

YEMEN

Dabut, Yemen (28 December 2004). A man stands among the rubble of Dabut market, Yemen. The main direct impact of the tsunami in Yemen was on the fishing sector.
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7. NATIONAL RAPID ENVIRONMENTAL ASSESSMENT – YEMEN

7.1 Introduction

The 26 December tsunami wave and subsequent sea surges hit the coast of Yemen between 11.40 a.m. and 8.30 pm., causing damage to Yemen's mainland and associated islands facing the Indian Ocean. Local observations indicate that water started to rise at about 11:00 a.m. local time on 26 December 2004. The water level receded in some locations (such as Muhaifif in Al Mahra), exposing about two kilometres of the sub-tidal flats before flooding in.

Relative to the countries of southeast Asia, damage in Yemen was much less, mainly because of its distance from the epicentre of the earthquake, and the protection it receives from the Indian Peninsula and Horn of Africa. Nevertheless, the impacts on the livelihoods of local people, especially fishermen, were significant, as many of them lost their main form of income. The two main areas identified as the most affected include Socotra Island and the coastline of Al Mahra Governorate, especially the area extending from Saihut to Wadi Hauf.



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7.2 Overview of Environmental Response

In the weeks following the disaster, UNEP received a request from the Ministry of Water Resources and Environment in Yemen for technical and financial assistance in conducting an assessment of the impacts of the tsunami on the marine environment. The request also included capacity building measures for capacity building of the Environmental Emergency Unit in the Ministry of Water and Environment, and inclusion of Yemen in any regional or global early warning system to address natural hazards.

As the first stage in responding to this request, UNEP organized a fact-finding mission to Yemen between 5 and 11 February 2005. Based on the findings of the mission, a more detailed technical assessment is planned to be conducted in March 2005 to collect additional information as well as to conduct a detailed impact analysis.

The principal coordinating partner in the assessment process is the Ministry of Water and Environment. Other ministries have also taken lead roles in their respective sectors including the Ministry of Fish Wealth, the Ministry of Transport, and the Ministry of Local Administration/Islands Development Authority. Additional partners included the Conservation and Development Project (SCDP), the Governorate of Al-Mahra, various local communities and a volunteer from IUCN stationed in Socotra.

The duration of the mission was quite short and much time was spent in travel to reach the affected sites, thus allowing very limited time for field assessment. Access to the Socotra sites was very difficult. As a result, the assessment could not include a sub-marine investigation of marine resources as there was insufficient time to organize diving at the affected sites. Additional work is clearly needed in this area. In Socotra, the sites visited were Mahfirin (most affected area), Khawr Matyif (second affected area), and Omouk (at this site, no significant damage could be established in the field). Other key sites that were not visited are the headlands to the east (Riy Di Irisseyl) and west (Riy Di Shu'ub), in addition to Qalansiyah, where a five-year old child was reported to have drowned.

7.3 Preliminary Findings: Impacts on the Natural Environment

The coastline of Yemen is over 2,100 kilometres long and comprises three coastal regions: the Red Sea, Gulf of Eden, and the Arabian Sea. The Red Sea region covers about one third of the length of this coastline, with the remainder bordering the Gulf of Eden region.

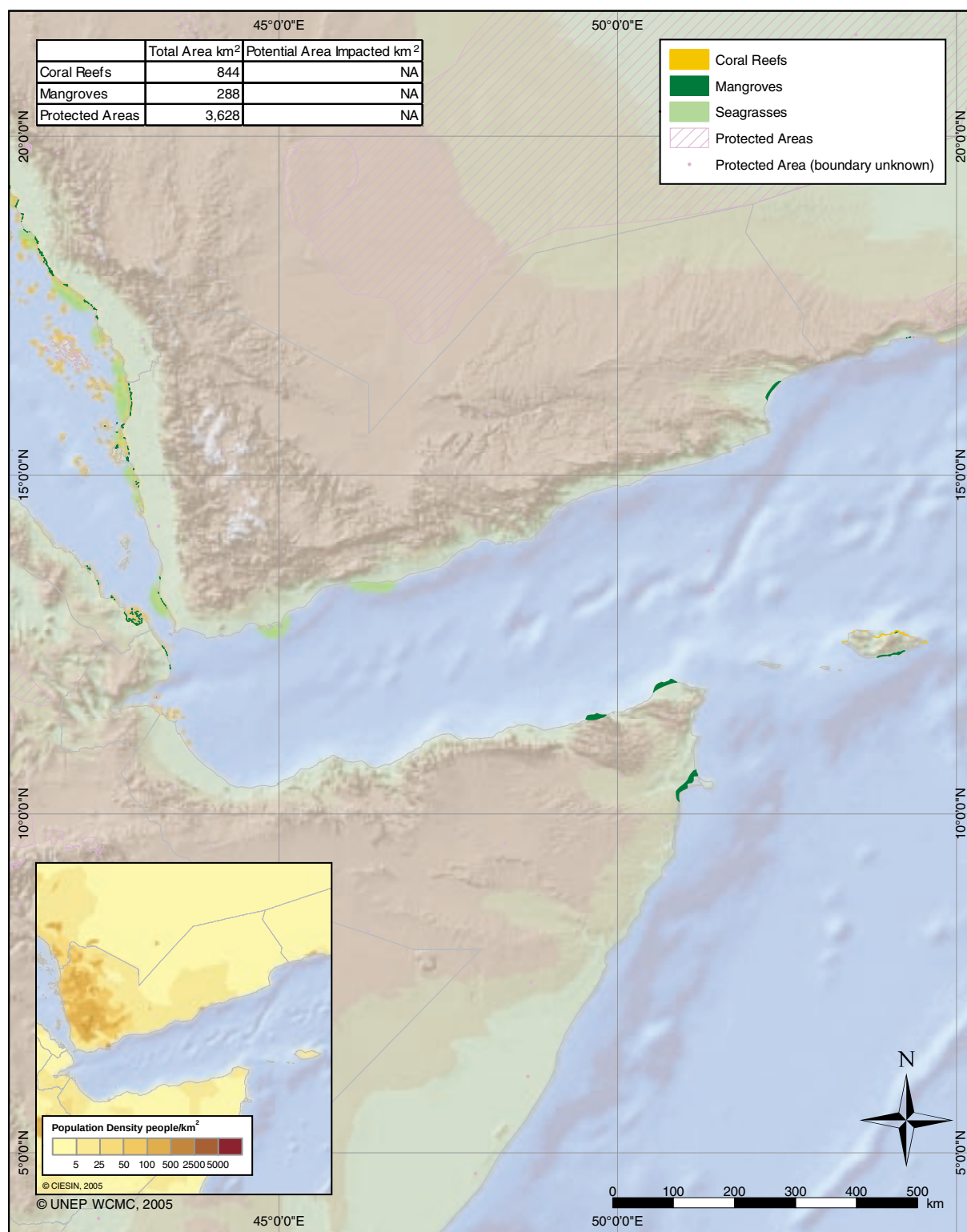
There is a high reliance on natural resources such as fishing and agriculture in the coastal areas of Yemen. The sustainable use of these resources is linked to public health, food security and economic and social benefits including cultural values and traditional livelihoods. In addition to fisheries and agriculture, tourism is increasing as a source of income in coastal regions of the country. A large portion of the coastal population in Yemen, particularly in Socotra, live in a subsistence economy. They are, therefore, particularly vulnerable to environmental change, decreasing productivity of the coastal ecosystem, extreme weather events and natural catastrophes such as storms, heavy rains, and tsunamis.

Marine and Coastal Ecosystems

The marine environment of Socotra and the coast of mainland Yemen are influenced by the monsoon winds. As a result of the strong up-welling, the inter-tidal and sub-tidal ecosystems are subjected to drastic changes of the physical and chemical parameters which create a rare ecosystem with a large diversity, particularly among algal/seaweed species. There is a high abundance of fish, particularly in the Gulf of Aden, which sustains local livelihoods.

No studies have been conducted to assess the impacts of the tsunami on the marine ecosystems of Socotra and Al Maharah. However, Socotra has relatively large amount of background data as a result of a recently concluded GEF-project and by other projects supported by IUCN, other agencies and organizations. Therefore, a follow-up investigation should be deployed to revisit sites that have been studied previously and that are located in the area affected by the tsunami. A monitoring programme of inter-tidal and sub-tidal sites is also on-going in Socotra. During the UNEP mission, discussions were held regarding the need for an extension of the monitoring in order to particularly target any impacts from the tsunami. It was found that such targeted studies should be performed and the recently produced IUCN "Guidelines for Tsunami Damage Assessment on Coral Reefs" was provided to the local SCDP team.

Priority Ecosystems and Protected Areas in Yemen



website: www.unep-wcmc.org
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All data on Protected Areas, Coral Reefs, Seagrasses and Mangroves
are available from UNEP WCMC databases.
Data on population density kindly provided by CIESIN.

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Due to time constraints, the UNEP-team did not have an opportunity to carry out a dive assessment during the visit to the southeast coast of Socotra. However, visits to the coastal area affected by the tsunami (see below for description of the impacts on the fishing communities) showed what appeared to be beach erosion and possibly altered beach profiles. The sand at the landing site in the village of Mahferhin has been washed away and left a beach consisting of stones and cobbles. These observations were also confirmed by the local fishermen at the site.

From Al Mahrah, there are no available background data from studies in the littoral and sub-littoral areas. In the absence of background site information, a follow-up study of the impacts in the marine environment therefore appears less meaningful than in Socotra. However, an investigation without baseline information may reveal damage in the form of broken and over-turned coral, debris on reefs etc. To be meaningful such an assessment should be carried out relatively soon after the incident.

Surface and Groundwater

Reports from villagers along the southeast coast mentioned increased salinity in groundwater wells as a problem. Wells on the coast initially had a low level of salinity and the water from the wells was used for washing, bathing, watering planted palm trees, and to a very limited extent for drinking. This water now has a high level of salinity and cannot be used at all. The number of wells affected could not be established but is believed to exceed ten. However, considering the fact that the tsunami penetrated up to 400 metres inland, groundwater reservoirs may have been affected and this may render some wells unusable for coastal communities for some time. A programme to sample and analyse ground waters from different parts of Socotra is planned by SCDP/Ministry of Water and Environment.

Coastal Erosion

There is some evidence of damage to the coastline. For example, in Dabut fishing centre, areas originally covered with sand have been exposed and are now stony surfaces. This is attributed to the tsunami and earlier coastal erosion.

7.4 Preliminary Findings: Impacts on the Human Environment

Impacts on Livelihoods

Fishing and the fisheries sector plays an important role in Yemeni society. The sector provides food security and employment. Fisheries statistics in Yemen, as in many other countries, are unreliable. In total, the catch figures reported by the Ministry of Fish Wealth range from 150,000 to 228,000 tonnes per year. About 60 per cent of the total catch comes from the two Governorates Al Maharah and Hadramout. Smuggling of fish out of the country as well as illegal fishing by boats from other countries is reported as a problem. About 50,000 persons are reported as fishermen in the national statistics. In the Al Mahrah Governorate, according to the official statistics, there are about 1,500 fishermen. However other figures quoted during the UNEP mission puts the number at about 6,000. There are about 700 fishing vessels in Al Mahrah. Fishing is mostly carried out from relatively small fibreglass boats (13–15 metres long) with an inboard or outboard engine.

The main direct impact of the tsunami in Yemen was on the fishing sector. However, in Al Mahrah some other sectors were affected to some extent. In Al Mahrah the coastal area between Sailhut and Hauf near the Omani boarder (particularly the fishing villages of Muhayfif, Yeroub and Nashtoun) experienced a strong tsunami wave (a 6 m high wave penetrated 400–500 metres inland at Muhayfif), which destroyed houses and other facilities on the beaches, destroyed and lifted boats several hundred metres inland and destroyed fishing gear. As far as is known at present, in Socotra primarily the coast between Omouk, Mahferhin and Matyif in the southeast of the island was affected. Floods also covered agricultural land near the coast, destroying fences and crops, and depositing salt on the soil.



Muhayfif, Yemen (28 December 2004). Tsunami debris outside the offices of the Al Mahra Fisheries Association.
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The following damage to human economic activities including the fisheries sector has been reported:

Table 1 Summary of damage to fisheries sector

	Al Mahrah	Socotra
Fishing nets and longlines	500 nets	174 nets 37 hook lines
Fishing traps	9,500	486
Fishing boats	33 (totally destroyed) 108 (partly destroyed)	16 boats 143 ropes 260 anchors, buoys and other equipment
Outboard engines	33 (totally destroyed) 106 (partly destroyed)	36 engines 10 fuel tanks
Fisheries facilities	Fish market stands and a 146m long wall, ice plant, Fisheries Cooperative storage area	23 petrol drums, 45 sacks of salt
Other buildings	Masjid, gas station,	
Vehicles	5 cars, motorcycles	

Case study: Ghost nets roaming the seas

Ghost nets are fishing nets that have been abandoned in the marine environment and which continue to harm marine life. They kill fish, marine mammals, and seabirds as well as destroy habitat. Lost gill nets are extremely lethal because of the ease with which organisms become entangled in them. Entangled organisms then become bait for predators which also get caught in the nets. The nets become a perpetual killing machine, and only stop once their structural integrity begins to disintegrate. With new synthetic materials, this could take decades, and the fish mortality caused over the lifetime of a single net could be in the hundreds of thousands. In addition, the lead lines associated with nets are pushed by the tide and scrape away sea grass beds and other marine habitat causing additional damage.

The issue of ghost nets was specifically raised as an environmental concern during the UNEP mission to Yemen. In the Governorate of Al Mahra alone, 500 fishing nets, 1,500 octopus traps and 8,000 lobster traps were lost to sea. Fishermen on the Island of Socotra also lost approximately 174 fishing nets and 37 hook lines. However, the largest possible source of ghost nets will most likely come from Sri Lanka and Indonesia where tens of thousands of nets may have been swept out to sea.



Grey reef shark, Andaman Sea (undated file picture). Fishing nets that have been abandoned in the marine environment, known as ghost nets, kill fish, marine mammals and seabirds, and destroy habitat. In Yemen alone, hundreds of nets and octopus and lobster traps were washed out to sea, where they could continue to harm the environment for years to come. © Fred Bavendam/Still Pictures

The total value of the damages in Al Mahrah (excluding automobiles) and Socotra has been estimated by the authorities at approximately 170,000,000 YR (\$935,000) and (\$175,000) respectively. Two agricultural farms on the coast (area not established) were completely lost. These were involved in growing crops and palm trees.

Ports and Industry

According to the Minister of Transport, the main ports of Yemen did not suffer damage, even though water levels in the ports rose an average of 60 centimetres for several hours during the period of the tsunami waves. No industrial facility was recorded to have been affected by the tsunami waves.

In addition to the above-mentioned areas, there were also reports from the Governorate of Aden that one fishermen died and five others injured.

Waste Management

Tsunami-generated debris is strewn all over the coastline especially within the fishing centres. The waste mainly consists of damaged nets, beached boats and canoes, lobster and octopus traps, concrete slabs, wood, dead fish, plastic bottles and diesel containers, and other materials. The local authorities have tried their best to collect this debris and pile it, but proper disposal is needed. This can be done with limited guidance. A number of barrels of fuel (petrol and diesel), tins of paint and other chemicals were washed out to sea. In Mahaifif alone, it is estimated that ten 200-litre barrels of fuel and about 350 litres of paint were washed out to sea. These are believed to have been naturally dispersed.

Water and Sanitation

None of the fishing centres on the coast have proper sanitation systems. Water deposited by the tsunami in depressions within these areas is spreading bad odours in the area. Stagnant water poses a health hazard to the fishing communities operating from these centres.

7.5 Preliminary Findings: Environmental Management Capacity

Environmental Framework Laws

Yemen has established a strong framework for environmental work. Since 1990, the Yemeni Government has established a number of national laws and regulations that concern and relate to the coastal and marine environment under responsibility of several agencies.

Environmental management laws and institutions in Yemen

The key environmental management laws in Yemen include:

- Presidential Resolution No. 275 of 2000 (Master Plan of Socotra Archipelago).
- Law No.4 of 2000 (Duties of Local Governments).
- Law No. 39 of 1999 (Cleaning and Improvement of Cities).
- Law No. 25 of 1999 (Regulating and Handling of Pesticides).
- Law No. 1 of 1995 (Common Benefit).
- Law No. 20 of 1995 (Urban Planning Procedures)
- Law No. 21 of 1995 (Land and Real Estate).
- Law No. 26 of 1995 (Environment Protection).
- Prime Ministerial Decree No. 4 of 1996 (Establishment of Protected Areas in Socotra).
- Law No. 15 of 1994 (Ship Registration, Documentation, Monitoring).

- Prime Ministerial Decree No. 23 of 1994 (Validation and Penalties).
- Law No. 4 of 1993 (Free Zone Law).
- Law No 11 of 1993 (Protection of the Marine Environment from Pollution).
- Law No. 37 of 1991 (Territorial Waters and the Exclusive Economic zones).
- Law No. 42 of 1991.

Authorities and institutions working under the umbrella of different ministries on issues related to coastal and marine environment include:

1. Environment Protection Authority (EPA).
2. Tourism Development Authority (TDA).
3. Maritime Affairs Authority (MAA).
4. Maritime Training Centre (MTC).
5. General Corporation for Development and Promotion of Yemeni Islands (GCDPI).
6. Marine Science and Resources Research Centre (MSRRC).
7. Coast Guard Authority (CGA).
8. High Council for Urban Planning (HCUP).
9. Faculty of Oceanography and Environment, Al-Hudyadah University.
10. Faculty of Environment and Marine Biology, Hadramout University.
11. Department of Earth and Environmental Science, University of Sana'a.
12. Environmental Research and Studies Division, University of Aden.

Staff of Socotra Conservation and Development Programme indicated that Law 26 of 1995 (Environment Protection) is one of the most applicable and used laws in Socotra, this is followed by Law 11 (Protection of the Marine Environment from Pollution).

While Yemen has developed laws and regulations dealing with various aspects of the environment including the coastal zone and marine areas, the country faces a number of obstacles to implement its legislation. There are a number of overlapping and contradictory functions vested in different authorities, and in most cases there is insufficient capacity to carry-out agency mandates. Environmental monitoring and enforcement are key problems.

Unlike severely affected countries in South East Asia, the tsunami did not impact the existing institutional capacity for environmental management, with almost no damage to staff, facilities or equipment.

Environmental Impact Assessment

Environmental impact assessment (EIA) is mandated in Yemen by Law No 26 of 1995. All projects have to conduct EIA studies before being approved. This applies to projects undertaken in coastal and marine areas. There is a Unit in the Environment Protection Authority that oversees these studies and ensures they are undertaken before project approval. Sub-national units are also established in some parts of the country. For example, the SCDP has established a new EIA Unit. However, lack of by-laws, lack of expertise, inadequate human and financial resources hinder strict application of EIA.

Coastal Zone Management

The coastal zone in Yemen is not yet well developed, except in a few cities such as Aden. According to the 1994 census, the total population of the coastal areas of Yemen was less than 2 million distributed over nine Governorates or 2,100 kilometres of coastline. Yemen recognizes that with the increasing need for development of the coastal zone, integrated coastal zone management has become a necessity. Coastal zone management has been applied in some areas in Yemen. In Socotra, for example, recent developments included an airport, a port jetty, the first asphalted road, schools, fuel storage facilities, better

telecommunication facilities, and improved power supply. For such developments, a zoning plan for Socotra was finalized in October 1999. The process was accomplished by engaging the local community in the development of the plan, including women.

The overall low development in the coastal zone in Yemen was a factor reflected in the limited impact of the tsunami on human lives, and properties. With increasing demand for development of the coastal zone, integrated coastal zone management will be necessary to ensure that people and property are not located in harm's way.

Early Warning

There are some early warning activities in Yemen. The Ministry of Agriculture and Irrigation in coordination with National Water Resources Authorities, in association with the Ministry of Water Resources and Environment is the main governmental body for monitoring and management of early warning systems for floods. This system is only active in limited areas in the western highlands in the country.

Most early warning systems originally established by projects funded by international organizations could not continue as soon as international support ended. The main reason for this halting is that there is no clear mechanism to regulate and control these issues.

There are information departments in many relevant ministries. However, there are no integrated national environmental and early information systems which could provide timely integrated data in case of an environmental emergency.

Disaster Management

In addition to the tsunami disaster, Yemen has experienced different types of disasters that also had severe impacts, including flash floods, earthquakes, drought, locusts, oil spills, red tides, civil war, and epidemics of communicable diseases. In 1999 alone, it is estimated that about 19,782 persons were affected by disasters in Yemen.

No policy or legislation on a national level has been implemented to address disaster reduction. However, since 1996, the issue of strengthening and establishing a disaster management policy and responsible entity received greater attention from the Government. In this direction, the Government took many steps including decrees on civil defence law for effective disaster management, forming a committee to prepare a national approach for disaster management, and issuing the Civil Defence By-Law. This is in addition to many other related laws. Yemen also established a national body for multi-sectoral coordination and collaboration in disaster risk reduction, known as the Civil Defence Council (CDC). The CDC includes the key ministries concerned.

In 2003, the Ministry of Water Resources and Environment established the Environmental Emergency Unit (EEU) to participate in and coordinate with stakeholders for the preparation of a national environmental disaster strategy, and to coordinate the management of disasters. It is establishing a national response team from focal points from relevant governmental and NGO agencies to implement the unit's mandates on environmental emergencies and disasters. However, the Unit lacks capacity to handle environmental emergencies. There is also poor coordination among the focal points in the county, and there is need to clarify the mandate of the CDC.

Local Ecological Knowledge

Local people in Yemen in general and in Socotra in particular have strong traditional rules to protect the marine and terrestrial natural resources they rely upon. Such traditional rules are still enforced by the local village councils. This remains the case in Socotra, but on the mainland the tradition has started to erode as daily pressures increase while financial resources are limited.

7.6 Conclusions and Recommendations

Assessment and Rehabilitation of Natural Resources

A more elaborate and detailed study on the impact of the tsunami on natural resources in the affected sites, is strongly recommended. More specifically, the sub-marine habitats and ecosystems should be studied to determine long-term impacts, and whether there is a need for rehabilitation efforts for these resources. This study should be undertaken within the next three months.

External support should be provided to concerned authorities and institutions (such as the Socotra Conservation and Development Programme) to undertake such a study, with the help of international experts, and provision of necessary equipment such as underwater video camera, compressor, and deep-water diving gear.

Baseline Survey and Monitoring

As a long-term project, there is need for a baseline survey of environmental resources along the Yemeni coastline. The baseline survey should also result in a cost-effective environmental monitoring system. After the tsunami and in the absence of data and information there is no adequate basis for comparison, even if a full assessment is to be conducted. Also, not much is known about the threats to the resources and the regulations that need to be instituted.

Livelihoods Recovery

Loss of livelihoods of local fishermen was the greatest impact from the tsunami wave in Yemen. Compensation and assistance to fishermen in the affected areas to replace their fishing gear and rebuild their fishing facilities is critical for them to recover and resume a normal life. Estimates of these losses are in the range of \$2 million.

Tourism Recovery

Tourism in the affected areas is still limited, even though the potential for development is very high, specifically in Socotra. Support to local authorities to develop sustainable eco-tourism is recommended. Tourism could help local fisher communities to find alternative incomes other than fishing, which provides the main source of subsistence.

Integrated Coastal Zone Management

In the affected sites, Socotra provides a good example of adopting coastal zone management. This model and experience in developing such zoning plans should be transferred to other sites. Training and assistance to Yemeni authorities in coastal zone management is highly recommended.

Early Warning

The current capacity for early warning should be assessed. Based on the outcome of the assessment, Yemen should be assisted to establish an integrated national early warning system to be coordinated by the Ministry of Water Resources and Environment. Such a system should be able to address the various aspects of early warning, not only for tsunamis, but also other issues of concern such as flash floods.

Yemen should be integrated into regional early warning systems to be developed and be involved in regional coordination processes. As a part of this, a network for monitoring of environmental parameters of concern should be established in the country.

Risk Assessment

Risk mapping should be undertaken for all possible environmental emergencies, followed by dissemination of risk maps and information to decision makers, the general public and communities at risk in appropriate formats. Further study is required on development of indicators and provision of statistical information on the occurrence of environmental emergencies. Documentation and sharing of information on risk management between affected countries would be helpful.

Disaster Management

Support should be given to the Yemeni authorities in the preparation of national plans for the protection of coastal areas from natural disasters. Support should be given in capacity building and strengthening the Environmental Emergency Unit in the Ministry of Water and Environment to undertake its mandate. In addition, there is a need to carry out a full assessment of potential hazards and to strengthen coordination between the EEU and local level actors (local governments and communities). The local rural development projects, the Fisheries Association, and other local actors offer an opportunity for developing local level platforms for environmental emergencies management.

The CDC mentioned above is responsible for disaster management but was not able to respond to the tsunami disaster in the country. However, it has communication and mobilization capability and can assist during environmental emergencies if properly guided. UNDP has been working with the Government of Yemen to strengthen the CDC. Yemen also has a vibrant media (local TV, satellite TV, radio) that is fully accessible. Cell phones also have a wide coverage and could be used for communication during or after emergencies. Communities need to develop a culture of safety and resilience, through information management and exchange, education and training, research and public awareness.

Key activities needed include developing a strong legal and policy framework, assessing available resources and developing strategies for resource mobilization, and promoting community participation.

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