National Park and proposed protected areas at Shaub Rumi, Meshairifa, Magarsum and some islands in Suakin Archipelago)	National Local	Legal framework Management information Technical development	**
Tourism management	Development of a framework and programme for visitors to coral reef areas, including guidelines for boats and moorings	National Local	Legal framework Management programme Technical development Public awareness	***
Living marine resources	Stock assessment and management programme for finfish, shellfish and sea cucumber, including <i>Trochus</i> , <i>Strombus</i> and <i>Najil (Plectromus)</i>	National	Management information Management programme	***
Living marine resources	Development of a fisheries management plan, including marketing	National	Technical study Management information Management programme Production programme	*
Community development	Development and implementation of poverty alleviation programmes in fishing communities, including provision of basic fishing gear	National Local	Feasibility studies Technical assistance Technical development	**
Navigation risk	Review current navigation charts, conduct hydrographic re-surveys and prepare updated charts for key areas along shipping routes and in vicinity of key ports	Regional National Local	Capacity building Technical development Management information	***
Navigation risk	Improved navigational aids and radio communication in Sudanese waters, especially along major shipping lanes	National Local	Capacity building Technical development	***
Petroleum transport	Development and implementation of oil spill contingency plan	National Local	Capacity building Technical development	***
Industrial development	Preparation of feasibility study and development of port reception facilities	Local	Feasibility study Capacity building Technical development	***
Industrial development	Establishment of framework for development and operation of the Free Zone in an environmentally sound manner	National Local	Environmental studies Capacity building Technical development	***

*	=important
**	=very important
***	=extremely important

Table 12. Priority Actions: SUDAN

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Urban development	Upgrading of wastewater collection and treatment in coastal areas, especially Port Sudan	Local	Feasibility study Capacity building Technical development	**
Urban development	Upgrading of solid waste management and disposal in coastal areas, especially Port Sudan	Local	Feasibility study Capacity building Technical development	**
Applied research	Development of database for biological resources and environmental information and establishment of a monitoring programme to support operations and enforcement activities	National	Management information	***

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***	=extremely important

Table 13. Priority Actions: YEMEN

Environmenta l Issue	Priority Action	Scale	Emphasis	Urgency
Legislation	Development of rules and human resources to implement the Maritime Law and the Law for Protection of the Marine Environment from Pollution	National	Legislative framework	***
Legislation	Finalization and implementation of environmental assessment procedures and guidelines	National	Legislative framework	***
Legislation	Development and implementation of a protected area law	National Local	Legislative framework	**
Institutional strengthening	Strengthening the institutional capability of the Environment Protection Council to coordinate and monitor activities affecting the marine environment	National Local	Capacity building Management information Enforcement	***
Institutional strengthening	Strengthening the Public Corporation for Maritime Affairs to enable it to protect the marine environment from pollution and promote the safety of shipping, including Port and Flag State duties	National Local	Capacity building Management information Enforcement	***
Institutional strengthening	Strengthening institutional capacity for enforcement of environmental and fisheries regulations	National	Capacity building Enforcement	***
Environmental management	Development and implementation of a mangrove management programme involving protected mangrove reserves, regulatory mechanisms and identification of alternative sources of fuel	National Local	Legal framework Management information Management programme	***
Environmental management	Development and implementation of a master plan for conservation and sustainable development of Socotra Archipelago	National Local	Legal framework Management information Management programme Technical development	***
Environmental management	Preparation and implementation of a coastal zone management plan	National	Management information Management programme Capacity building	***
Environmental management	Strengthening the capacity of GTA, GIA and the Free Zone Authority for environmental management	National Local	Management programme Capacity building	**
Environmental management	Development and establishment of a system of representative Marine Protected Areas with effectively implemented management plans	National Local	Legal framework Management information Management programme	**
Habitat conservation	Design and conduct of inventory surveys, habitat mapping and sensitivity analyses of the entire coastline, including distribution of rare and endangered species	National Local	Management information Capacity building	**
Living marine resources	Development and implementation of a turtle conservation programme, involving protection of nesting sites, monitoring of nesting turtles and public awareness	National Local	Management information Management programme Public awareness Enforcement	***

*	=important
**	=very important
***	=extremely important

Table 13. Priority Actions: YEMEN

Environmental Issue	Priority Action	Scale	Emphasis	Urgency
Living marine resources	Stock assessment and management programme for finfish (including cuttlefish and sharks), shellfish and sea cucumbers	National	Management information Management programme Public awareness	***
Navigation risk	Improve navigational aids and radio communication in Yemeni waters, especially along major shipping lanes	National	Capacity building Technical development	***
Navigation risk	Review current navigation charts, conduct hydrographic re-surveys and prepare updated charts for key areas along shipping routes and in vicinity of key ports	Regional National Local	Capacity building Technical development Management information	***
Petroleum development and transport	Development and implementation of oil spill contingency plan, in the framework of the Marine Emergency Mutual Aid Center (MEMAC) in Djibouti	National Local	Capacity building Technical development	***
Industrial development	Establishment of framework for development and operation of the Aden Free Zone in an environmentally sound manner	National Local	Environmental studies Capacity building Technical development	***
Industrial development	Development and implementation of a port reception facilities plan	National Local	Technical studies Capacity building Technical development	**
Urban development	Upgrading of wastewater collection and treatment in coastal areas, including Aden, Hudaydah, and Mukallah	Local	Feasibility studies Capacity building Technical development	**
Urban development	Upgrading of solid waste management and disposal in coastal areas, including Aden, Hudaydah, and Mukallah	Local	Feasibility studies Capacity building Technical development	**
Applied research	Development of database for biological resources and environmental information and establishment of a monitoring programme to support operations and enforcement activities	National	Management information	***
Applied research	Development of training programmes for marine resource surveys, monitoring and management, and geographic information systems applications	National	Management information Capacity building	**
Applied research	Design and implementation of programme to evaluate potential impacts from agricultural chemicals on the Tihama coastal zone	Local	Management information Management programme	*
Public participation	Promote the broad-based participation of nongovernmental organizations	National Local	Public awareness	*

*	=important
**	=very important
***	=extremely important

Appendix A

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Report Preparation

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Appendix B

Key Activities in the Preparation Process

A. Meetings of the PERSGA Council

1. First PERSGA Council Meeting
September 1995
Cairo, Egypt
2. Second PERSGA Council Meeting
October 1996
Jeddah, Saudi Arabia
3. Third PERSGA Council Meeting
Planned for November 1998

B. Meetings of the PERSGA Task Force

1. First Task Force Meeting
October 1995
Jeddah, Saudi Arabia
2. Second Task Force Meeting
April 1996
Amman, Jordan
3. Third Task Force Meeting
January 1997
Sana'a, Yemen
4. Fourth Task Force Meeting
May 1997
Jeddah, Saudi Arabia

C. Country Report Consultation Workshops (PERSGA/GEF)

1. Djibouti Country Report
December 1996
Djibouti City, Djibouti
2. Egypt Country Report
May 1997
Cairo, Egypt
3. Jordan Country Report
July 1996
Aqaba, Jordan
4. Sudan Country Report
November 1996
Port Sudan
5. Yemen Country Report
December 1996
Sana'a, Yemen

D. Regional Navigation Risk Assessment and Management Plan Meetings (PERSGA/World Bank)

1. First Meeting of Expert Group
November 1996
Aden, Yemen
2. Second Meeting of Expert Group
April 1997
Ismailia, Egypt

E. Regional Study on Status of the Living Marine Resources in the Red Sea and Gulf of Aden and Their Management (PERSGA/GEF)

1. Meeting of Expert Group
May 1997
Jeddah, Saudi Arabia

F. Special Meetings and Regional Training Programmes

1. Sea to Sea Conference
(PERSGA/ROPME/ACOPS/
UNEP)
October 1995
Jeddah, Saudi Arabia
2. Coastal Zone Management
(World Bank/EDI)
October 1995
Aqaba, Jordan
3. Environmental Assessment
(PERSGA/GEF)
January 1996
Jeddah, Saudi Arabia
4. Marine Protected Areas Management (PERSGA/GEF)
June 1996
Ras Mohammed National Park,
Egypt
5. Marine Surveys and Monitoring
(PERSGA/GEF)
Planned for 1997
Al Hudaydah, Yemen

G. Field Surveys (PERSGA/GEF)

1. Northern Coast of Somalia Field Survey
March–April 1996
2. Sudan Field Survey
June 1996
3. Djibouti Field Survey
June–July 1996
4. Yemen Field Survey
July–August 1996

H. Meetings of the PERSGA SAP Drafting Group

1. First Meeting of the Drafting Group
September 1996
Jeddah, Saudi Arabia
2. Second Meeting of the Drafting Group
January 1997
Sana'a, Yemen
3. Third Meeting of the Drafting Group
May 1997
Jeddah, Saudi Arabia

Appendix C

Selected Studies and Background Documents

A. SAP Country Reports

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C. Background Documents

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Appendix D

Status of International Agreements

International Maritime Organization (IMO) Conventions related to the Marine Environment (as of June 1998)

	Egypt	Jordan	Saudi Arabia	Sudan	Yemen	Djibouti	Somalia
IMO Convention 48	✓	✓	✓	✓	✓	✓	✓
IMO amendments 91	✓						
IMO amendments 93	✓		✓				
SOLAS Convention 74	✓	✓	✓	✓	✓	✓	
SOLAS Protocol 78	✓		✓				
SOLAS Protocol 88	✓						
Stockholm Agreement 96							
LOADLINES Convention 66	✓		✓	✓	✓	✓	✓
LOAD LINES Protocol 88	✓						
TONNAGE Convention 69		✓	✓		✓		
COLREG Convention 72	✓		✓		✓	✓	
CSC Convention 72			✓		✓		
CSC amendments 93							
SFV Protocol 93							
STCW Convention 78	✓		✓	✓			
STCW-F Convention 95							
SAR Convention 79							
STP Agreement 71	✓		✓		✓		
STP Protocol 73	✓		✓		✓		
INMARSAT Convention 76	✓		✓				
INMARSAT amendments 94			✓				
INMARSAT OA 76	✓		✓				
INMARSAT OA amendments 94			✓				
FACILITATION Convention 65	✓	✓			✓		
MARPOL 73/78 Annex I/II)	✓					✓	
MARPOL 73/78 (Annex III)	✓						
MARPOL 73/78 (Annex IV)	✓						
MARPOL 73/78 (Annex V)	✓						
MARPOL Protocol 97 (Annex VI)							
LC Convention 72	✓	✓					
LC Protocol 96							
Intervention Convention 69	✓				✓	✓	
Intervention Protocol 73	✓				✓		

International Maritime Organization (IMO) Conventions related to the Marine Environment (as of June 1998)

	Egypt	Jordan	Saudi Arabia	Sudan	Yemen	Djibouti	Somalia
CLC Convention 69	✓		✓		✓	✓	
CLC Protocol 76	✓		✓		✓		
CLC Protocol 92	✓						
Fund Convention 71						✓	
Fund Protocol 76							
Fund Protocol 92							
NUCLEAR Convention 71					✓		
PAL Convention 74	✓	✓			✓		
PAL Protocol 76					✓		
PAL Protocol 90	✓						
LLMC Convention 76	✓				✓		
LLMC Protocol 96							
SUA Convention 88	✓						
SUA Protocol 88	✓						
SALVAGE Convention 89	✓	✓	✓				
OPRC Convention 90	✓					✓	
HNS Convention 96							

IMO Convention	International Convention to establish the International Maritime Organization
SOLAS Convention	International Convention for the Safety of Life at Sea
Stockholm Agreement	United Nations Conference on the Human Environment in Stockholm 1972
LOAD LINES Convention	International Convention on Load Lines
TONNAGE Convention	International Convention on Tonnage Measurement of Ships
COLREG Convention	International Regulations for Preventing Collisions at Sea
CSC Convention	International Convention for Safe Containers
SFV Protocol	The Torremolinos International Convention for the Safety of Fishing Vessels
STCW Convention	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
STCW-F Convention	International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel
SAR Convention	International Convention on Maritime Search and Rescue
STP Agreement	Special Trade Passenger Ships Agreement
INMARSAT Convention	Convention on the International Maritime Satellite Organization
FACILITATION Convention	Convention on Facilitation of International Maritime Traffic
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto
LC Convention	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter
Intervention Convention	International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties
Intervention Protocol	Protocol related to Intervention on the High Seas in cases of Pollution by Substances other than Oil, 1973, as amended.
CLC Convention	International Convention on Civil Liability for Oil Pollution Damage
Fund Convention	International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage
NUCLEAR Convention	Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Materials
PAL Convention	Athens Convention relating to the Carriage of Passengers and their Luggage by Sea
LLMC Convention	Convention on Limitation of Liability for Maritime Claims
SUA Convention	Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation
SALVAGE Convention	International Convention on Salvage
OPRC Convention	International Convention on Oil Pollution Preparedness, Response and Co-operation

HNS Convention

International Convention on Liability and Compensation for Damage in connection with the Carriage of Hazardous and Noxious Substances by Sea

Appendix E

National Economic and Social Indicators

	Egypt	Jordan	Saudi Arabia	Sudan	Yemen	Djibouti	Somalia
Area (million km ²)	1.01	0.09	2.25	2.51	0.53	0.02	0.64
Estimated length of Red Sea/Gulf of Aden Coastline (kms) ^a	1,800	26	1,840	853	2,200	370	1,300 ^b
Total population (millions)	65.9	4.9	19.4	28.0	13.2	0.6	9.2
Population in coastal urban areas on Red Sea and Gulf of Aden (millions) ^c	0.62	0.06	2.50	.70	1.20	0.50	0.27
Projected population growth rate (1993–2000)	2.0	3.8	3.1	2.7	3.7	2.1	2.7
Urban population growth rate	2.6	4.7	3.6	4.6	6.6	7.6	4.3
GDP per capita	3,847	4,187	9,338	1,084	805	1,270	712*
Literacy rate	50.5	85.5	61.8	44.8	41.1	45	24.9*
HDI	.614	.73	.77	.33	.33	.31	.22*
HDI rank	109	84	73	158	148	162	172*

Sources: Except where noted below, Human Development Report 1997, UNDP; World Resources 1994–1995 and 1996–1997, World Resources Institute, and the World Development Indicators 1998, World Bank.

a Source: Country Reports prepared for the Strategic Action Programme for the Red Sea and Gulf of Aden.

b This is for the North Coast of Somalia, which is included under the Jeddah Convention as part of the PERSGA area.

c Source: Country Reports prepared for the Strategic Action Programme for the Red Sea and Gulf of Aden.

* = 1994 data (more recent data unavailable).

HDI = Human Development Index.