UNITED NATIONS ENVIRONMENT PROGRAMME

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Coastal and marine environmental problems of Somalia

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Annexes

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PREFACE

In 1984 the Government of the Democratic Republic of Somalia approached the Executive Director of UNEP with a request for assistance in assessing the coastal and marine environmental problems of the country and in drawing up a national action plan for the protection, management and development of its marine and coastal environment.

In response to this request and in close co-operation with the relevant national authorities a multidisciplinary mission was organized by UNEP in collaboration with ESCWA, FAO, UNESCO, IMO, IAEA and IUCN. The terms of reference of the mission specifically included consideration of problems related to:

- contingency planning for marine pollution emergencies, including incidents within ports and port-generated pollution;
- development of national capabilities for the monitoring and control of marine pollution through training of staff and acquisition of equipment; and
- development of national legislation for the protection and management of marine and coastal environments.

The eight members of the mission visited Somalia from 11 to 25 June 1986 and based on the mission's findings this document has been prepared.

The draft of the document has been presented during the Seminar on Coastal and Marine Environmental Problems of Somalia (Mogadishu, 7 - 8 September 1987), attended by high level national experts, and administrators and policy-makers, as well as high officials and experts of UNEP. The Seminar, chaired by Hon. Musse Noor Amin, Permanent Secretary of the Ministry of Marine Transport and Ports of Somalia, reviewed the document and endorsed it with minor amendments reflected in this publication.

The document consists of a summary report on the coastal and marine environmental problems of Somalia, of an action plan proposed for the protection, management and development of the marine and coastal environment of Somalia and of seven sectoral reports on which the summary report is based. In preparing the proposal for the national action plan, Somalia's participation in the UNEP sponsored Action Plans for the Protection and Development of the Marine and Coastal Environment of the Red Sea and Gulf of Aden and for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region was specifically kept in mind.

The contribution of Messrs S.K. El-Wakeel (mission leader), S.W. Fowler (marine pollution), A. Hamza (marine pollution from land-based sources), S.L. Ross (oil and chemical spills), T. Stromme (marine living resources), D. Elder (protected areas and reserves), P. Burbridge (coastal area development and management) and J.C. Sainlos (environmental legislation) as members of the mission towards the preparation of this document is gratefully acknowledged. The assistance of the national authorities and counterparts of Somalia as well as of the UNDP offfice in Mogadishu were essential for the successful completion of the mission's task.

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SECTORAL REPORT

ON

MARINE POLLUTION

BY

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MUSEE OCEANOGRAPHIQUE
PRINCIPALITY OF MONACO

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1. GEOGRAPHICAL SETTING

The Somali Democratic Republic, which forms the "Horn of Africa", has an approximately 3,300 km coastline bounded on the north by the Gulf of Aden and on the east by the Indian Ocean. The total area of the country is 637,657 km^2 with a population of approximately 5.4 million inhabitants. Most of the terrain consists of dry savannah plains, with a high mountain escarpment in the north, facing the coast. The climate is hot, though pleasant, on high ground and along the coast during June-September, with an annual rainfall which rarely exceeds 500 mm in the most favourable regions. Only two permanent rivers - the Juba and Scebelle - water this arid land. Both rise in the Ethiopian highlands, but only the Juba regularly flows into the sea at Kismayo. This feature limits most of the prime agricultural land to the region South of Mogadishu.

The climate, particularly in the coastal regions, is governed by the monsoon winds and oceanic current systems. During the period of the South-west Monsoon (April to October) an eastward surface current, the South-west Monsoon Current, prevails, extending southwards to about 7^oS. The South Equatorial Current flows northwards forming the Somali Current whose root lies at about 10^oS. The prevailing strong wind with a speed of over 600 cm s^{-1} influences the Somali Current to continue its northerly flow, bending eastwards off the Somali peninsula into the Arabian Sea. The strong-flowing Somali Current with speed of about 300 cm s^{-1} transports about 50-65 million m^3 s^{-1} of water penetrating deep into the oceanic water mass and causing an upwelling along its left flank in Somalian coastal waters. The upwelling induces the comparatively high productivity off the Somalian Coast and is most intense between 5^oN and 11^oN. The turbulence associated with this phenomenon brings nutrient-rich, cold subsurface waters with temperatures below 20^oC to the surface, thereby enriching the surface waters with nutrients. The average temperature of the surface water during this period is about 24^oC and the salinity is 35.0 ppt. It is in this area where a potentially rich pelagic fishery resource lies.

During the North-east Monsoon period (November to March), the surface current changes from its clockwise pattern to anti-clockwise in the northern Indian Ocean. The North-east Monsoon winds now prevail and the North-east Monsoon Current, otherwise called the North Equatorial Current, is well-developed and operative, flowing westwards down to 3^oS. The Somali Current is now less strong, reverses its flow partly to form the Equatorial Counter Current with its axis at 7^oS and partly flows downwards to join the Mozambique Current. The turbulence of the waters is minimal because of the weak Somali Current of speed less than 10 cm s^{-1}, and a thermocline exists at about 60-80 m with the surface waters having a uniform temperature of about $28-30^oC$ and a salinity of 34.5 ppt. A weak upwelling on the right flank of the Somali Current is presumed to occur in the region of previous upwelling, while for reasons of continuity, sinking occurs on its left flank. This alternating current system is obviously extremely important in determining the distribution of pollutants in Somalia's coastal waters.

The coastal ecosystems and habitats vary widely from north to south. Along the Gulf of Aden to Ras Hafun there are large expanses of sandy beach alternating with rocky outcrops and coastal plain. Below Ras Hafun to Eil a narrow beach exists abutted by rocky cliffs. Somewhat south of Eil a coastal dune system begins where sandy beach alternates with rocky outcrop as far south as Kismayo. Along the same coastal stretch from just north of Mogadishu to the Kenyan border there is a fringing reef which supports a developing artisanal reef fisheries. In the extreme southern region between Kismayo and the border there is an extensive mangrove system which serves as a nursery for demersal fish species. A detailed description of the coastal ecosystems and habitats is given in the Sectoral Reports on Marine Living Resources and Ecosystems and Marine Protected Areas and Reserves.

2. TYPES, SOURCES AND LEVELS OF POLLUTANTS

Somalia is a developing country and, as such, has many priorities which may overshadow the necessity of surveillance and control of sources of marine pollutants. For example in the latest five year plan which ended in 1986, there is no plan for environmental protection. Nevertheless, the Government is eager to assess the current situation with respect to marine pollution in order to protect its coastal resources for future generations. Fortunately for Somalia land-based sources of marine pollution are minimal and are expected to remain so for the foreseeable future.

Marine pollution is often a function of demography and it is instructive to examine the distribution of population in Somalia. Figure 1 shows 1984 estimates of the number of the inhabitants in the various districts of Somalia. It is immediately evident that there are three main population centres along the coast: Mogadishu, Kismayo and Berbera. If all the districts adjacent to the sea are considered, calculations show that 44 percent of the approximately 5.4 million inhabitants live near the coast. This is undoubtedly an overestimate since many of the coastal districts extend far inland; thus, a more realistic estimate might be in the order of 30 percent. Figure 1 further shows that of this fraction, the districts which include the cities of Mogadishu, Berbera, Bosaso and Kismayo make up 15 percent with Mogadishu alone accounting for 11 percent of the near coastal population.

2.1 Industrial Wastes

Somalia is a country of light industries most of which are located in the coastal population centres of Mogadishu, Kismayo, Brava and Berbera. The Iraq-Soma oil refinery just south of Mogadishu imports roughly 160,000 tonnes of oil each year. However the plant is only operational periodically and very little effluent actually reaches the sea. Consequently, its immediate impact on the coastal ecosystem is minimal. Likewise an urea plant at the refinery is not considered an important source of marine pollution since it only discharges about three cubic meter of waste water a day into a pond inland from the sea.

Somalia is a major livestock producer and consequently there are a number of local slaughter houses located on the seashore. In Mogadishu the release of animal remains directly into the sea is believed to be the cause of a relatively large number of shark attacks in the near vicinity. However, long-time residents point out that sharks which enter the inside of the reef have always been a problem in local waters and that the slaughter house wastes merely aggravate the situation. It is evident that disposal of animal remains inland would undoubtedly serve to lessen the shark problem and also eliminate the unsanitary and unsightly situation of animal refuse on the beach that was noted, for example, at Brava.

Of all the industries in the country, only the tanning factories may deliver a significant input of contaminants to the marine environment. For example the factories at Brava and Kismayo discharge their liquid effluent directly into the sea. Calculations indicate that the effluent at Brava and Kismayo may discharge as much as 18 and 30 kg of chromium a day, respectively, to the sea. However, measurements of the levels of chromium as well as other heavy metals in the effluent or the coastal environment do not exist, thus, it is not possible to assess the extent of this source of pollution.

PCBs from local industrial sources are not a problem and any PCB residues in the coastal environment probably originate from aerial transport. However, a number of old transformers were observed to be stored in the open at Mogadishu port. Damage or misuse of this stock could lead to grave environmental problems.

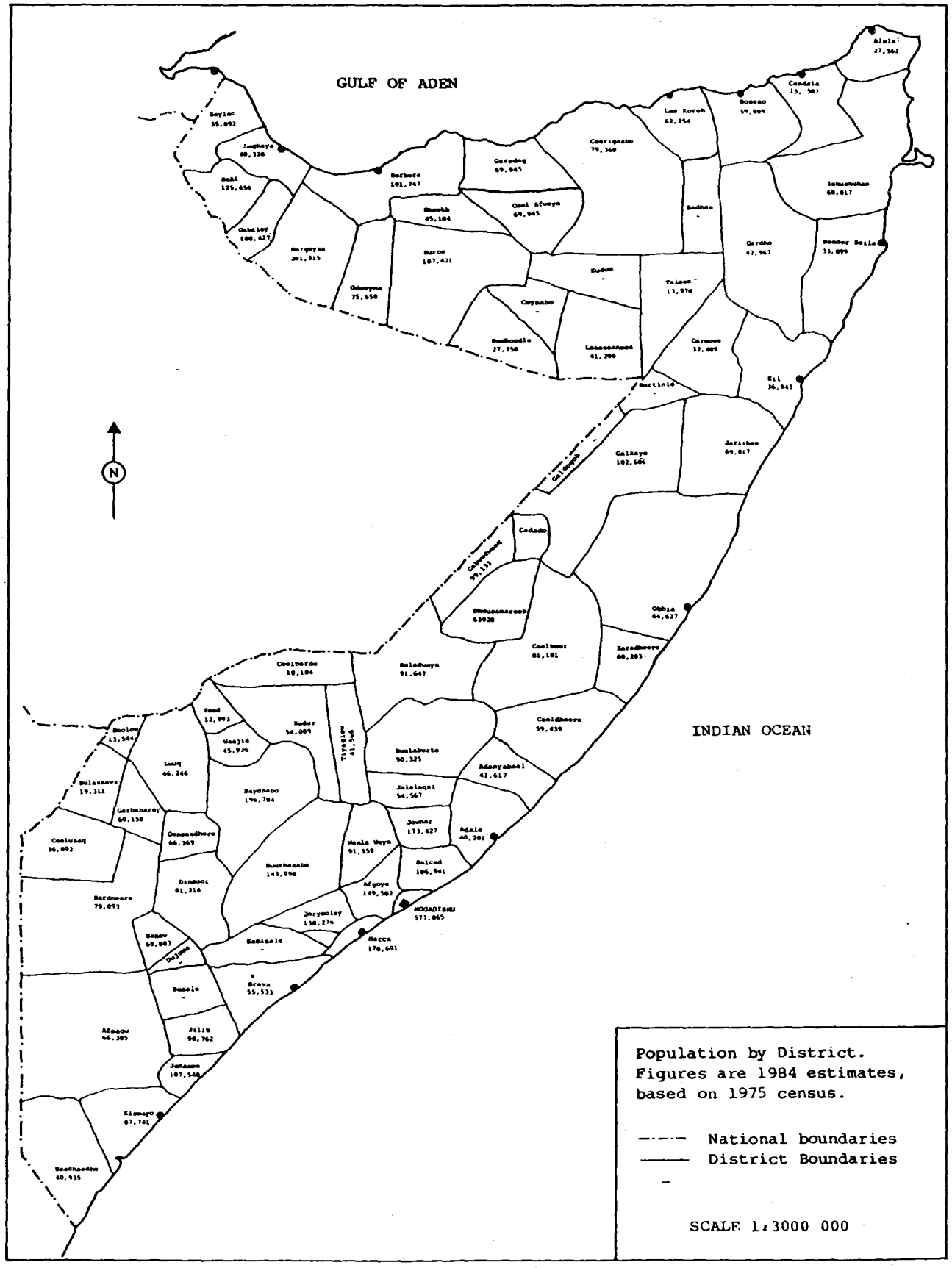

Figure 1. Population map of Somalia (population of total coastal districts = 2,381,295)

2.2 Domestic Wastes

Domestic sewage is certainly an important source of pollution to coastal waters of the major population centers. For example, in Mogadishu raw sewage is discharged directly into the port through a series of drainage pipes. Locals use these waters for bathing and swimming, and it is not uncommon to see human faeces and a wide array of other domestic wastes strewn along the beaches. This was particularly evident on the Lido which serves as Mogadishu's touristic beach. The situation concerning municipal sewage is no different in other coastal towns. However, their lower population density results in much reduced input to their coastal waters. Nevertheless no sector of the government involved with pollution is monitoring this situation either at the source (sewage and drainage effluents) or in the sea. Hence, without measurements, there is no way to reliably estimate the levels of pathogenic organisms entering or existant in coastal waters near urban centers.

Urban solid waste dumps likely form another source of local pollution. A large open tipping site is located right on the coast at Mogadishu close to the city abattoir. The tip is uncontrolled and infested with vermin. Its marine pollution potential could be high especially in the rainy season when leachates run off directly into the sea. However, there are no measurements to substantiate this contention. Furthermore, the cost in terms of amenity reduction is high as judged by the large amounts of domestic detritus in the area around the Lido Beach and just north of the old port.

2.3 Agricultural Wastes

In Somalia most of all the prime arable land lies in the Scebelle and Juba river basins. The Scebelle River fans out in the coastal lowlands forming swamps and wetlands, whereas the Juba River enters the sea just above Kismayo. Monthly flow rates for the Juba measured far inland at Lugh Ganana vary between approximately 30 m^3 s^{-1} in February and 450 m^3 s^{-1} during October (World Bank, 1981). Flow rates for the Scebelle measured at Afgoi were much lower ranging from 10 to 90 m^3 s^{-1} for the same months (ibid.), but this flow is not discharged directly into the sea.

Several types of chlorinated and organo-phosphorus pesticides are used continually on farms and plantations in this region and thus residues find their way to coastal waters via both rivers and land runoff. Two to three decades ago dieldrin was commonly applied in locust control. It is no longer used in Somalia but the Plant Protection Unit of the Ministry of Agriculture maintains an old stock of dieldrin that could be a potential source of environmental contamination. Another toxic chlorinated pesticide, chlordane, has been used restrictedly for the specific control of termites and certain soil insects (e.g. cutworms). Furthermore, endosulfan is used routinely by the National Range Agency in their tsetse fly eradication programme inland from Mogadishu.

Table 1 gives a list of the types and quantities of insecticides and herbicides ordered for use in 1986. These quantities are typical of what might be expected for use in the future, i.e. approximately 53 tonnes per year. However, the Ministry of Agriculture is not the sole source of these compounds. For example, independent companies such as the Somalia Fruit Company and the Sugar Factory purchase their own pesticides. Hence, the total quantities in use are greater than that shown in Table 1. Because of the high toxicity of the pesticides chlordane and carbofuran, the Ministry of Agriculture intends to concentrate on using less toxic compounds like dimethoate and deltamethrin.

In addition to the pesticides used in the agricultural sector, the Ministry of Public Health has been spraying DDT in towns as part of its anti-malarial programme. Table 2 gives the amounts used over the past six years. Unfortunately records were not available prior to 1981. However, DDT has been in use in Somalia for at least 30 years. It is clear that residues of this persistent pesticide enter coastal waters, most likely in the southern region adjacent to the two river drainage systems.

Table 1. Quantities of pesticides scheduled for use in Somalia during 1986*.

Pesticide compound	Formulation	Quantity (kg)	Quantity (litre)
Insecticides			
Diazinon	EC		3,000
Diazinon	G	3,000	
Carbaryl	SP/WP	7,000	
Chlordane	EC		2,000
Endosulfan	EC		7,500
Malathion	EC		2,000
Triazophos	EC		2,000
Dimethoate	EC		1,000
Deltamethrin	EC		2,000
Cypermethrin	EC		2,000
Fenvalerate	EC		500
Carbofuran	G	500	
Specific acarricides for spiders and mites		EC/WP	1,000
Herbicides			
Methylchlorophenoxyacetide			2,000
Propinil		8,000	
Atrazine & Ametryne		5,000	
Ametryne & 2, 4-D			5,000

EC denotes emulsifiable concentrate; G, granular; SP, soluble powder; and WP, wettable powder.
* Data supplied by the Plant Protection Unit, Ministry of Agriculture.

Table 2. Quantities of DDT used in Somalia for the anti-malarial programme*.

Year	Amount (kg)	Notes
1981	17,501	
1982	25,610	
1983	19,246	
1984	(10,000)	not known precisely but estimated as less than previous years.
1985	0	DDT did not arrive until very late in the year.
1986	30,000	30 tonnes are in stock and are being used on an emergency basis.

*Data supplied by the Anti-Malarial Unit of the Ministry of Public Health. No data available for years prior to 1981.

Despite the widespread use of pesticides, including DDT, in Somalia, there is no programme at present to monitor and assess these ecologically harmful chemicals in the coastal waters or the riverine systems feeding them. This is particularly noteworthy since at present there are no legal controls on the use of pesticides. The only legislation concerning pesticides requires their registration upon importation (see Sectoral Report on Marine Environmental Legislation).

The only environmental data available on pesticides are those from selected fish collected in the Mogadishu area during September - November 1985. Mean concentrations of lindane in muscle ranged from 7 to 80 ppb wet weight while those for total DDT were between 26 and 360 ppb wet weight (Mohamud, 1985). These values are typical of those found in fish from other oceanic areas and do not suggest any major local contamination. However, given the fact that the major use of pesticides occurs much further south in the Juba and Scebelle river basins, obtaining samples from coastal waters in the southern region should be given high priority.

Other types of marine pollution resulting from agricultural growth and development may also be affecting the coastal areas of Somalia. Coastal dune formation and subsequent erosion arising from overgrazing of the covering vegetation has lead to increased siltation particularly in the southern region. Further increases in silt load could have a heavy impact on the fringing reef ecosystem which serves as a nursery ground for Somalia's artisanal demersal fisheries (see Sectoral Report on Marine Living Resources).

The very large livestock production and export taking place in the coastal region also acts as a source of nearshore pollution. For example on the beach just a few kilometres east of Berbera, dried faecal pellets and lumps from goats and camels littered the area nearly everywhere. Berbera is a major livestock exporting site and animal wastes presumably enter the waters in or near the port and are swept eastward by the prevailing currents. The dessicated faecal droppings containing vegetable matter probably do not pose an immediate health hazard, but they cause a definite reduction in amenities of the public beach.

2.4 Coastal Construction and Quarrying

Little is occurring in the way of coastal construction projects that would lead to marine pollution. However, the widespread activity of coastal quarrying for limestone, sand, and gravel pose a threat on several fronts indeed. These activities are taking place very near the coastal zone and in some cases, at Kismayo, on the beach itself. Where large, deep quarry pits approach the beach at a site a few kilometres south of Mogadishu, there is considerable risk that sea water will break the coastal margin and enter the pits. This has in fact occurred in some areas giving rise to large, stagnant pools of sea water. These areas are already devoid of coastal vegetation and incurrence of sea water will hasten the process of coastal erosion (see Sectoral Report on Marine and Coastal Area Development). Furthermore, bulldozing and quarrying sand such as that occuring on the beach just North of Kismayo leads to increased siltation which could damage the offshore fringing reef. Above all these quarries are leaving a permanent scar on an otherwise beautiful coastal environment.

2.5 Oil Pollution

An earlier report on marine pollution in the East African region concluded that oil in coastal waters and on beaches originating from tanker deballasting activities is the most serious marine pollution problem in the region (FAO/UNEP, 1982). From observations made during this mission, the same conclusion holds in the case of Somalia.

Because of limited oil refining activities in Somalia, little, if any, of the oil and tar found on beaches originates from land-based sources. During June 1986, some minor oil slicks were observed in the vicinity of Mogadishu port. At other port facilities in Kismayo and Berbera, no oil was noted in the sea water. At Kismayo port, oil lines leading from the terminal to storage tanks run along the coast just adjacent to a large bed of rock oysters (Crassostrea cucullata). Opened oysters smelled very fresh and showed no visual evidence of oil tainting. This observation suggest little impact from the terminal operation of the port.

In contrast, oil in the form of tar balls was found on all beaches examined. Because of the lack of data on tar concentrations in Somalia and the region as a whole (FAO/UNEP, 1982), a quantitative beach tar survey was carried out at a limited number of sites following the internationally recommended methodology outlined in UNEP/IAEA (1982). Time constraints limited the extent of the survey; nevertheless some interesting trends emerged (Table 3). The highest levels on the order of 100 g m^{-1} shoreline were observed at Jezira and Merca south of Mogadishu. These levels are roughly one-half the overall average of 224 g m^{-1} found in Oman where values were reported to be among the highest recorded for any world area (UNEP/IAEA, 1982). Significantly less tar was observed in the southern region and at Berbera in the Gulf of Aden. A comparison of the Somalia values with tar levels in other world areas is given in Table 4. It is interesting that the levels measured during June 1986 are close to a regional range reported for East Africa (UNEP/IAEA, 1982).

Table 3. Quantities of tar on beaches of Somalia during June 1986.

	Beach	Date	Transect length (m)	Tar (g)	Mean value for beach (g m^{-1})
1.	Berbera	17/6/86	46	0.1	0.3
			50	0	
			41	1.2	
			47	0	
2.	Jezira (18 km south of Mogadishu)	15/6/86	30	97	121*
			25	154	
			32	113	
3.	Merca	21/6/86	Visually assessed		100*
4.	Brava	22/6/86	46	0.2	3.6
			45	3.3	
			41	7.4	
5.	Kismayo	23/6/86	39	0.3	4.4
			42	1.8	
			44	9.8	
			40	5.7	

*Considered to be minimum value since some tar was buried in thick layer of sea plant detritus on upper beach face.

Table 4. World-wide beach tar distribution adapted from UNEP/IAEA (1982) and this study. (Most values in g m^{-1} of shoreline except those designed by * which are computed in g m^{-2} of beach surface. N.C. means not computed).

Location	Range	Average
U.S.A.		
East coast	19-81	42
West coast	0.003-23.9*	1.35*
Canada		
West coast	0.04	0.02
Bahama Islands	1-130	N.C.
Bermuda 1971-1972	98-220	171
1978-1979	115-1,108	195
Caribbean Islands	0-1,000	N.C.
Mediterranean & Red Sea		
Egypt	3.5-380*	134*
Malta	0.5*	
Israel	3,625	
Eilat coast	6,000 maximum	
India		
West coast	2.2-758*	28*
East coast	5.9-139*	20*
Kuwait	25-1,912	387
Oman	5-2,325	224
East Africa	10-100	N.C.
Somalia	0.3-121	46

During the entire survey the South-west Monsoon wind was blowing. As has been noted in a previous beach survey in Kenya, the period when most tar accumulates on these beaches is during the North-east Monsoon (FAO/UNEP, 1982). Likewise just after the South-west Monsoon in southern Oman (September/October), the beaches are relatively clean from tar (UNEP/IAEA, 1982). On all the beaches in Somalia, most of the tar lumps were extremely weathered and located primarily at or above the high water mark. This suggests deposition during an earlier period. Sightings by the Ministry of Fisheries of large, fresh tar balls at Fuma beach south of Kismayo prior to the onset of the South-west Monsoon support this hypothesis. It thus seems likely that tar concentrations along the Somalia coast are much higher during the portion of the year when the North-east Monsoon winds prevail.

If it is assumed that the data collected for single beaches are representative averages for a given region, the standing stock of tar on the beaches can be computed. This was done for the approximately 600 km stretch of beach between Mogadishu and the Kenya border (Table 5). The data show that roughly 17 tonnes of tar were on the beaches of the southern region of Somalia during June 1986. This can be compared with the 440 tonnes of tar computed for the 2,000 km coastline of Oman during September/October 1980 (UNEP/IAEA, 1982). Unfortunately due to lack of data it is not possible to assess tar loads on the remaining 2,700 km of Somalia's coast. In this regard a more comprehensive survey would help clarify the present situation.

Table 5. Estimates of the standing stock of tar on the beaches between Mogadishu and the Kenya border during June 1986.

Region	Beach length (km)	* Tar (g m^{-1})	**Standing stock (tonnes)
Mogadishu–Jezira area	55	121	6.7
Merca area	80	100	8.0
Brava area	180	3.6	0.65
Kismayo area to Kenya border	285	4.4	1.25
TOTAL LENGTH	600	TOTAL TAR	16.6

* Data from Table 3

** Values do not include offshore islands south of Kismayo and are extrapolations for areas based on data collected from a single beach typical of a given area.

From the above discussion it is clear that most of the tar on Somalia's beaches originates from the deballasting and cleaning activities of passing tankers on route to the Gulf. A similar conclusion has been drawn from a case study in Oman (UNEP/IAEA, 1982). It has been calculated that roughly 33,000 tonnes of crude oil are discharged annually in the East African region through normal tanker operations (IMO/UNEP, 1982). If the assumption is made that tar balls on the beach surface have a residence time of no more than one year, it can be estimated that approximately 0.05 percent of the annual discharge was deposited on the coastal strip between Mogadishu and the Kenya border. This of course is a minimal estimate since tar balls weigh only a fraction of their original weight when released as crude oil.

2.6 Catastrophic Events (MV Ariadne grounding)

Periodic accidents of ships in nearshore waters often result in a localized input of contaminants into the marine environment. Such was the case with the MV Ariadne, a container ship carrying a variety of toxic chemicals which went aground in Mogadishu harbour on 24 August 1985. One month later the ship broke up and caught fire. Some of the chemicals and oil were released into the harbour at that time. Shortly thereafter salvage operations began and continued until 31 May 1986 when rough sea conditions brought a halt to the work. Detailed descriptions of the accident and assessments of the situation in late 1985 can be found in UNEP (1985b) and IMO (1985). A list of chemicals that the ship was carrying is shown in Table 6. Of particular concern are the two extremely toxic substances: tetraethyl lead (TEL) and sodium pentachlorophenate (SPCP).

In late February 1986 a further assessment of the pollution situation was made. According to Linden (1986) some of the chemicals had been released into the sea. Measurements of chlorinated pesticides in harbour water made by the Faculty of Industrial Chemistry and cited by Linden (1986) showed values ranging between 0.06 and 0.15 mg l^{-1}. These values were interpreted to be low and to indicate that most of the pesticides were still intact in the wreck (Linden, 1986). In fact, the cited concentrations are several orders of magnitude higher than normally found in sea water and, if true, would indicate large-scale pollution. However, relatively low chlorinated pesticide concentrations in fish collected from Mogadishu waters during the same period did not suggest the presence of elevated levels of pesticides in the surrounding waters (Mohamud, 1985).

Table 6. The chemical cargo of the MV ARIADNE as understood from ships manifest and according to information from Somali Ports Authority (from Linden, 1986).

No. 1 Hold				
Hexane	UN 1208	IMO 3.1	68 Dm	9 Mt
Sodium hydroxide	UN 1823	IMO 8	1440 sacks	36 Mt
Hydrazine hydrate	UN 2030	IMO 8	50 Dm	11 Mt
No. 1 Deck				
Unknown ("Harmful poisonous/ toxic solid mixtures")	UN 2811	?	30 Dm	7 Mt
Hydrogen peroxide	UN 2014	?	269 cans	18 Mt
No. 2 Hold				
Xylenes	UN 1307	IMO 3.3	80 Dm	15.4 Mt
No. 2 Deck				
Calcium carbide	UN 1402	?		214 Kg
Paints, etc.	UN 1263	?		4 Mt
Organochlorine pesticide (DDT)	UN 2761	?		14 Mt
No. 3 Hold				
Sodium sulphide	UN 1849	IMO 8	320 Md	59 Mt
Hexane	UN 1208	IMO 3.1	234 Dm	110 Mt
Silicon resin solution in flammable liquid	UN 1866	IMO 3.3	20 Dm	20 Mt
Diethyl ether	UN 1155	IMO 3.3		355 Kg
Malathion	?	?	20 Dm	5.4 Mt
No. 3 Deck				
Ethanol	UN 1170	?	15 Dm	3 Mt
Aerosols	?	?	9100 Ctn	94 Mt
No. 4 Hold				
Styrene monomer	UN 2055	IMO 3.3	160 Ctn	6 Mt
Boron trifluoride	UN 1008	IMO	2 Dm	?
Paints and solvents	UN 1263	?		?
"	UN 1822	?		?
"	UN 1933	?		?
Nitrocellulose	?	?		?
Petroleum	UN 1133	?	2 Dm	400 Kg
Batteries	UN 2794	IMO 8	22 pallets	10 Mt

Table 6 (continued)

No. 5 Hold

Tetraethyl lead	UN 1649	IMO 5.1	273 Dm	119 Mt
Isopropanol	UN 1219	IMO 3.2	75 Dm	13 Mt
Xylenes	UN 1307	IMO 3.3	38 Dm	7 Mt
2-ethoxyethanol	UN 1171	IMO 3.2	3 Dm	624 Kg
Ethylene glycol	UN 2364	IMO 3.2	1 Dm	198 Kg
Toluene	UN 2194	IMO 3.3	146 Dm	19 Mt
Butanol	UN 1120	IMO 3.3	5 Dm	1 Mt
Methylisobutanol ketone	UN 1245	IMO 3.2	14 Dm	2 Mt
Acetone	UN 2090	IMO 3.1	37 Dm	7 Mt
Butylacetate	UN 1123	IMO 3.2	3 Dm	594 Kg
Methylethyl ketone	UN 1193	IMO 3.2	53 Dm	11 Mt
Trichloroethylene	UN 1710	IMO 6.1	42 Dm	14 Mt
Ethyl acetate	UN 1173	IMO 3.3	21 Dm	4 Mt
Sodium pentachlorophenate	UN 2567	IMO 6.1	250 bags	5 Mt
Dipenten	UN 2052	IMO 3.3	42 Dm	9 Mt
Methylethyl ketoxide	UN 1993	IMO 3.2	8 Dm	1.7 Mt
Munosperse	UN 1866	IMO 3.3	9 Dm	8.7 Mt

Dm = drum
Mt = metric tons
Ctn = containers

Procedures and methodologies for trace pesticide analyses in environmental samples were discussed with the Faculty of Industrial Chemistry during a visit to their laboratories. The importance of such precautions as contamination-free sampling, proper sea water volume, ultra-clean glassware, pesticide-free reagents and satisfactory low blank measurements was stressed. It was also suggested that the laboratory takes part in ongoing international intercalibration exercises in order to verify and refine their methodologies. From observations of the facilities and discussions with the analysts, it became evident that the laboratory has had only limited experience in trace contaminant analyses. For this reason, the cited chlorinated pesticide results for sea water should remain questionable.

Gas chromatographic analyses of sea water in the port failed to show the presence of TEL (Linden, 1986). No information was available with which to judge the reliability of the methodologies used for lead analyses; however, it is doubtful whether relatively insoluble, dense tetraethyl lead released at depth would be present in surface water samples.

In contrast periodic measurements of sodium pentachlorophenate in surface sea water showed the presence of the compound in several samples (Table 7). Although blank measurements were apparently not made (Mohamud, 1985; Chiavari and Mohamud, 1986), the methodology appears reliable. These results, while possibly not quantitative, suggest that the sodium pentachlorophenate released was rapidly diluted and removed from the port waters through tidal flushing action.

As of June 1986, an accurate assessment of the impact of the accident on the environment still could not be made. Confusion remained as to exactly which chemicals were still present in Hold No. 5. The Linden (1986) report suggests that both TEL and SPCP are likely to be found on the sea bed. However, from discussions with the Somali Shipping Agency it was learned that a comparison of the ship's chemical cargo (Table 6) and the salvager's inventory of the chemicals removed suggests that 250 bags of SPCP (5 tonnes) and 42 drums of trichloroethylene (14 tonnes) still remain in or around the wreck. In addition, the contents of at least three drums of TEL have leaked into the sea (Linden, 1986). Given this information, future efforts should concentrate on assessing the presence and extent of environmental contamination of these three compounds. Without a systematic survey of the contaminants in sediments and fish in and near the port of Mogadishu, it is not possible to assess the impact of this accident on the marine environment.

Table 7. Sodium pentachlorophenate concentrations reported for surface sea water from the port of Mogadishu, Somalia (from Mohamud, 1985; Chiavari and Mohamud, 1986).

Date	Concentration (ppb)
26/09/85	-
29/09/85	-
1/10/85	1
2/10/85	138
4/10/85	8
5/10/85	-
6/10/85	1
7/10/85	60
8/10/85	103
9/10/86	3
10/10/86	-
11/10/85	-
13/10/85	2
16/10/85	-
17/10/85	2

3. EFFECTS OF POLLUTANTS ON THE MARINE ENVIRONMENT

In the foregoing section, a detailed analysis of the sources and levels of potential pollutants arising from the various national sectors is given. Based on the available information, it is likely that at present the overall effects of pollutants on the marine and coastal environment are extremely limited. However, for specific pollutants in localized areas it is difficult to draw conclusions with any certainty as hard data is totally lacking.

For example, the discharge of raw sewage and animal and domestic wastes directly into the sea in the heavily populated area around Mogadishu most certainly poses a health hazard to humans using the local waters for bathing and fishing. However, no data exist on the types and concentrations of pathogens in nearshore waters. Nor are there reliable statistics on the number

of people who have become ill through contact with the waters or from eating contaminated sea food. Public health is an area of primary concern in Somalia and should be safeguarded.

Likewise the effects of specific pollutants such as the chlorinated pesticides, e.g. DDT, and toxic heavy metals, e.g. chromium, on the coastal fisheries in certain areas of the southern region are impossible to assess since there are no data on existing levels in edible marine organisms or other environmental matrices from the areas which may be susceptible to impact. Even in the case of the Ariadne accident where a source term has been identified, lack of reliable data obtained in a systematic fashion precludes accurately assessing the effects of the released chemicals.

Land use and agricultural activities such as limestone quarrying on the coast, beach sand mining and sediment discharge via the Juba river may lead to increased siltation which could affect the fisheries nursery grounds in the reef and mangrove ecosystem. Nevertheless, there have been no coastal environment or fisheries surveys with which to gauge changes and effects in these ecosystems.

Perhaps the most obvious pollution effect, or at least the only observable one, is the reduction in socio-economic amenities brought on by indiscriminate open dumping of wastes and coastal quarrying activities. Despite the overall natural beauty of the Somali coast with its attendant tourism appeal, the beaches were some of the filthiest ever observed by the mission team. Land-based detritus ranging from countless foam rubber sandals to livestock remains to human faeces littered the beaches. In many cases these sorts of materials far outnumbered and outweighted the marine-derived tar balls also contaminating the beaches. Proper waste treatment and tipping facilities, located away from the nearshore zone, would greatly alleviate this problem.

4. INSTITUTIONAL FRAMEWORK FOR THE ASSESSMENT OF MARINE POLLUTION

At present Somalia has no effective action plan or strategy for the assessment and control of marine pollution. All matters relating to marine pollution are under the jurisdiction of the Ministry of Marine Transport and Ports which serves as a focal point for the Eastern African Region and the Red Sea and Gulf of Aden Region Action Plans (UNEP, 1985a). An interministerial National Environmental Co-ordination Committee made up of the pertinent Ministries (e.g. Fisheries and Marine Resources, Commerce and Industry, Public Health, Marine Transport and Ports, Livestock, Forestry and Range) has been created but is not yet functional.

As there is no systematic national pollutant monitoring network, known or suspected pollution events are handled on an ad hoc basis. A case in point, and the only one of any significance, is the recent Ariadne disaster. Following the grounding, the Ministry of Marine Transport and Ports requested the Faculty of Industrial Chemistry of the National University to carry out some limited chemical analyses in order to assess the immediate situation (see Section 2.6 above). Lacking the requisite oceanographic equipment for sampling the samples were limited to surface sea water taken in plastic bottles, and local fish. The Faculty of Industrial Chemistry is the only laboratory in Somalia which has the necessary facilities and instrumentation to carry out pollutant analyses. However, the staff has only had limited experience analyzing marine samples and needs advanced training in trace contaminant analyses which are often extremely difficult to carry out even under the best of laboratory conditions. To date some reliable analyses have been achieved through collaboration with Italian colleagues at the Chemical Institute of the University of Bologna. The faculty has been further assisted with fish collection and dissection by the Faculty of Veterinary Medicine at the National University.

The Ministry of Fisheries and Marine Resources handles all aspects of marine resources, yet it has no laboratory. Within the National University there is presently nobody dealing

specifically with marine science. However, the next five year plan (1987-1991) has recommended the establishment of a Faculty of Marine Science which would incorporate staff from the Faculties of Geology and Industrial Chemistry. In this regard IOC/UNESCO recently carried out a site assessment for a marine laboratory at Jezira; however, no decision has been taken regarding its establishment. Given the present level of development of marine science in Somalia, it is questionable whether Somalia could staff and support a marine laboratory. Most important, basic and advanced training in pollutant analyses and assessment methodologies are urgently required. For the present, a solidified collaboration between the Ministry of Marine Transport and Ports, the Faculties of Industrial Chemistry and Veterinary Medicine, and the Ministry of Fisheries and Marine Resources appears to be the most effective solution for undertaking marine pollution assessment under the regional action plans. In terms of assessing the effects of land use and domestic wastes on the coastal environment and ecosystems, additional collaboration should be sought with the Ministries of Public Health and Livestock, Forestry and Range.

5. CONCLUSIONS AND RECOMMENDATIONS

Based on a two week fact-finding mission in Somalia, an attempt has been made in the preceding sections (a) to estimate the sources and present degree of marine pollution in the coastal marine environment and identify any changes or effects on ecosystem components that might be ascribed to marine pollution; (b) review Somalia's capabilities in the field of marine science and pollutant studies; and (c) propose an infrastructure for assessing marine pollution and devise a monitoring scheme which would enable Somalia to fulfill its obligations to the Eastern African and Red Sea and Gulf of Aden Action Plans. In the following paragraphs some general conclusions and recommendations pertaining to the overall assessment are presented.

5.1 State of Marine Pollution

Based on Somalia's level of development, industrial activities and locations, land use practices, and agricultural and fisheries technologies, the coastal ecosystem of Somalia is not at present severely impacted by land-based sources of marine pollution. However, it must be emphasized that this assessment is made without the benefit of any quantitative data. Few, if any, reliable pollutant measurements have been made in the critical areas identified, and virtually no quantitative surveys have been undertaken which would allow assessing subtle or abrupt changes and effects in the coastal marine ecosystem. Even in the case of a well-recognized pollution incident of MV Ariadne, there is not enough useful information to make an accurate assessment of the potential or real impact from this accident.

Somalia recognizes the need to understand and protect its coastal ecosystems. Therefore, it is essential that a pollution monitoring network of limited extent be established in order to gather the necessary quantitative data. In addition, an effort should be made to identify, describe and quantify critical marine species, habitats and ecosystems so that the possible effects of various types of marine pollution can be gauged against fluctuations and changes brought about by natural causes.

At present the only noticeable effect of marine pollution appears to be a reduction in amenities brought about by indescriminate domestic waste discharges along the coast, coastal quarrying of limestone and sand, and the widespread occurrence of tar and detritus on beaches. The tar situation in Somalia should be quantified in a more rigorous fashion during both monsoon seasons by carrying out inexpensive tar surveys at various sites along the entire coastline. Improved domestic waste practices will go a long way towards reducing the amounts of unsightly and unhealthy detritus on beaches, and carefully planned land-use strategies will reduce the effects of coastal erosion and increased siltation.

5.2 Capabilities in Marine Science

Somalia's capabilities in marine science and pollution studies are extremely limited. A basic technical infrastructure for pollutant monitoring and assessment of marine pollution does exist within the country (i.e. Ministry of Marine Transport and Ports and Faculty of Industrial Chemistry). However, it needs to be strenghtened and developed into a systematic and reliable monitoring network. At the technical level, the laboratory of the Faculty of Industrial Chemistry is relatively well-equipped with the necessary instrumentation to carry out the analyses of pesticides, PCB and certain heavy metals in marine samples. However, in their present facilities the general level of "cleanliness" is not sufficient to ensure "contamination-free" results of the analyses of certain pollutants. In addition the question of reliable instrument service may lead to problems and delays in the analyses. Above all, the chemical analysts at the laboratory should be provided with advanced training in pollutant analyses as soon as possible, preferably through the auspices of the regional action plans.

Qualified marine biologists, ecologists and fisheries specialists also need further training in order to initiate the basic marine surveys necessary for assessing the effects of marine pollution.

At present these types of training will have to be obtained outside the country, perhaps in other areas where UNEP's Regional Seas Programme is in a more advanced stage. Reciprocal visits in which the experts performing the training work with their counterparts in the country will be most beneficial. In the long term, after a reliable infrastructure in marine science and pollutant assessment has been established, the concept of establishing a marine science faculty or institute will be more realistic and beneficial to the country.

5.3 National Environmental Co-ordination Committee

At the policy-making level, a mechanism and infrastructure for assessing marine pollution has been devised in the form of an interministerial National Environmental Co-ordination Committee. Within the Committee the Ministry of Marine Transport and Ports has been designated as the body responsible for marine pollution matters. The Ministry also acts as the focal point with UNEP for the of Eastern Africa Action Plan and the Red Sea and Gulf of Aden Action Plan. Detailed descriptions of the infrastructure are given in the Sectoral Report on Marine Environmental Legislation.

The above-mentioned infrastructure appears to be the most viable solution and should be made fully functional. Within the infrastructure the Ministry of Marine Transport and Ports should strenghten its ties with UNEP so that the Regional Seas Programme activities can begin in Somalia as soon as possible. At the technical level the Ministry should establish a limited marine pollutant monitoring network which utilizes the expertise and laboratory facilities of the National University's Faculty of Industrial Chemistry. With advanced training the laboratory staff should be capable of supplying policy-makers with the necessary data with which to make appropriate decisions concerning marine pollution. In this context, advice and expertise should be sought from the Ministry of Fisheries and Marine Resources and their regional offices which can assist with sample collection and information on the critical demersal fish to monitor. The Ministry of Fisheries and Marine Resources should also be encouraged to supply the types of fishery survey data and statistics that can be used in the assessment of posssible pollution effects in critical areas. In addition, the Ministries of Commerce and Industry, Public Health, Agriculture, and Livestock, Forestry and Range should be consulted on appropriate matters if and when land-based sources of pollution are recognized as being significant in the coastal environment.

5.4 Marine Pollution Assessment Programme

In the initial stages of the marine pollution assessment programme, a simplified network should be set up to monitor only the critical areas where pollution is expected or valuable resources need to be protected. At the outset the primary focus should be on the Mogadishu, Brava and Kismayo areas. These towns contain deep water ports and various industries whose activities are generally recognized as sources of pollution. An additional "clean" site, outside the immediate influence of any source of pollution, should be selected to establish background contaminant concentrations with which to gauge pollution impact in other areas. Possible sites are 500 km north of Mogadishu at Obbia or at Ras Hafun.

At each station a surface sediment sample should be taken. In particular at Kismayo the sediment should be collected from near the mouth of the Juba river, a suspected source of pesticides to coastal waters. Ideally each station should be in an area where representative bio-indicator organisms can be found. Strategies for selection and use of bio-indicator organisms have been outlined by Phillips (1980). An ideal bio-indicator for many heavy metals and organic compounds is the rock oyster, Crassostrea cucullata. This filter-feeding mollusc is currently being used in several monitoring programmes in other regions. Furthermore it is present in large number in Kismayo and undoubtedly occurs on rocky outcrops in other areas of Somalia. In its absence a nearshore clam species could alternatively be used. Since demersal fisheries are becoming an important sector of Somalia's economy, fish from each area should also be periodically analyzed. Two species common in Somalia, grouper (Epinephelus) and snapper (Lutjanus), are prime candidates and are also monitored in other Regional Seas programmes. Due to the growing lobster fishery at Kismayo, it would also be advisable to monitor lobster from this region.

The frequency of sampling will be dictated by time and logistic constraints. The sites should be sampled at least two times per year, i.e. during the two monsoon seasons. The samples should be collected, prepared and analyzed by internationally-accepted procedures such as those set out in the UNEP Reference Methods series. The most important pollutants to measure are the pesticides, in particular DDT residues, and selected heavy metals such as mercury, lead, copper and chromium.

Supplementary sediment samples should be taken near the outflow of the effluent from the tannery factories at Brava and Kismayo and analyzed for chromium. If chromium pollution is found to be extensive at these sites, they should then be monitored more routinely.

At Mogadishu, additional effort should be made to assess the potential environmental impact of the Ariadne disaster. Pesticides, tetraethyl lead and other organic compounds rapidly associate with sedimentary particles. It is therefore recommended that surface sediments in the vicinity of the wreck be sampled along an onshore-offshore transect similar to that suggested by Linden (1986). In this way, if present, the extent and degree of contamination can be accurately assessed.

Tar originating from offshore tanker operations is a potential threat to Somalia's beaches. An effort should be made to quantify the extent of the problem by carrying out a beach tar survey at the locations examined during the mission as well as some other sites in the central and northern regions of the country. Tar surveys are quickly made, relatively inexpensive to carry out and furnish valuable information on the distribution patterns and quantities of tar entering the coastal ecosystem. Tar should be monitored at least once during each monsoon season by standardized methodology (UNESCO, 1976; UNEP/IAEA, 1982).

With regard to domestic wastes, in particular sewage, it is of utmost importance to establish a co-operative programme with the Ministry of Public Health to routinely monitor pathogenic micro-organisms (E. coli, Salmonella, Vibrio) in the nearshore waters of Mogadishu.

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ANNEX II

SECTORAL REPORT

ON

MARINE POLLUTION FROM LAND-BASED SOURCES

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CONTENTS

1. GEOGRAPHICAL SETTING

Somalia lies on the Horn of Africa with 3,300 km of coastlines extending from the Gulf of Aden in the north, turning south westward facing the Indian Ocean. Of its 640,000 km^2 area, only 13 percent is potentially cultivable and 45 percent is considered suitable for grazing. Much of the coastal plain is arid to semi-arid, presenting harsh environment to the rural and nomadic inhabitants. Rainfall is not only low but also of infrequent distribution, subjecting the country to frequent droughts. Industrialization and exploration of the mineral resources are in the early stages while the main economic development prospects center on agricultural and livestock development subject to careful management of the limited natural resources. Environmental services represent a priority national problem due to inadequate public health and environmental services, poor housing and overcrowding, malnutrition, insufficient water and sanitation, lack of logistic support and shortage of budgetary resources.

2. MARINE POLLUTION FROM MUNICIPAL SOURCES

2.1 Water Resources

As in other arid countries of eastern Africa, water is a major concern of the Somali people and represents the major determinant of the location and magnitude of development activities. Water resources of the country are sparse and differ widely from region to region due to the variation in rainfall distribution, topography and geology. Rainfall varies from an upper range of 450-780 mm a year in the inland highlands to a lower limit of less than 50 mm a year along the Gulf of Aden's coastal strip. The four seasons in Somalia comprise a dry season from December to March (Hagai), an intense rainy season from April to June (Gu'), a dry season from June to October (Jilaal) and a short rainy season from October to December (Deyr). Because of the arid climate, permeable soil and as evapotranspiration greatly exceeds rainfall, surface water is not available throughout the year in most regions.

The Juba and Scebelle Rivers are the main sources of surface water in Somalia; their average annual flows are 6,066 and 2,090 million m^3, respectively. The Scebelle River rises in Ethiopia and enters Somalia at Fer-Fer. In Somalia, the river flows about 630 km before it terminates in a swamp about 30 km east of the Juba River. The southern reaches of the river run dry twice a year and exhibit wide variations of water quality with the seasons.

The Juba River also flows from the Ethiopian plateau and has a channel length of about 800 km; it discharges some 400 km south of Mogadishu, at Kismayo, into the Indian Ocean. Though the quality of Juba's water is less variable than the Scebelle, it also fluctuates with the seasons. Recently attention has been given to potential harnessing of surface water from the small and often intermittent streams in the northern mountain range of Somalia; however, there is little information about the flow and availability of these seasonal streams.

In view of the scanty precipitation and extensive evaporation, groundwater is considered the major source of water supply in the country, and in most areas it represents the only perennial water source. Shallow aquifers presently encounter serious water quality problems. The risks of over-development of groundwater are emerging in certain arid areas of the country where conditions are unfavourable for the recharge of groundwater resources.

At present, the sustainable yield of groundwater within the Afgoi-Balad Wein-Mogadishu triangle is about 25 million m^3 a year. This source is derived from recharge of the Scebelle River during the high river stage. Maximum utilization will occur in the early 1990s at which time Mogadishu may have to secure additional supplies from the Scebelle River or other distant groundwater sources. As shown in Table 1, several regions suffer from a shortfall of ground water during drought periods.

On urban water supply, the three major cities of Mogadishu, Hargeisa and Kismayo are served with piped water supply networks in addition to the smaller towns of Berbera, Bardoa, Merca, Afgoi, Balad Wein and Jowhar. The Mogadishu network was commissioned in 1973 with the construction of 19 wells producing a total of 24,000 m^3 a day. Expansion entails the construction of 55 wells and associated works which is due for completion in 1987; a river water extraction scheme is also planned to meet the 1990 target of 58,000 m^3 a day.

The Government has adopted the objective of providing water at the rate of 130 liter per capita a day (lcd) for private connections and 30 lcd for public fountain service in 1990. To achieve these targets the Government is planning to add 25 new urban systems. Financing of 17 of these projects has been assured through international donors.

The population coverage in Mogadishu is the highest in the country with an estimated 87 percent of the city population served by regular supplies. Most of the Urban population in the outlying areas which does not have access to a standpipe is currently served by the private transport and sale of water. The Hargeisa water supply system has six municipal wells, the city has plans to double the capacity with the construction of six additional wells. Kismayo receives its water supply from the Juba river. At present, the water treatment works is inoperable and raw water is being pumped through the network; prompt actions should be taken to refurbish the works to permit the provision of safe water supplies to the city.

On rural water supply, unreliable estimates suggest that about 20 percent of the rural and nomadic population are regularly supplied with water mainly from unprotected dug wells within the settled rural centers. Well use is seasonal as users prefer to obtain their needs from surface water when available to avoid payment for well water. The traditional water sources for rural communities are uars, burkeds and ballehs which are man-made water sources designed to store surface water for extended periods. When these sources dry up, people must seek water at the next available location which sometimes involves extensive travel of one or two days. The Government goal is to provide the rural population with 25 lcd by 1990, which implies an eight fold increase in water supply from 3 million m^3 a year in 1982 to 25 million m^3 in 1990. Due to financial and technical constraints, the projections for 1990 have been recently modified to provide a total of 20 million m^3 a year for rural consumption which requires the construction of 232 wells dug from 1986 through 1990.

Agricultural water needs are supplied through diverted flood irrigation, rainfall, and controlled open channel irrigation. In the 1982-1986 five-year plan, the water requirements in the Scebelle basin was estimated to be 757 million m^3 a year and in the Juba basin 209 m^3 a year. Livestock water consumption varies with climatic and range conditions. However, figures for consumption per head are not expected to increase significantly in the foreseeable future. In 1984 the consumption was estimated at 100 million m^3 a year and is projected to increase to about 130 million m^3 a year in the 1990s. No reliable information is available concerning institutional and industrial water consumption in the country. In Mogadishu, institutional and industrial demand may account for about half the total water consumption. In 1984, the total institutional and industrial demand was estimated at 8.5 million m^3 a year and, as most projections indicate little growth in the public services and industrial activities, it is expected that water demands will reach 10 million m^3 a year by the early 1990s.

Most of the water development projects currently undertaken in Somalia are funded through international aid programmes. Continued foreign assistance is vital to accomplish the goals of increased water coverage in Somalia.

2.2 Sewerage and Excreta Disposal

Construction of the new Mogadishu sewerage scheme, which is the first in the country, commenced in 1983. In the first phase, it is expected to serve an equivalent population of 10,000

Table 1. Annual water requirements and availability in Somalia, 1980

Regions	Area (km^2)	Average rainfall (mm)	Annual Water Requirement (10^6 m^3)			Average annual surface water resources (10^6 m^3)	Total Annual Total Water Extraction				Total Water Available (10^6 m^3)		Ground water shortfall during drought (%)
			Human	Livestock	Total		Drilled wells No.	Drilled wells Volume (10^6 m^3)	Shallow wells No.	Shallow wells Volume (10^6 m^3)	With normal rainfall	During drought	
North West	86,000	300	2.55	7.83	10.38	-	59	3.22	21	0.66	129.00	4.38	58
North East	174,000	150	1.21	6.04	7.25	-	32	2.02	28	0.88	130.50	2.90	60
Central	113,000	150	1.32	7.81	9.13	-	165	10.41	22	0.69	84.75	11.10	-
Scebelle	82,000	350	8.04	9.05	17.09	2,090	134	8.45	52	1.64	143.50	10.09	41
Juba	116,000	350	2.14	15.30	17.44	6,066	153	9.65	37	1.67	203.00	11.32	35
Inter Riverine	66,000	400	1.99	5.25	7.24	-	107	6.76	32	1.01	127.00	7.76	-
Total	637,000	283	17.25	51.28	68.53	8,156	650	40.51	192	6.55	817.75	47.55	31

Source: UN Multi-Agency Drought Mission Report, October 1980

to 12,000. Funding was provided through low interest loans from the African Development Bank, the Islamic Bank and OPEC. Completion of the first phase has been postponed from June 1985 to December 1986 due to financial and operational problems. The population of Mogadishu in 1985 was estimated at 700,000 and the average household size at 6.5 persons. Mogadishu population is projected to reach 1,000,000 in 1990 and 1,600,000 in the year 2000, with a projected average household size of 7.5 in the year 2000.

At present, Mogadishu sewage and municipal wastes are discharged to septic tanks with or without seepage pits. Three types of pits are commonly found in Mogadishu. They are: (a) septic tanks with seepage pits which are generally used by households served by public water supplies or on-site wells, and overflows are emptied once every 2 - 3 years and the sludge is being disposed in the dune area located north-east of the city; (b) where houses are served from public taps at close distance, and seepage pits are utilized due to the low water consumption and the need for a longer emptying period (5-6 years); and (c) in areas served from public sources spaced at long distance, the residences are commonly provided with vaults which require no collection since new ones are built when those in operation are filled. Operation of septic tanks does not appear to pose public health problems at present.

On rural sanitation, the total rural and nomadic population was estimated in 1981 at 4 million of which the settled rural population was 1.1 million and nomadic 2.9 million. The combined rural and nomadic population was approximately 79 percent of the total population in 1981. With a growth rate of 3 percent per annum, the 1990 rural and nomadic population is expected to rise to 5.4 million of which 3.7 million may be nomadic. According to Somalia's Rural Development Strategy (1981-1990), poverty in Somalia is primarily found in four major rural occupations, namely, the nomads and semi-nomads, casual agricultural labourers and small-holders engaged in rain-fed farming, fishermen and their families and the refugees. These groups are unable to provide minimal food, shelter and services to their members. Arid conditions of rural Somalia limit the availability of water for public supply and the dilution of wastes. The prevalence of high temperature, inadequate water supply and the lack of adequate excreta disposal facilities contribute to the high incidence of water-borne diseases. In the National Morbidity Survey of 1980-1982, the rate of morbidity for major afflictions was as follows: Malaria 19/1000, Schistosomiasis 63/1000, other parasitic diseases 125-176/1000 while the infant mortality rate estimated in the range of 146-180/1000.

The inadequate and unsanitary disposal of infected human faeces in most rural areas is believed to be the major source of contamination of the ground and surface water supplies. It also affords a favourable environment in which certain species of fly lay their eggs, breed, feed on the exposed material and then carry infection. Improper excreta disposal attracts domestic animals and rodents which spread the faeces. In almost all of the villages visited and in nomadic areas, poor excreta disposal was cited as the priority health problem. In most areas, all basic elements of rural sanitation are virtually absent, and indiscriminate fouling of the soil with human excrement is common. It is anticipated that the menace of inadequate excreta disposal will continue to pose a major public health problem in Somalia so long as sanitary privies are absent in the rural communities.

Introducing technical programmes for improved rural sanitation, or even providing free service, without due regard to public education in hygiene based on local traditions and beliefs will be futile. The mere fact that most rural communities are lacking adequate excreta disposal facilities may suggest the need for prompt action to provide latrines through community participation projects. However, without proper education, the people may not be ready for, or may even be hostile to, such facilities. Therefore, it is strongly recommended that local initiative and self-reliance be encouraged on a well-informed basis; and that local authorities should promote construction of privies by the families with the local health department providing

the essential guidance and the concrete privy slab at a minimal cost or even gratis. The health department should also undertake pilot projects for excreta disposal at schools, welfare centres and other official places. A field visit to two marginal settlements (Kaaraan and Yagshiid) on the outskirts of Mogadishu indicated the presence of three distinct types of low-cost sanitation: (a) pit latrines separated from the household comprising a single-lined pit and temporary superstructure; (b) pit latrines attached to households; and (c) interior water seal toilets, including a ceramic lining and drainage to cess pits, which are emptied by tankers provided by the municipality. These facilities are only found in the residence of the comparatively wealthy middle-class people.

2.3 Solid Waste Collection and Disposal

The collection and disposal of refuse and solid wastes are essential public services. The observed procedures of solid waste disposal in the urban and rural communities of Somalia are unsatisfactory in every respect. In fact, they represent a major impediment to improvement in environmental quality and public health in the country. The most pressing problems relating to solid waste management exist in the large cities where a considerable part of the population has rural waste disposal habits and where collection facilities are either not available or unaccessible. It goes without saying, that the lack of financial resources and the absence of technical know-how represent the major obstacles to effective management of solid wastes in Somalia. The following problems are attributed to improper management of solid wastes in the urban settlements: (a) haphazard dumping of wastes in the streets favours the development of infectious diseases such as cholera, hepatitis, typhoid and enteritis; (b) wastes create pungent odours, particularly during hot weather; (c) children and animals are exposed to contamination through direct contact with waste matter; and (d) rains help in further spreading of wastes which leads to the unsightly appearance of the cities and towns.

At present, the municipality of Mogadishu has about 110 refuse containers of 6-m^3 capacity. These comparatively large size containers are suitable only for large institutions, commercial facilities and big houses which generate appreciable amounts of solid wastes. They are not accessible to the areas in most need such as low-income communities within the cities and the outlying residential areas. Improper collection and extended disposal intervals create a nuisance in the vicinity of the containers and act as a breeding ground for flies and insects. The municipality is employing crews to collect scattered waste materials prior to the replacement of containers which usually triples the time needed for handling the containers.

In a recent move, the municipality instituted a new regulation requiring all commercial establishments to acquire steel containers of 100-litre capacity. Although collection vehicles are not compatible with these containers, which renders handling a tedious work, this action is regarded as a step towards improving the existing solid waste handling practices. A considerable part of the collected waste is rescattered during transport as most containers and trucks are not covered.

The disposal of wastes takes place through open dumping in two main sites, one close to the airport and the other adjacent to the slaughter house. Visits to both sites revealed inferior sanitary practices as children and animals are allowed to sift through the waste in search of usable matter. Both sites are not supervised and truckers dispose their loads in a haphazard manner; in several spots the wastes are allowed to burn which creates significant air pollution in the surrounding areas. Both locations are unfavourable because the prevailing winds often carry the smoke, dust and acrid smell into the nearby residential areas.

Some truckers were spotted disposing refuse in unauthorized areas to save fuel. This confirms the lack of proper supervision and the need for concerted action to upgrade the existing practices of collection, transport and disposal.

Street cleansing is confined to major roads and is carried out manually as most residential roads are covered with gravel or sand which render their cleansing difficult. The removal of silt and accumulated rain in several areas is not carried out due to the shortage of manpower and lack of equipment.

Since most residential areas are served by irregular and narrow streets which makes them inaccessible to existing containers, it may be appropriate for the municipality to provide plastic bags to individual households or smaller containers of 100- to 200-litre capacity for common collection from clusters of dwellings in the low-income areas. Daily collection is recommended in view of the unfavourable climatic conditions which speed waste decomposition and breeding of insects.

2.4 Assessment of Domestic Waste Loads

Estimate of domestic solid wastes in Mogadishu is as follows:

Population is 700,000;
Household size is 5.5 persons in 1985;
Number of households is 127,000;
Estimated volume of waste for a household a day is 4.5 litres;
Total volume of waste is, therefore, 571.5 m^3 a day;
Estimated weight of waste for a household is 2.5 kg a day; and
Present collection capacity 600 m^3 a day.

Facilities required to improve collection are:

10,000 100-litre capacity containers;
1 dozer, 2 loaders, and 1 compactor at landfill site; and
5 Tankers for septic effluents.

Estimates of liquid wastes from non-sewered areas for Mogadishu and other coastal areas are given below:

	Mogadishu	Other coastal areas
Waste volume	17,250 m^3/d	35,000 m^3/d
BOD_5	15,000 kg/d	30,000 kg/d
COD	33,000 kg/d	66,000 kg/d
SS	30,000 kg/d	60,000 kg/d
N	650 kg/d	1,300 kg/d

At present most of the non-sewered domestic wastewater drains through the ground while septic effluents are being discharged on land with minor flows from seashore institutions (hotels and public buildings) being discharged directly into the sea through individual outfalls. Although no true estimates can be made, the discharges to the sea are believed to be small and cannot be regarded as a significant source of marine pollution.

The following calculation gives the estimated sewered loads for the year 2000 in Mogadishu. Basic sources of waste water are domestic, institutional and industrial establishments. The average per capita residential consumption for Mogadishu is estimated as follows:

Large houses with gardens	120 lcd
Large houses without gardens	60 lcd
Houses served by nearby public taps	8.5 lcd
Houses served by distant source	4.3 lcd

Consumption figures will gradually increase due to the expanding coverage of the piped supply. Based on average density of 6 premises a hectare and a household size of 7.5 persons, the estimated inhabitant density in the coverage area will be 45 persons a hectare. According to the anticipated uses a peak flow period will average 8 hours and therefore estimated peak flow will be:

$$\frac{200 \text{ lcd} \times 45 \text{ C/ha}}{8 \text{ h} \times 3600 \text{ s}} = 0.3 \text{ l/s. ha}$$

Therefore, projected waste water flows in the year 2000 are:

Domestic	3,149 m^3/d
Institutional	1,600 m^3/d
Industrial (milk, soft drinks, soap)	1,901 m^3/d
Total	6,650 m^3/d

Average BOD loading = 6,650 x 0.3 x 0.4 kg/m^3 = 800 kg/d

2.5 Institutional Infrastructure on Water Supply and Waste Management

Water supply has yet to be developed as an independent sector capable of nation-wide planning, based upon the integrated programming, management and implementation of services. Several ministries and specialized institutions are entrusted with the responsibilites of developing and managing water resources in the country:

(a) The National Water Committee (NWC) is the core policy and decision making organ in the water sector. Membership of NWC is comprised of the Ministers of Mineral and Water Resources (MM&WR), Livestock, Forestry and Range (MLFR), Interior (MOI), Agriculture (MOA), Health (MOH), and general managers of Water Development Agency (WDA) and National Range Agency (NRA). The NWC is responsible for formulating national water policy, setting prices (currently set at Sh. 13.50 a cubic metre throughout the country), determining priorities for the WDA's rural borehole drilling programme and other water development projects.

(b) The MM&WR has the primary task of directing and monitoring the activities of the WDA and the regioal water agencies of Mogadishu, Hargeisa and Kismayo. The Hydrology Department of the MM&WR is responsible for research exploration, legislation and follow-up policies.

(c) The WDA mandate comprises: research including the collection and analysis of water resources data, and formulation of comprehensive plans for use of resources and the coordination of water use in Somalia in addition to regulating the private sector activities for water development. The WDA's responsibilities have been recently expanded to include the operation and maintenance of water systems outside Mogadishu, Hargeisa and Kismayo formerly entrusted to autonomous agencies charged with the operation of the water schemes for these major urban centres. The WDA is financially and technically supported by various external aid sources and relies on expatriates for the planning and design of water systems.

(d) The MOI promotes and initiates small scale water supply projects in the rural areas. It also coordinates functions, raises funds and organizes self-help labour for rural projects at the regional and district levels.

(e) The MOA is responsible for the regulation and development of surface water for irrigation purposes.

(f) The Ministry of Planning (MOP) coordinates overall planning activities including those related to water supply and sanitation. In this connection, the Ministry has the prime responsibility of coordinating external aid programmes.

(g) The MOH is responsible for control and surveillance of water quality and supervises activities related to environmental health and public sanitation. The MOH activities are severely curtailed due to the extreme shortage of trained staff and the virtual nonexistence of monitoring equipment and analytical instruments.

(h) The NRA has a wide environmental protection power as it approves the location of boreholes in rural areas and takes an active part in the construction and maintenance of water supply facilities, mainly the uars and ballehs used for the livestock watering.

On sewerage and rural sanitation, no national agency is assigned the responsibility of planning and implementing a country-wide sanitation programme. The three autonomous water agencies for Mogadishu, Hargeisa and Kismayo were supposedly in charge of sewage management in areas within their jurisdiction. However, it appears that the Mogadishu Water Agency (MWA) is not involved in the Mogadishu sewerage project. The Ministry of Public Works was given the responsibility to supervise the construction on behalf of the Mogadishu Municipality (MM) which will take over responsibility for the operation upon completion of the works. Since the MM does not have the technical capability and management means to assume this responsibility, the consultant for the project (GKW) has already submitted a proposal to help in developing the needed capabilities.

As it stands now, there is no formal implementation by any agency of an organized programme to promote rural sanitation or low-cost, on-site sanitation of the undeveloped areas in major urban centres. Emphasis appears to be directed to the provision of water supply, waterborne sewerage and urban sanitation. No evidence exists for programmes related to rural sanitation, except for the proposed assistance to the (MM) to develop capabilities in the construction of low-cost sanitation, which will be provided through the World Bank, and the UNDP Technical Advisory Group (TAG) with a contribution from the Italian Government.

Faced with rapidly growing solid waste problems, the sanitation department of the MM has attempted to improve the services by the ad hoc acquisition of equipment and by increasing the labour force. Apparently these measures have been unable to cope with the acute problems of solid waste management in Mogadishu, this may be attributed to a failure to adjust the existing organization and management structure to the expansion of services. The existing organization of the sanitation department of the MM comprises three units; collection (districts and fleet operations), disposal (dumping sites and septic tank services) and street cleansing. Mogadishu, as well as other major cities, lacks a coherent municipal waste management scheme, this is clearly reflected in the shortage of trained manpower, improper acquisition of collection and transfer equipment and absence of long-term planning to account for future waste management needs.

While the MM needs to maximize the productive use of existing vehicles and equipment, they will also have to give much greater thought to ways of improving labour productivity and the adoption of practical means to enable better accessibility to the collection system for the deprived masses in the marginal settlements. The public will also need to be encouraged to move waste to a convenient point for collection. Public co-operation may result in substantial savings in operational costs over the existing practices which rely on the municipality for doing most of the work, including the unnecessary efforts of collecting the scattered refuse in the streets.

In the poorer, densely populated districts of Mogadishu, the MM should promote the use of communal storage on proper sites designed to suit local conditions and which are convenient for residents. The MM may provide 200-litre oil drums fitted with handles or similar containers that could be manually fitted to side-loading vehicles. The long-term benefits in terms of improved environment and better hygiene are likely to be a primary incentive for the MM to finance such scheme and to induce the needed co-operation from the public.

2.6 Constraints of Environmental Services

Environmental services in general and schemes of water, sewerage, rural sanitation and municipal solid wastes in particular, continue to be plagued by major management and operational problems which severely affect the delivery of these essential services. Agencies and departments responsible for water and sanitation encounter serious professional understaffing at the managerial and operational levels, severe shortage of financial resources which, in turn, affect manpower recruitment and equipment procurement. The management and operational capabilities also suffer from the diversion of resources to emergency situations. Despite the apparent "autonomous status" accorded to these environmental institutions, they lack authority to take decisions and they have to rely on expatriate consulting and unpredictable foreign aid.

It is also of great concern that environmental service institutions in Somalia have difficulties not only in hiring and training enough qualified personnel, but also in preventing those on the job from being drained off to the oil-rich countries in the Arab world.

The following constraints are responsible for the ineffectiveness of the existing management system:

(a) Absence of operating guidelines and discipline procedures which often complicate decisions on operational and personnel matters.

(b) Fragmentation of managerial responsibility and extensive reliance on decisions from the parent ministries concerning expenditure and staff hiring.

(c) Lack of managerial talent and experienced technicians which is attributed to the inability to offer competitive salaries and incentives to attract qualified people. It is essential to introduce significant reforms of the salary and incentive structure particularly in jobs associated with occupational hazards such as refuse collection and sewerage maintenance.

(d) Co-ordination among various environmental services is beset with difficulties stemming from the absence of an institutional set-up for environmental management at the national and regional levels, lack of recognition of the importance of long-term planning of environmental services, and the vagueness of the communication channels among planning, operation, monitoring and enforcement agencies.

(e) New and rehabilitation projects encounter long delays in the importation and customs clearance of equipment and supplies and shortages of local construction materials.

(f) Training and management development is given low priority in all environmental organizations.

2.7 Monitoring and Research

At present, the tasks of environmental monitoring in Somalia are assigned to the Environmental Health Unit (EHU) of the MOH and the Department of Public Health (DPH) of the MM. The observed inadequacy of the existing monitoring schemes is associated with an extreme shortage of technical information on levels and sources of pollutants, shortage of skilled analysts and laboratory technicians and unavailability of analytical and monitoring instruments.

Procedures for environmental monitoring presently executed by the EHU and DPH are merely dependent on observation and human judgement; in few instances water samples from suspected wells are analysed for faecal coliform at the central laboratories of the MOH. The present environmental surveillance scheme is clearly limited in scope and obscures the assessment of the level of sanitation and environmental quality in Somalia.

The following are the structure and functions of the existing monitoring institutions:

(a) Priorities of the EHU comprise monitoring and surveillance of adequate and safe water supplies, food control, surveillance of conditions in environmental institutions, monitoring of waste disposal, control of vectors of diseases, monitoring of air and stream pollution. At present, the EHU focuses only on the Mogadishu area and only executes nominal monitoring of water supplies. The unit has no laboratories or field instruments and no means of transportation. It is obvious that the lack of manpower and essential facilities are major impediments to implementation of an effective monitoring system.

(b) In the Benadir region, which includes Mogadishu, the DPH is assuming the responsiblity of monitoring environmental health and supervising sanitary conditions in residential areas, as well as public and private institutions. The department head is being assisted by about 20 field inspectors. The functions of the DPH include prevention and eradication of cummunicable diseases, surveillance of environmental health, food sanitation, including imports through Mogadishu Port, monitoring refuse disposal and sanitation of residential and public places and monitoring of pesticides use. The DPH has no laboratories to complement its field activities.

(c) The Department of Industrial Chemistry at the National University of Somalia has been involved in few water research activities. No information was made available to the mission to assess the adequacy of the research findings.

2.8 Environmental Legislation

A review of environmental legislation in Somalia has revealed few legal instruments which deal with water resources management and sanitation. Typical of other developing countries, this legislation is basically sectorial and does not deal explicitly with the problems of environmental pollution. Attention is not given in the existing laws to the interdependence of development activities; at best they serve as a piecemeal approach to environmental problems. At present, Somalia does not have regulations, codes or limitations for air emissions, solid waste, industrial pollution, water quality, food sanitation and occupational health. Developing regulatory and control limits in these areas will assist in preventing a further decline in environmental quality. It is important to enact standards on substances which pose a hazard to the environment in order to allow the safe use of resources and to prevent potential detrimental effects to people and the environment.

Existing environmental legislation comprises:

(a) Water Law No. 77 of 18 November 1972. Article 4 states that every person is entitled to use water for domestic and non-domestic purposes from public water sources, however, no user shall pollute water or cause any damage to the public source.

(b) The Sanitary Code of 1936. This code, though specifying several provisions on environmental aspects of water supply and sanitation, needs further revision to meet the emerging needs for environmental protection.

(c) Sewage and Drainage Law No. 3, 5th March 1983. Article 10 refers to possible discharge of trade effluents for treatment by the sewerage authority, Article 24 mentions the procedures to be followed in case of accidents or non-compliance.

(d) Town Planning Ordinance of June, 1947. This ordinance was only applicable to the Northern Region and provides for the planning and implementation of programmes related to water supply and sanitation requirements. The regional authorities may impose measures needed for sanitation purposes.

(e) Water Agencies Laws. (i) Water Development Agency Law No. 28, of 20 February, 1971; (ii) Mogadishu Water Development Agency Law No. 18, of 6 April, 1978; (iii) Kismayo lower Juba Water Agency Law No. 29 of 29 July, 1978; and (iv) Hargeisa Water Agency Law No. 32 of 2 July, 1970. These agencies are responsible for the inventory of water in their respective regions, including related sanitation.

(f) Drinking Water Quality. In 1981, a WHO consultant drew up comprehensive quality criteria for drinking water supplies in Somalia. However, no action is expected in the foreseeable future to institute quality criteria for the drinking water supplies.

Any new or revised environmental legislation should be amended with regulations concerning implementation and sanctions based on clear working directives. Legislation covering environmental assessment and monitoring procedures need to be enacted to fill the current gaps and to strengthen the capability of the existing environmental institutions.

3. ENVIRONMENTAL CONSEQUENCES OF INDUSTRIAL DEVELOPMENT

Industrialization is still in the infancy stage of development in Somalia. Capital formation in the industrial sector is relatively low and most plants are operating at chronically low rates of capacity utilization.

3.1 Industrial Development in Somalia

The objectives of the long-term development plan for the industrial sector encompass:

Realization of self-sufficiency as soon as possible;
Accelerating the pace of industrial development;
Promotion of manufacturing exports;
Employment of labour intensive technologies;
Rehabilitation of existing industries;
Development of training to provide necessary skills; and
Efficient utilization of local resources, especially for agro-industries and production of building materials.

The strategy for achieving the above objectives embraces putting public enterprises on a sound financial and management footing, reviewing pricing policies, encouraging private sector participation and liquidating nonviable public enterprises. The targets for the 1982 - 1986 plan were:

To attain self-sufficiency in sugar production;
To augment the supply of drugs by 1983;

To improve milk supplies to the population of Mogadishu;
To have surplus of cement for export by 1986;
To remodel the existing oil refinery to meet the country needs;
To produce urea fertilizers in sufficient quantities by 1983; and
To increase the production of textile to 20 million yards by 1986.

By and large, most of these targets have not been realized and the performance of the manufacturing sector was lackluster for most of the last decade. During the past two years, several major plants operated considerably below their capacity. This poor performance is attributed to acute shortage of fund, lack of infrastructure, poor management, droughts which led to shortages of raw material to agro-industries and lack of local markets. Most public enterprises are plagued by major problems including unprofitability, questionable foreign exchange, and extreme shortages of fuel and power supplies. Futhermore, the concentration of major activities in urban centres has intensified demands on the already strained public services. Table 2 shows the basic performance indicators and waste disposal of major industrial plants in Somalia. Locations of basic industries in Somalia are shown in Figure 1.

3.2 Sources of Industrial Pollution in the Coastal Areas

The industrialization pattern in Somalia appears to cause minor impact on the marine environment. However, it contributes to the deterioration of the coastal environment and urban settlements. Industrial planning does not instigate environmental assessment to ascertain whether or not major production establishments are environmentally compatible or where operating processes impinge on the society and the environment. This is clearly demonstrated in the case of relocation of the slaughter house adjacent to the Lido beach, which has led to the attraction of sharks and abandonment of this beach area. A further example is the siting of a tannery adjacent to the university campus which creates unfavourable environmental conditions and may have already contaminated water wells in the area. The common practice of repeated "shut-downs" of the major facilities such as the petroleum refinery, urea factory, textile mills etc. is already having a serious effect on equipment durability in addition to increasing the level of processing wastes.

With respect to the discharge of industrial effluents into public sewers, the drainage law No. 3 of 1983 referred to the possibility of accepting liquid wastes provided that the approval of the appropriate authority has been granted. Article 4 mentions the procedures to be followed in the event of spills or non-compliance with regulations, while Article 34 grants the power to the sewerage authority to request pre-treatment prior to discharge to sewerage if this is deemed necessary. Article 35 specifies sampling facilities by the industry in order to permit the sewerage authority to perform its duty. Despite these provisions, the discharge of industrial effluents into sewerage networks is not recommended due to the incompatibility of the trade wastes, particularly the tannery wastewater with domestic sewage which would lead to damage of the sewer lines and upset the treatment works.

On-site treatment of industrial emissions is presently found in few plants. To alleviate future industrial waste problems, the Ministry of Commerce and Industry should pursue the following strategy:

Directing industrial growth towards new development centres in which environmental impacts are controlled through proper planning.
Orienting new industries to low-waste technologies and more rational use of resources.
Financing, or offering of subsidies for, the installation of treatment facilities in the existing plants.

3.3 Loads of Industrial Effluents in the Coastal Environment

Pollution emanating from industries which discharge their effluents directly into the sea does not represent a potential danger to the marine environment at present. Sources and loads of pollution emanating from major industries in coastal areas are given in Table 3.

The following is a description of major facilities which discharge effluents directly into the ocean:

Urea plant

The plant is located just outside Mogadishu on the coast at Gezira. The plant's rated capacity is 150 T/d of urea, and utilizes fuel oil from the refinery for partial oxidation process, and for synthesis gas generation followed by ammonia and urea production.

Details of the process are depicted in Figure 2. The plant is supplied by raw water from the nearby wells at a rate of 90 m^3 an hour to feed the water softening unit, the cooling tower, and other uses. Consumption figures per ton of urea are: feedstock fuel 0.5 t; fuel oil 0.4 t; raw water 13.8 m^3; and electric power 484 kw/hr. Wastewater from the ammonia and urea synthesis is estimated to be 75 m^3 a day with an average NH_3 concentration of 100 mg/l. The effluent is presently discharged to a lagoon of 1,000-m^3 capacity before final discharge to the ocean through a short sea outfall. It should be noted that the plant is presently operating at less than one tenth of its rated capacity which results in minor pollution loads.

The National Refinery

This topping plant has a designed production capacity of 600,000 tonnes a year. The production of LPG and bitumen for road construction is being considered in the next five-year plan. The plant has been operating at a nominal level due to the frequent shortage of crude oil. In 1985 production was as follows: light Naphta 9,475 t, heavy Naphta 12,055 t, gas oil 34466 t, kerosine 18,289 t, and heavy fuel oil 8,2349 t. There has been persistent under-utilization in the past five years.

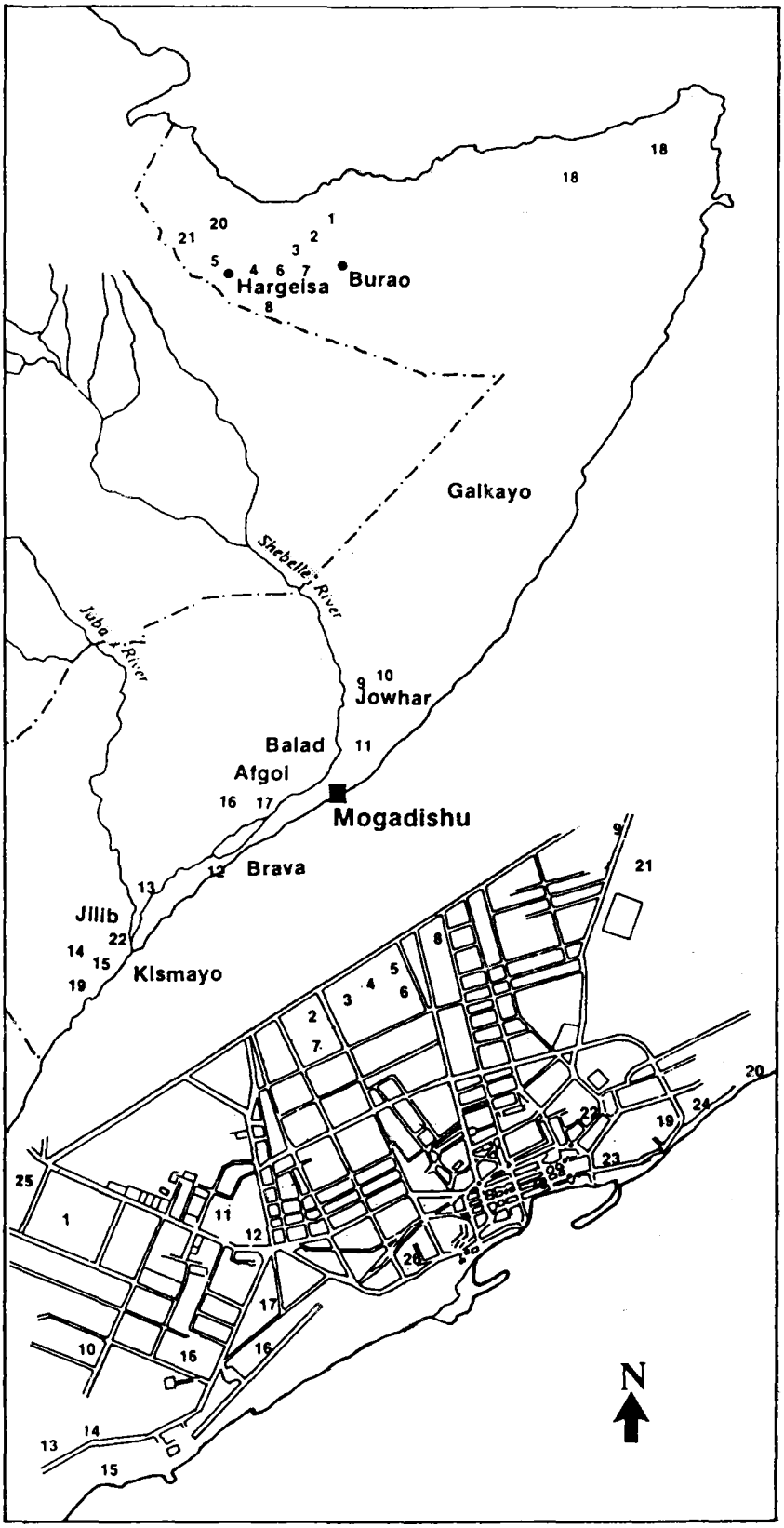
The plant is equipped with an API oil separator designed to handle 20 m^3 an hour with an oil content of up to 2,000 ppm and an estimated recovery efficiency of 95 percent. Monitoring of the treated effluent is not practised at the plant.

Slaughter house

Slaughtering is carried out manually. The sanitary conditions at the plant are inferior due to poor housekeeping and cleanup of residues, while the carcasses are handled in unhygienic manner in close proximity to the public dumping site. Wastewater from the cleanup operations is loaded with blood, intestinal waste and suspended residues and is presently discharged inshore without pretreatment. The pollution of the coastal area caused by dumping of the wastewater and the unhealthy conditions created by the adjacent dumping site requires the immediate attention of public health authorities. The liquid effluent should be screened and treated biologically using an extended aeration package unit before ultimate discharge into the Ocean.

Table 2. Basic performance indicators and waste disposal of manufacturing industries in Somalia

Industry	Product	Annual capacity	Annual domestic need	1984 production	Capacity used in 1984 (%)	Waste disposal
Juba Sugar	Sugar	67,000 T	67,000 T	26,900	40	Land disposal
	Molasses			13,200		Without treatment
Jowhar Sugar	Sugar	40,000		680	1.7	Land disposal
Mogadishu Oil	Edible oil		45,000 T	0	0	Land disposal
	Crushing	140 T/d				
	Refining	1,000 T				
Pasta, Mogadishu	Pasta	13,200 T		11,000	85	Insignificant waste
	Macaroni		3,100 T	1,600	52	
Sopral Meat	Canned	1,800 T		0	0	
Kismayo Meat	Canned	5,000 T		125	2.5	No market
ITOP Fruit	Canning			0	0	Lack of raw matls
Mogadishu Milk	Milk and cheese	6 million l	56 million l	0	0	Land disposal
Bottling, Mogadishu	Coca Cola	million cases		455,000	46	Land disposal
Cigarette, Mogadishu		1,000 T		270	18	Minor pollution
Somaltex Balad		22.5 million yard	38 million yard	5.2 million yard	23	Land disposal
Tannery, Mogadishu	Skins		459,000	217,500	47	Extreme pollution
	Hides		90,000	26,100	29	Land disposal
	Shoes		120,000	44,000	25	Without treatment
Tannery, Kismayo	Skins		360,000	120,000	33	
	Hides			10,000		
Packing, Jamama	18 million pieces (card box)			3.8 mil.	20	Land disposal
		16.8 million pieces (Polyethyl)		4.2 mil.	25	without treatment
Chemical, Mogadishu	Detergent	65,000 T			15	Land disposal
	Soap	20,000 T			15	
Pharmaceutical	Antibiotics			0	0	Land disposal
Urea, Mogadishu		45,000 T	15,000 T	500 ('85)	9	Sea disposal
Refining	Petroleum products	460,000 T	600,000 T	125,000 ('85)	31	Sea disposal
Power plant		40 MW		?		Sea disposal
Cement, Berbera		200,000 T	200,000 T	0	0	Commence in 1987
Asbestos, Berbera		40 T		15	37.5	Air pollution
Gypsum, Berbera		60,000 T		20,000	33	Air pollution
Foundry, Mogadishu		610 T		105	17	Minor pollution
Al. Utensils, Mogadishu		120 T		9.6 ('85)	8	No pollution



LOCATION OF INDUSTRIES IN SOMALIA

1. Cement project
2. Gypsum factory
3. Eternik (corrugated sheets)
4. Shoe and Pickling plant
5. Somali Bottling (Pepsi Cola)
6. Sunshine detergents
7. Powdered detergents
8. Pickling plant
9. SNAI-BIASA: liquor, cosmetics, plastics
10. Jowhar Sugar factory
11. Somali Textiles
12. Hides and shoe factory
13. Juba Sugar Project
14. Shoe and Tannery plant
15. Meat factory
16. Brick factory
17. ITOP: fruit and vegetable processing
18. Fish factory
19. Fish factory
20. Ayaan milk factory
21. National Building Components Co.
22. INCAS corrugated container plant

LOCATION OF INDUSTRIES IN MOGADISHU

1. Tannery, Shoe and Leather factory
2. Cigarette and Match factory
3. Foundry and Mechanical Workshop
4. Edible Oil factory
5. Flour Mills
6. Aluminium utensils factory
7. Allamagans furniture
8. IFCA insect sprays, toiletries
9. Basta spaghetti factory
10. Warshadda Masaamiirta (wire products)
11. Somali Prefab building materials
12. National Bottling (Coca Cola)
13. Oil Refinery
14. Urea Plant
15. Somali GRP fibreglass boats
16. Foam Industry
17. Bail Soap factory
18. Sharif Zein garments factory
19. Deeqa stationery manufacturer
20. Pepsi Cola
21. Haplas plastic materials
22. Alba soft drinks
23. Igfas pharmaceuticals
24. Shamow Bros aluminium
25. Warshadda Daawada
26. Multifabric Somali

Figure 1. Location of industries in Somalia and in Mogadishu

Table 3. Industrial pollution in the coastal areas
(Based on rated capacity)

Industry	BOD (kg/d)	COD (kg/d)	SS (kg/d)	Grease (kg/d)	Phenol (kg/d)	NH_3 (kg/d)	Chromium (kg/d)	Sulphur (kg/d)	Solid waste (kg/d)	Particulate (kg/d)	SO_2 (kg/d)	NO_2 (kg/d)	Operation* in 1986
MOGADISHU													
Refining(**)	120	156	15	150	0.06	2			1,320		200		1
Edible oil	455	735	570	2,275									0
Tanning	1,000	2,250	1,230	190			40	268					2
Milk	85	110	35	20									0
Bottling	30	65	40										3
Power(**)	10	15		50									3
Urea(**)	30	38				7.5				1,500	70	300	1
Soap, detergent	1,640	2,700	920						120			1	
Slaughter house	900	1,500		240					3,500			3	
KISMAYU													
Tanning(**)	800	1,800	984	152			30	160	1,500				2
Meat Process(**)	106	155	50	180					5,100			0	
Fish(*)	20	28	30	5					200				2
BRAVA													
Tanning(**)	180	380	204	30			18	96					2
LASKOREH													
Fish(**)	20	28	30	5					200				2
ADALE													
Fish(**)	10	14	15	3					100				2
BERBERA													
Cement										94,000			0
Asbestos										?			0
Gypsum										25,000			0
Fish(**)	10	14	15	3					100				0
TOTAL	5,426	9,988	4,138	3,830	0.06	9.5	88	524	12,140	120,500	270	300	

*Operation: (0) not operating; (1) nominal; (2) under capacity; (3) continuous. ** Sea discharge.

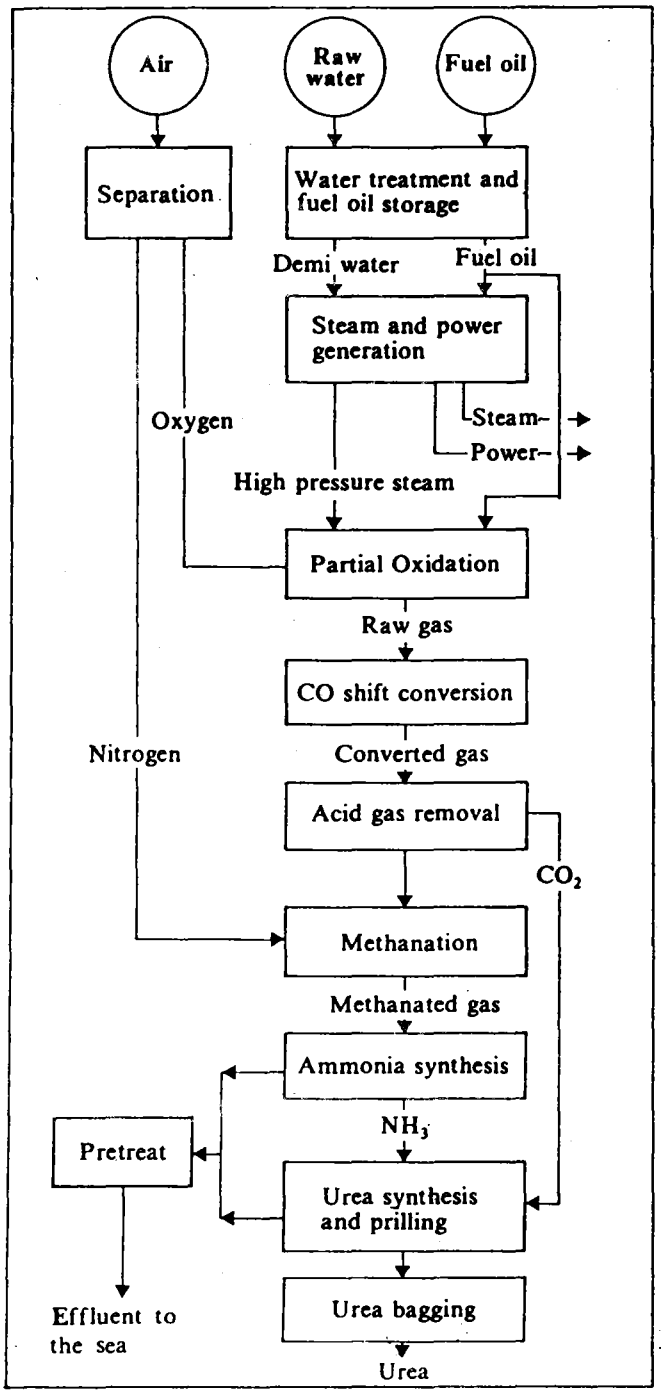


Figure 2. Urea production process

Tanning

The raw effluent from the Mogadishu tannery is presently disposed of on land in a succession of deep holes at the rear of the plant. The liquid drains through the sandy soils and is partially removed by evaporation leaving sludge which is scraped up mechanically. The amount of effluent discharged is 256 m^3 a day. Unfavourable environmental conditions are prevailing in the area, and a fatal accident involving a child occurred in November 1984 due to the collapse of a sand heap. It is also to be expected that the drainage of this toxic effluent may have already deteriorated the underground water supply. Wells in the nearby areas must be monitored promptly to ensure the safety of the water for human consumption. The consulting firm of Collins, Holding and Associates has proposed connecting the plant sewers to the public sewerage based on the wrong assumption that the population served by the sewer system would be 700,000 which would give a dilution factor of 140:1. Since the projected sewerage flow to the year 2000 is 6,660 m^3 a day, it is anticipated that the discharge of the highly toxic effluent from the tannery plant at a dilution factor of 25:1 would lead to serious problems in the sewerage network and the disruption to the waste treatment works. It is therefore advisable to provide on-site treatment of the tannery effluent before final discharge into the sewerage system; the treatment process should encompass pH adjustment, precipitation and biological treatment. The treated effluent discharged into the sewerage system should contain the following maximum concentrations: chromium 4 mg/l, sulphides 5 mg/l, BOD 500 mg/l, and SS 300 mg/l. The tanneries at Kismayo and Brava are discharging their raw effluents together with some solid residues directly into the sea; no plans are currently being considered for treating the effluent before dumping it into the sea.

Power plant

The power plant at Gezira has an installed capacity of 40 MW as at 1985. The plant seems to generate minor amounts of pollutants.

Kismayo Meat Factory

The plant has been operating at nominal level since its commissioning in 1976; refurbishing the plant to its original capacity in the product line for which it was initially designed seems to be unpromising according to a recent USAID study. However, the FAO has chosen to refurbish the plant to meet short-term needs associated with the refugee programme and is providing financial support to start operation before the end of 1986. Wastewater is discharged together with the tannery effluent through an open channel to the sea. Wastewater from both plants should be treated on-site, before final discharge to the sea. No immediate action is envisaged as the plant may be abandoned in the future due to lack of markets.

3.4 Estimated Industrial Pollution Loads Discharged Directly to the Sea

At present, liquid effluents are discharged from the refinery, slaughter house, urea and power plants in Mogadishu, tannery and fish plants in Kismayo, Brava tannery, and fish plants of Laskoreh and Adale. The estimated loads in kg a day are BOD 1,306, COD 2,628, SS 1,343, Grease 578 phenol 0.06 and Ammonia 9.5.

Solid wastes discharged along the shore areas which may eventually reach the sea are estimated in kg a day as follows: slaughter house 3,500; tanneries 1,500; and fish and other minor industries 950. The total estimated is 5,950 kg a day.

Estimated air emission is as follows (kg a day):

	Particulate	SO_2	NO_2
Urea	1,500	70	300
Refinery		200	
Cement	94,000		
Gypsum	25,000		
Total	120,500	270	300

4. ENVIRONMENTAL MONITORING DIVISION (EMD)

The complexity and importance of environmental monitoring, and the virtual absence of monitoring programmes and instrumental capability requires formulation and execution of a reactive strategy which entails the establishment of an EMD within the administrative system of the EPA. The division mandate would be to monitor quality parameters according to the objectives and criteria set by State directives.

The scope of activities and performance level of the EMD depends on available resources of expertise. A tentative phased strategy may be implemented as follows:

(a) Phase I (one year)

This phase encompasses: (i) collection and analysis of available data on environmental quality; (ii) implementation of a short-term monitoring scheme in co-operation with the National University of Somalia - NUS and EHU of MOH; and (iii) proposal of long-term monitoring programmes.

(b) Phase II (two years)

This phase contains: (i) commissioning of preparatory activities of the integrated monitoring programme; and (ii) commissioning of autonomous environmental monitoring laboratories (advanced analytical facilities of NUS need not to be duplicated; the monitoring schemes may involve water, air, domestic and industrial pollution, stream and marine water quality, solid wastes and food hygiene).

(c) Phase III (two years)

This phase consists of: (i) continuation of the priority monitoring activities; (ii) establishing regional monitoring capability, if the need arise in co-ordination with the proposed regional laboratories of EMU; and (iii) conducting limited research activities in priority environmental areas which have been overlooked by NUS or specifically requested by other public organizations.

4.1 EMD Outputs Envisaged

Outputs of EMD are: (i) monitoring compliance with environmental quality and proposing amendments to existing regulations; (ii) evaluating the overall effectiveness of the National

environmental protection strategy; (iii) advising on industrial siting and urban expansion; (iv) predicting pollution trends based on adequate inventory of analytical data; and (v) implementing inter-laboratory quality control and standardizing analytical techniques for other research and government environmental laboratories.

4.2 Organizational Structure of EMD

EMD may comprise the following units:

(i) Emission Monitoring, monitoring liquid effluents, air emissions, solid waste from domestic and industrial sources, marine pollution, sea outfalls, and stream quality. Proposed emission limitations are given in Tables 4-6.

(ii) Instrumental Services: providing essential analytical back-up for monitoring activities, carrying out routine and special services and standardizes methods of sampling and analysis.

(iii) Field Monitoring: carrying out periodic monitoring of point sources (domestic and industrial) and assessing offending discharges and proposed control measures.

(iv) Food Hygiene: pending co-ordination with PHD of MM and the central laboratories of MOH, EMD may establish analytical services to monitor food quality during processing, handling and distribution.

(v) Interpretation and Assessment data acquisition from EMD units and other laboratories, processing and interpretation; assessment of environmental quality for receptors and level of compliance with regulations and standards laid down by the legislation.

EMD is not intended to, and should not, assume functions assigned to other institutions but should concentrate on filling existing gaps with specific emphasis on monitoring parameters currently overlooked or not assigned to functioning institutions. Its basic function is to provide back-up and competent advice to NEPC on technological, organizational and operational aspects related to the integrated scheme of environmental management. Other structural units of EPA will not be detailed at this stage.

Table 4. Proposed effluent guidelines for discharge to the sea

Parameter	Maximum allowable	Monthly average
pH	6-9	-
Floating particles	Nil	Nil
Total suspended solids (mg/l)	60	40
Turbidity (N.T.U.)	90	70
Biochemical oxygen demand (mg/l	80	50
Chemical oxygen demand (mg/l)	350	200
Oil and grease (mg/l)	20	12
Phenols (mg/l)	1.0	0.1
Total Kjeldahl nitrogen (as N) (mg/l)	15	8
Chlorine residual (mg/l)	2.0	0.1
Chromium (mg/l)	2.0	0.5
Dissolved oxygen (mg/l)	min. 2.0	-
Ammonia (as N) (mg/l)	4.0	2.0
Total phosphorous (mg/l)	2.0	1.0
Sulphide (mg/l)	0.1	0.05
Zinc (mg/l)	5.0	2.0
Mercury (mg/l)	0.005	0.001
Nickel (mg/l)	0.5	0.2
Lead (mg/l)	0.5	0.1
Manganese (mg/l)	1.0	0.2
Cyanide (mg/l)	0.1	0.05
Cadmium (mg/l)	0.05	0.01
Arsenic (mg/l)	0.5	0.1
Total coliforms (MPN/100 ml)	10,000	1,000

Table 5. Proposed industrial effluents limits discharged to public sewers

Parameter	Upper Limits	
	Maximum value	50% of the time
pH	5-10	5-10
Temperature (^{o}C)	60	35
Total dissolved solid (mg/l)	2,000	1,800
Total settleable solid (mg/l)	40	10
Biochemical oxygen demand (mg/l)	400	300
Chemical oxygen demand (mg/l)	600	400
Chromium (mg/l)	4.0	1.0
Chloride (mg/l)	700	300
Mercury (mg/l)	0.02	0.005
Phenol (mg/l)	5.0	2.0
Sulphide (mg/l)	6.0	3.0
Sulphate (mg/l)	800	400
Arsenic (mg/l)	1.3	0.8
Cadmium (mg/l)	0.5	0.3
Cyanide (mg/l)	3.5	1.0
Lead (mg/l)	0.5	0.1
Nickel (mg/l)	2.5	1.0
Zinc (mg/l)	10.0	5.0
Oil and grease (mg/l)	100	60

Table 6. Proposed air emission limits

Parameter	Source	Emission control
Asbestos	Asbestos plant	No visible emission
Nitrogen oxides	All uses	220 ng/J(0.05 lb/10^6BTU)
Particulates	All uses	Equivalent to best available technologoy, with no incandescent particles from combustion processes.
Sulphur dioxide	All uses	300 ppm by volume NTP (95% removal in sulphur recovery operations in the refining).
Volatile organic compounds (VOC)	Refinery and petroleum storage	Floating roof should be provided for minimum VOC emission. If the true vapour pressure under actual storage conditions exceeds 76.5 KPa, the storage vessel shall be equipped with recovery system to remove a minimum VOC of 98%. Emission of VOC from the refinery shall be controlled by flaring all blowdown, purging, venting and recycling.

5. PERSPECTIVE AND RECOMMENDED ACTIONS FOR COMBATING COASTAL POLLUTION

The effects of environmental deterioration in the coastal environment is attributed to rapid population growth, limited expenditure for infrastructural expansion, inadequate environmental services and inferior sanitation. Illiterate, unskilled, and socially bewildered citizens occupy squatter shack areas and are offered limited public services, a bare subsistence and little chance of self-improvement.

Present socio-economic and environmental conditions provide sufficient justification for a comprehensive approach to the conceptualization and planning of environmental management to replace the current segmented approach of the government machinery. This approach has led to the organization of specific programmes in virtual independence of one another and their administrative assignment to different agencies which result in overlapping, and wastage of resources.

At the outset, it is necessary to emphazise that enhancing environmental quality in Somalia's coastal areas as well as in other inland settlements does not necessarily require massive infusion of funds or adoption of far-reaching public programmes. On the contrary, resources may be wasted, as was clearly demonstrated in some areas, if programmes are not based on knowledge, indigenous capabilities and real needs of the country. This is particularly true in a least developed country like Somalia which can ill-afford to waste its meagre resources, nor can it afford experimenting with schemes which have proved ineffective in countries with similar environmental problems. My perspective and recommended actions for combating pollution are given below.

5.1 Coastal Development

Perspective

Coastal population in 1984 amounted to 2.55 million or about 30 percent of the total population. Physical congestion and blight are evident in Mogadishu, Kismayo, Berbera and other cities; they appear to defy efforts towards improvement or control and are causing environment and life in the coastal areas to be more precarious. Squatter's settlements are mushrooming around

cities; overburdened environmental services and social institutions may be shattered as a result. The technological, financial and human resources needed for the conservation of coastal environment appears to be beyond the means of Somalia at present. The already extensive burden involved in provision of the community needs is likely to be more difficult in the future as the country is experiencing acute financial difficulties which severely restrict the investment in development and environmental services.

Actions

(a) Suitable coastal planning may lead to sustained development on environmentally sound basis. Planning should emphasize self-reliance and full utilization of economic and human potentials through judicious location of new developmental activities and the provision of services in a more efficient manner.

(b) Inspite of dissimilarities in the level of economic growth, social structure, political organization and technological development among countries of eastern Africa, it seems that exchange of experience of coastal planning among these countries may offer a unique possibility for formulation of sound plans and development of adequate operational policy.

5.2 Management of the Coastal Environment

Perspective

The organizational tangle of administrative agencies responsible for community services is responsible for the ineffectiveness of services' delivery. Government programmes develop piecemeal as problems and demands emerge. Central agencies are not providing localities with effective tools, fund and swift enforcement devices; this limits local initiatives to improve sanitation and to enhance environmental quality.

Actions

(a) A new active management set-up must be created for the implementation of a nation-wide plan for environmental protection. The institution should have a clear perspective on the priority of environmental problems, and should be responsive and flexible in assuming priorities, devising remedies and implementing appropriate protection measures.

(b) Management should rely on appropriate environmental assessment studies and achievable pollution control limitations.

(c) Cost-effective programmes adapted to the need of the coastal community must be developed with maximum dependence on local resources.

5.3 Public Participation

Perspective

Public tolerance and indifference to the negative visual and psychological manifestations of environmental degradation seem common. Evolution of effective public awareness is not conceived in the foreseeable future.

Actions

(a) Environmental awareness must be aired to the public more effectively through mass-media channels.

(b) The Government should strengthen capabilities of the existing institutions, creating new organizations and citizens' groups dealing with protection of environment.

(c) More emphasis should be placed on advocating religious principles concerning preservation of natural resources and improving the quality of life.

5.4 Water Supply and Waste Disposal

Perspective

Urban coverage of water supply and sanitation will not improve through 1990. However, reasonable improvement of services is envisaged in the rural areas. Wastes are disposed of improperly on land, while the Government cannot afford the cost of constructing sewerage systems in major cities. Long-term plans for provisions of water and sanitation may be impeded due to inappropriate administrative and financial frameworks, inadequate planning, lack of expertise, and shortage of supplies and local materials.

Actions

(a) Water works of Kismayo suffers from ineffective maintenance and shortage of chemicals and spare parts. Performance has to be upgraded; prompt actions should be undertaken to put the plant back to operation to enable delivery of safe potable water.

(b) State Governments and municipalities should promote solution to sanitation problems through demonstration facilities, improved public services and more community participation.

(c) Sewerage master plans must be gradually implemented in major cities and reasonable financial and technical support must be provided to accomplish this task.

(d) Urban planning should reserve within city master plans an adequate area for long-range refuse disposal needs.

5.5 Environmental Monitoring and Manpower Development

Perspective

Environmental monitoring is virtually non-existent. The surveillance of water quality and food sanitation is inadequate. Most monitoring agencies are not equipped to discharge their responsibilities; laboratory facilities are limited, technicians and analysts are not available. Nominal monitoring is only provided in the capital city. Manpower development is not a priority concern in the environmental sector despite the acute shortage of expertise.

Actions

(a) In-house monitoring should be integrated in the activities of the existing environmental services and institutions, such as regional water agencies and the municipalities. The Ministry of Health should establish central environmental health laboratory to complement the ongoing activities of the primary health care programme.

(b) It is desirable to initiate national environmental monitoring schemes; UNEP and WHO can help in establishing the monitoring programme, and the training of staff in data acquisition and analysis.

(c) Training in the areas of management of solid wastes, rural sanitation, water supplies and environmental monitoring should be undertaken through on-the-job training, special short-courses and by awarding fellowships for overseas training.

5.6 Industrial Pollution

Perspective

Minor pollution loads are emanating from industries in the coastal region. However, the trend to concentrate the industry in urban centres may contribute to overcrowding, poor hygiene and burdening the public services. In the absence of adequate legislative instruments for environmental protection, foreign concerns may seize the opportunity to introduce less cost-intensive polluting industries.

Actions

(a) The Government should promote employment of labour-intensive, less-polluting industries, upgrade existing production facilities and decentralize industrialization to ease the burden on the strained urban centres. New impetus should be given to expanding agro-industries which employ low-waste technologies and prohibition of hazardous industries.

(b) Environmental enhancement can be properly achieved through setting of criteria for the receiving environment at a minimum permissible quality level, while emission standards of the present and future industries should be controlled to the maximum practical extent.

5.7 Public Health

Perspective

The unfavourable climate, malnutrition, low socio-economic standards and deteriorated living conditions in the substandard communities may hinder the objective of health for all. Health hazards emanating from poor sanitation and inferior drinking water supplies are bound to increase in both urban and rural communities.

Actions

(a) Concerted efforts are needed to ensure provision of safe drinking water, extend coverage of sanitation and to improve practices of solid waste collection and disposal.

(b) Assessment of health impacts, particularly risk assessment, should be incorporated along with environmental integrity in the feasibility studies of the future developmental projects.

(c) Continued support to the primary health care programme to combat environmentally induced diseases.

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ANNEX III

SECTORAL REPORT

ON

MARINE OIL AND CHEMICAL SPILLS

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CONTENTS

1. ENVIRONMENTAL SETTING

Somalia, forming the Horn of Africa, lies in the north-eastern corner of the Continent (see Figure 1). It is bordered by the Gulf of Aden to the north, the Indian Ocean to the east, and Kenya, Ethiopia and Djibouti to the west. The country's 3,200 km coastline is virtually the longest in continental Africa. The northern part, latitude 11°N, is nearly 1,000 km long while the eastern seaboard stretches from about 12°N to 2°S, a distance of some 2,000 km.

The northern coast on the Gulf of Aden consists of a series of sandy bays interrupted by rocky promontories extending into the sea down to a shallow depth. There are neither fringing coral reefs nor bars. From the coast, the sea bottom has a steep slope and the extent of the continental shelf is very limited. The 200 m contour line is, on the average, only 6 km from the shore except between Berbera and Zeila, where it is about 30 km wide owing to the presence of an offshore shoal.

The eastern coast from Ras Asir to latitude 8°N resembles the northern coast, except that sandy bays are scarcer and rocky outcrops more frequent. Along this part of the coast the continental shelf extends to about 50 km offshore. Between latitudes 6°N and 8°N the coast becomes sandy with a gradual appearance of coral. The shelf is 16 to 20 km wide and occasionally reaches 30 km. This is not true further South of the equator because of the more extensive coral reefs, deep ravines and the steep dropping off of the shelf. From the equator to 2°S latitude, the shelf remains as narrow (about 16 km) and coralline as it is further North; there are about 500 islands parallel to the coast, more or less connected by reefs.

There are several long and sandy beaches along the coast, both in the north and south of the country. The extent of beaches along the entire coastline has been estimated at 1,200 km (Bihi 1985). The rest of the coastline includes steep rocky areas especially on the north-eastern stretch.

Along much of the Somali coastline bordered by the Indian Ocean there are natural coral reefs that protect the beaches, particularly in the southern part of the country. Mangroves are found in the extreme South of the country, South of Kismayo.

Somalia has two permanently flowing rivers, the Juba and the Scebelle, both rising in the Somali plateau in the territory of Ogaden, and which drain into a large catchment area after flowing for a considerable distance through vast territories of the southern regions of the country. Of the two main rivers only one of them, the Juba, flows into the Indian Ocean near Kismayo, in the extreme southern part of the country.

The nearshore continental shelf is not extensive in Somalia, for the depth of the coastal zone waters increases suddenly, in most areas, at a distance of only a few kilometers from the shore.

The country has a subtropical climate with four seasons: Gu' - the main rainy season, from March to May; Hagai - from June to August, when the south-west monsoon brings some light showers to the southern coastal areas only; Deyr - from September to November, the second rainy season, covering the whole country; and Jilaal - the dry season that dries up the rivers and sometimes causes droughts, from December to February. The temperature varies from 28°C to 32°C during the year.

The north-east Somali coast is characterized by an upwelling at the end of the South-west Monsoon in October. This upwelling is responsible for very high, primary productivity since it brings up nutrient-rich waters from the deep ocean. The upwelling results in a great profusion of small pelagic species, mostly sardinelles.

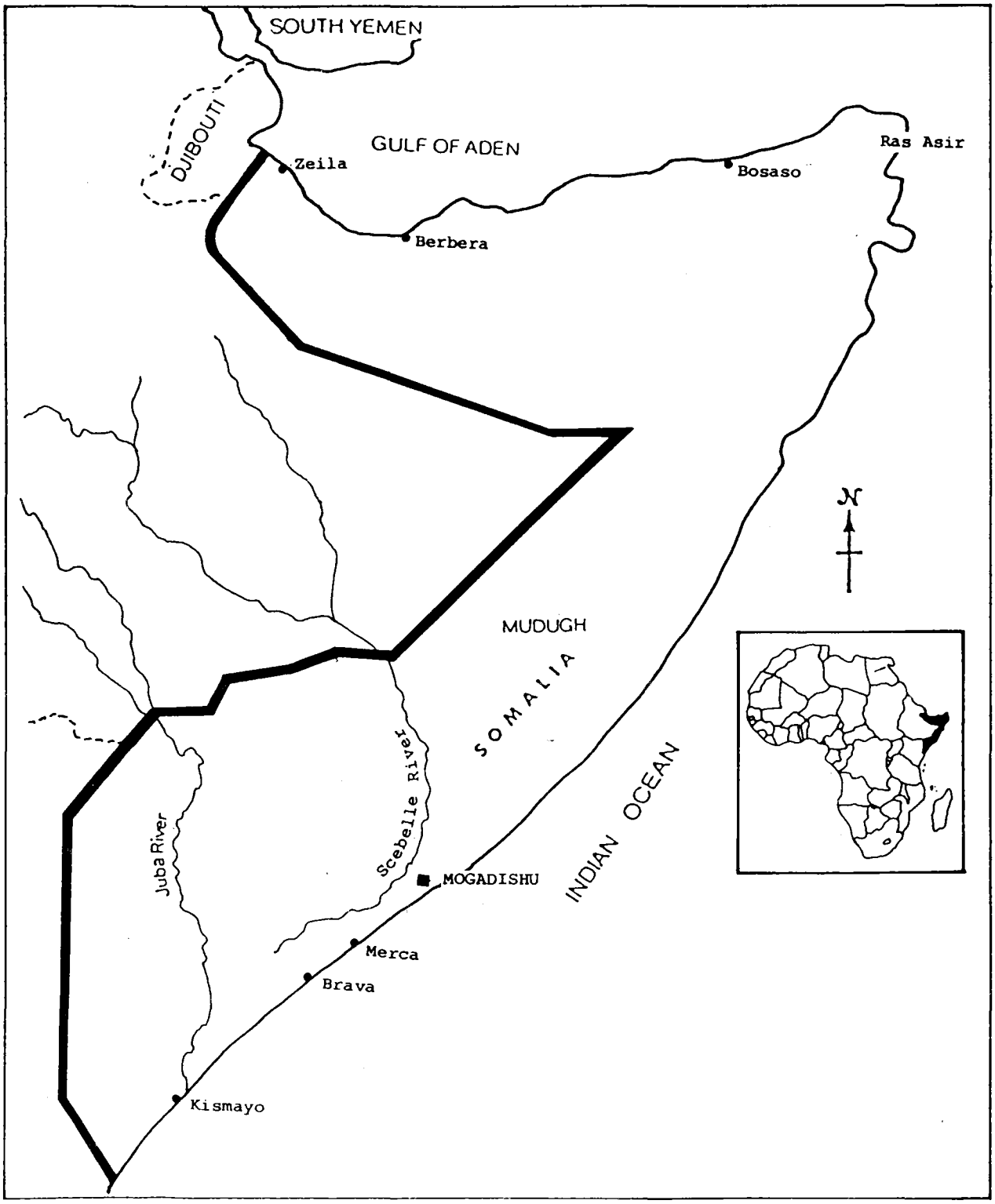


Figure 1. Map of Somalia

The Somali coast is affected mainly by two current patterns - the Somali Current and the Indian Monsoon Drift (see Figures 2 - 5). The currents run parallel to the coast and though they are strong they are concentrated into narrow flows of up to 100 miles, beyond which the currents are often quite weak. To the North of 2°S the Somali current reverses in direction, following the monsoon winds. Generally this current flows north-east during the South-west Monsoon at a rate of 4 to 5 knots, occasionally reaching 7 knots during June to September (UNEP 1982). During the North-east Monsoon it flows at a rate of 3-4 knots.

The offshore currents produced in the periods between monsoons are shown in Figure 6.

The coastal population is generally estimated at one million and is directly or indirectly dependent on the coast and coastal waters because the country exports and imports all goods through its principal ports. About 100,000 people are directly engaged in artisanal fishing, extraction of building materials from coastal areas, and to a limited extent in tourism.

2. SOURCES AND RISKS OF OIL SPILLS

There are five categories of oil spills that can affect the Somali coastal environment and these are:

(a) Operational discharges that occur in ports;

(b) Spills from land-based sources that enter the marine environment;

(c) Spills at sea occurring as a result of oil drilling accidents (e.g., blowouts);

(d) Intentional tanker discharges at sea of oily ballast; and

(e) Major oil tanker spills.

These are now discussed in turn; first the activity that is the potential source of the spill type is reviewed; this is followed by a discussion of the risks involved.

2.1 Spills in Port and Harbour Areas

2.1.1 Sources

Marine traffic is very important for Somalia since it has a very long coast and most international trade is done by sea. However, since livestock and bananas account for most of the export trade, and since the country has a very low level of industrialization (approximately 2 to 3 percent of the population is engaged in industrial activity), the amount of crude oil and petroleum products that enter or leave Somali ports is relatively low. Hence, the risk of significant oil spills in ports is relatively low at least insofar as traffic volume is concerned.

The country has three deep water ports into which crude oil or refined products are imported. (Prior to 1986 there was a small export trade in heavy fuel oil, but this was stopped by the government, shortly after the formation in December 1985 of the National Petroleum Agency).

Mogadishu

The capital city of Somalia (Mogadishu, Pop. 500,000) is the country's chief sea port. A new port was recently constructed and the port now has six deep-water berths with a total quay length of 1,000 m. One berth is dedicated to the livestock trade and another to crude oil. From 1980 to 1983 the amount of imported crude oil averaged about 200,000 - 250,000 tonnes annually. (At the time of the mission's visit, crude oil had not been delivered to the country for over one month, the refinery was not operating for lack of feedstock, and petrol rationing was in place throughout the country)

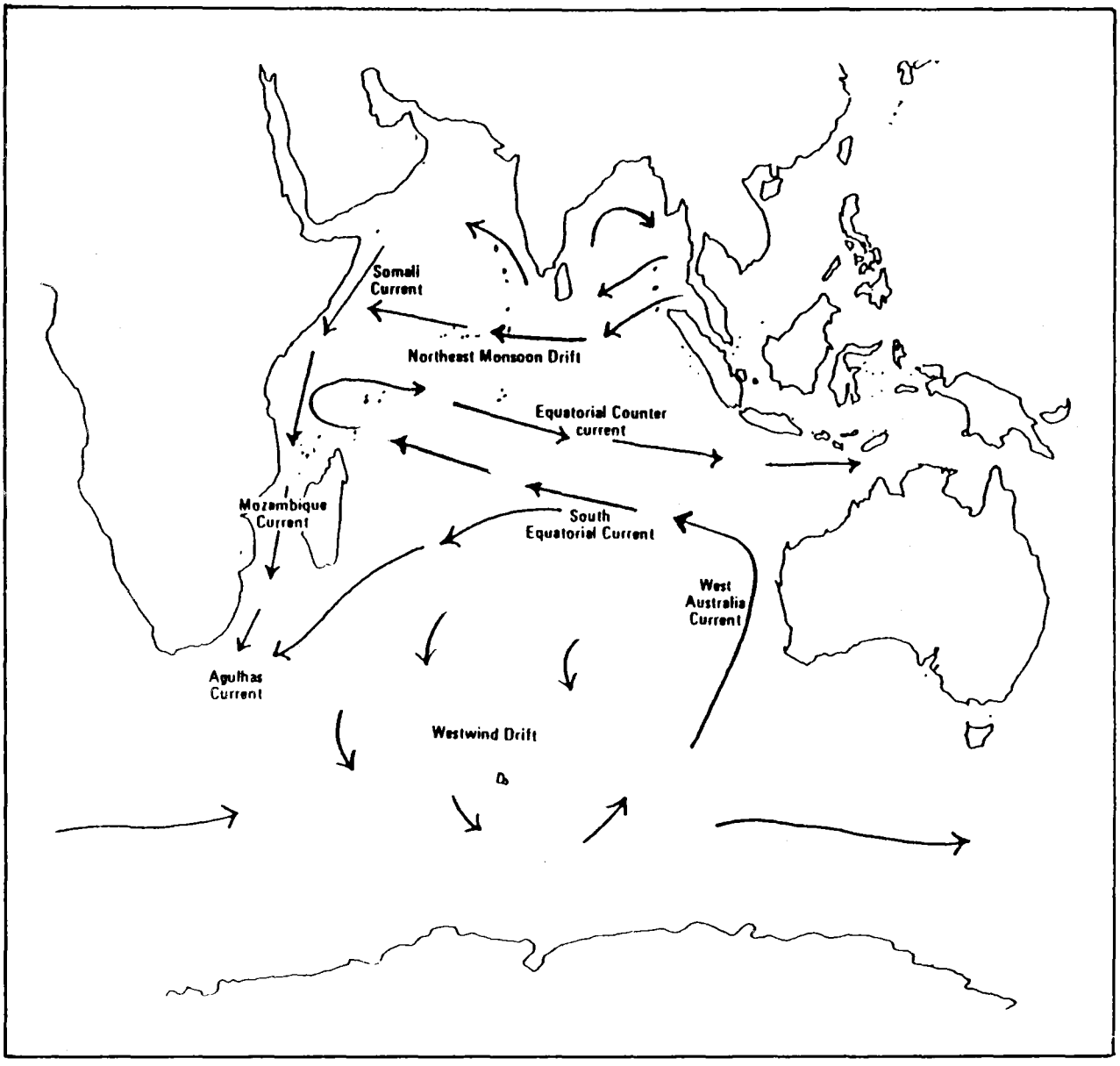


Figure 2. January current pattern

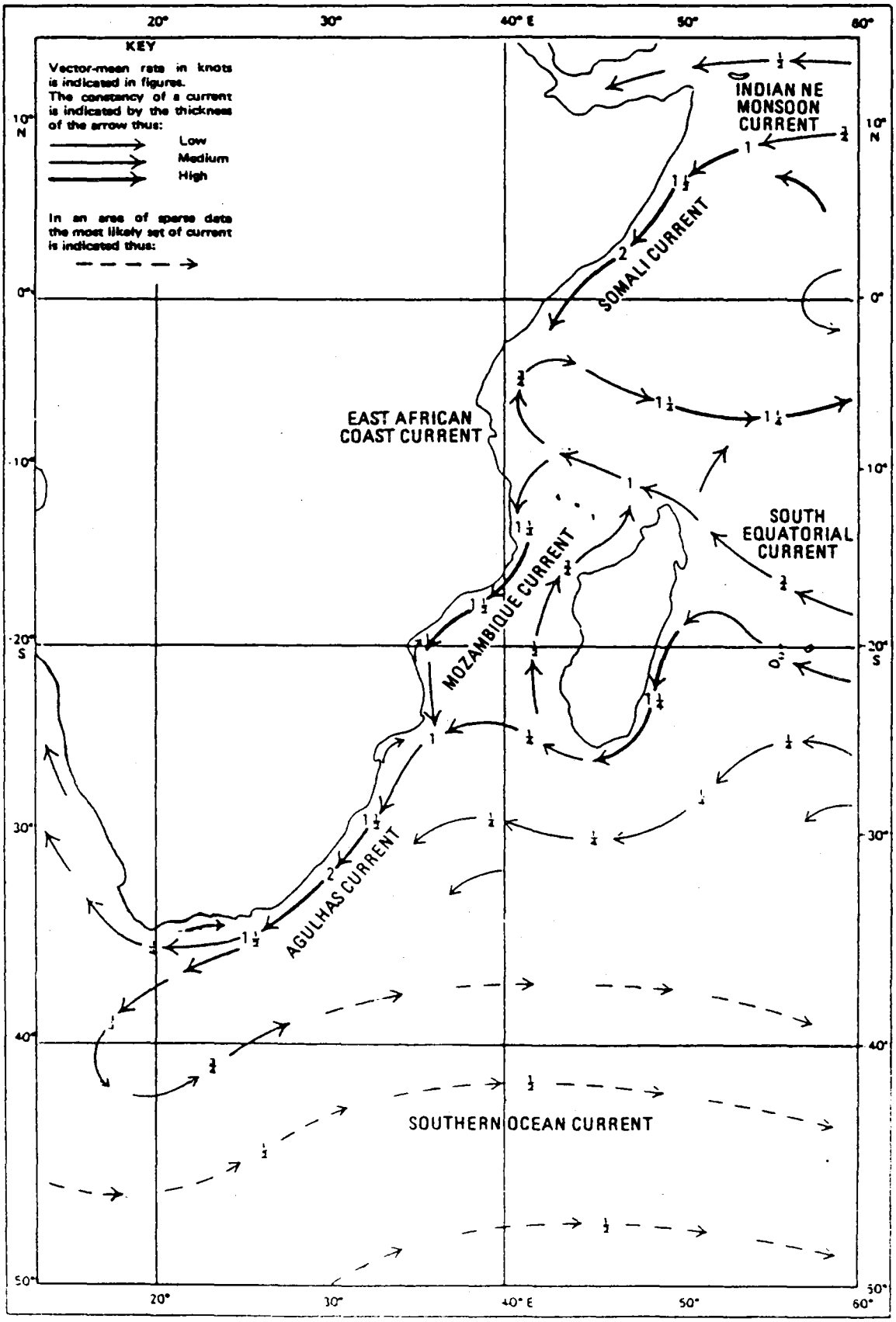


Figure 3. Vector-mean currents for January

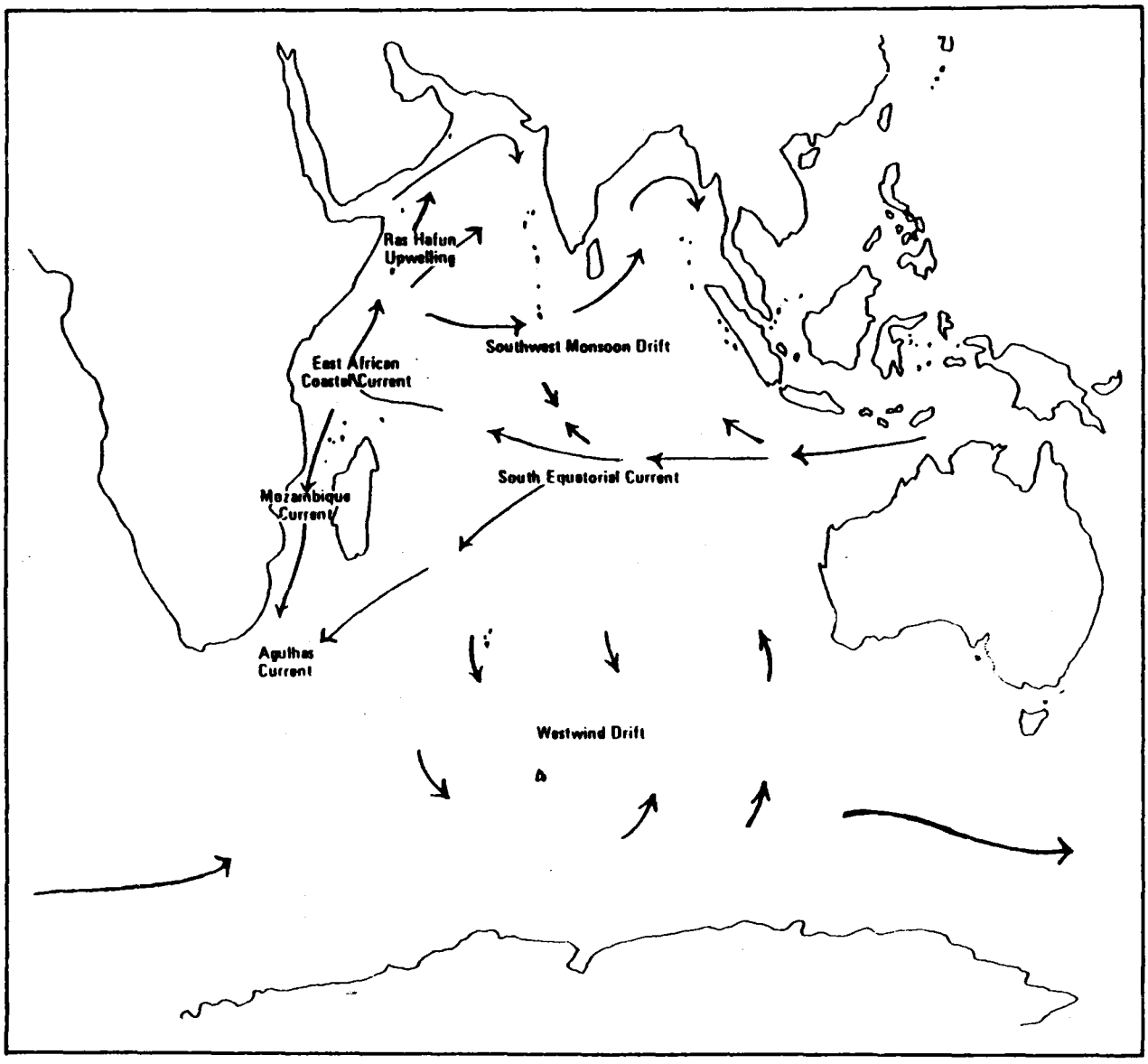
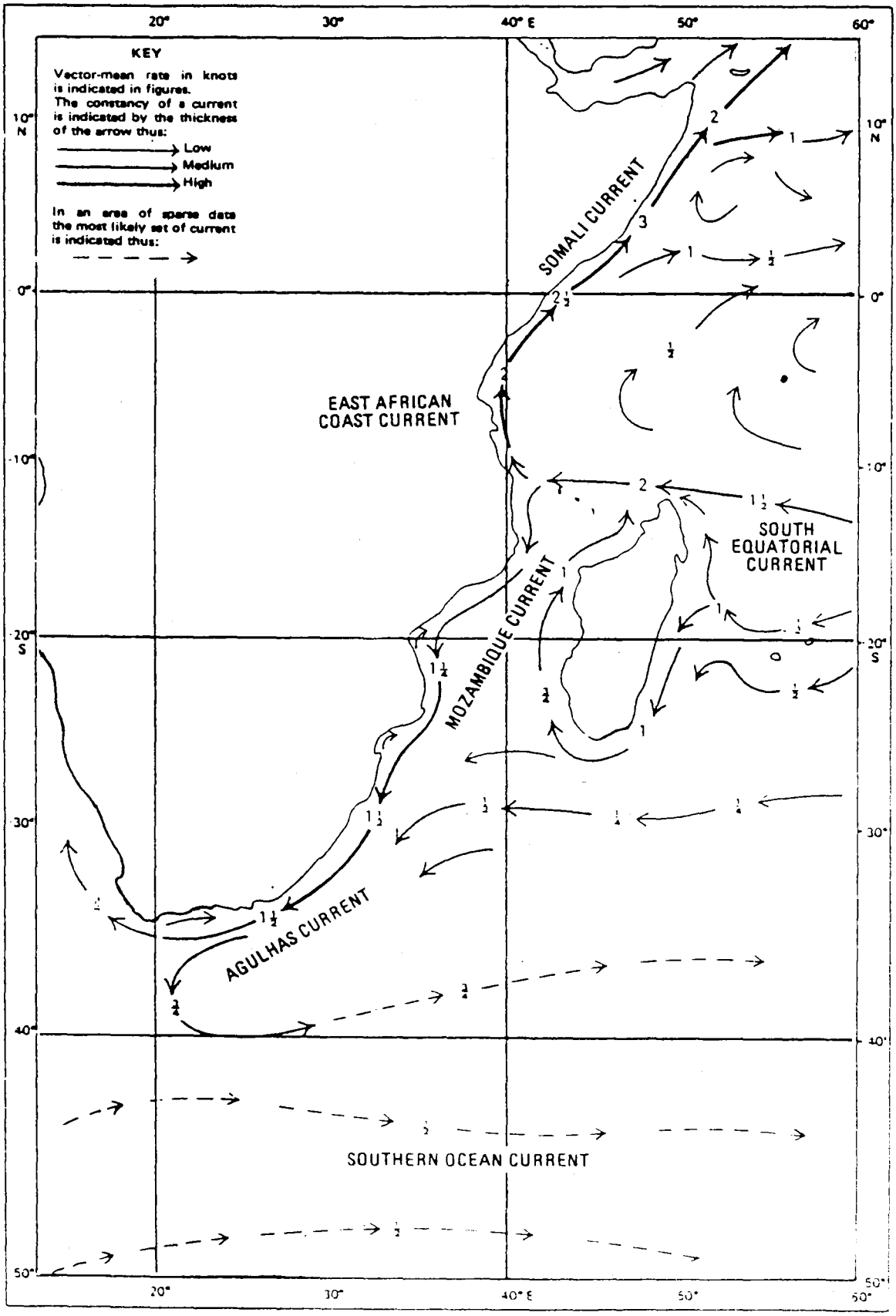


Figure 4. July current pattern


KEY
Vector-mean rate in knots is indicated in figures.
The constancy of a current is indicated by the thickness of the arrow thus:
Low
Medium
High
In an area of sparse data the most likely set of current is indicated thus:
SOMALI CURRENT
EAST AFRICAN COAST CURRENT
SOUTH EQUATORIAL CURRENT
MOZAMBIQUE CURRENT
AGULHAS CURRENT
SOUTHERN OCEAN CURRENT
20°
30°
40° E
50°
60°
10° N
0°
10°
20° S
30°
40°
50°

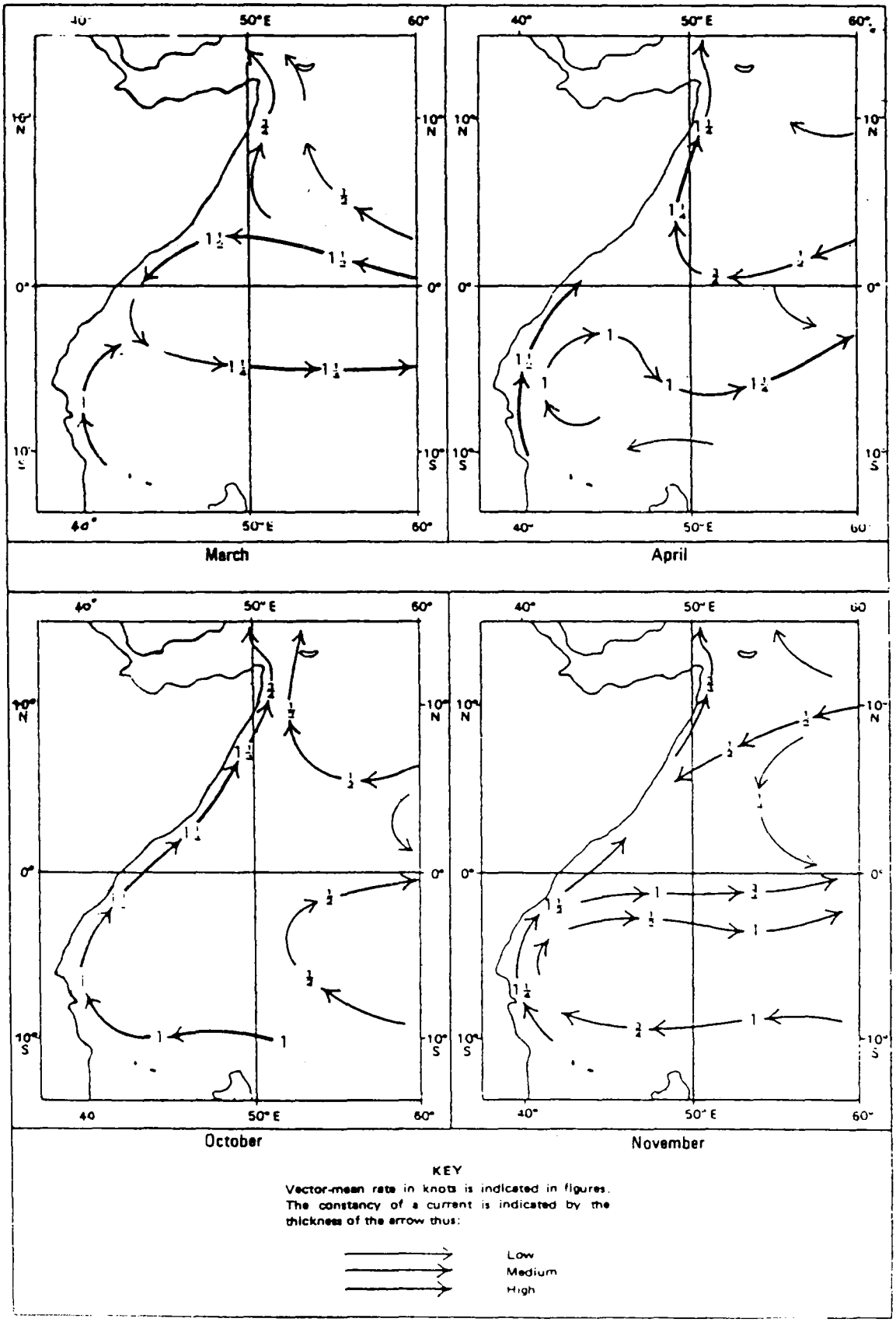


Figure 6. Vector-mean current between Monsoons

The crude oil that is shipped to the country (in 20,000 - 100,000 tankers) comes from various sources, mostly Saudi Arabia, Oman and Dubai, and has a API gravity in the range of 32-36° API and viscosity of 5-6 Cst at 50°C.

Refined products are also shipped to the Port of Mogadishu. In 1984 the statistics were:

Diesel oil	:	27,896 tonnes
Gasoline (Petrol, Benzine)	:	14,988 tonnes
Jet Fuel	:	12,977 tonnes
Total	:	55,861 tonnes

The oil is delivered quarterly (approximately) by tankers in the 10,000 - 15,000 DWT range.

As mentioned above, the crude oil is unloaded alongside the oil berth. The transfer operation is conventional. The oil is pumped through a flexible line connected to a pipeline system located dockside and transferred to the refinery some 14 km south of the city.

The refined products are unloaded at an anchorage outside the harbour; the transfer is made through a floating pipeline system connected to a tank farm adjacent to the port.

The unloading procedure for either operation could not be evaluated firsthand, since no oil shipments took place during the period of 11 June to 25 June 1986.

Berbera

Berbera (pop. 50,000) is the seaport for the North-western part of Somalia, serving particularly the inland capital cities of two regions, i.e. Hargeisa and Burao. The existing quay is some 650 m in length (320 m were constructed by the Soviet Union in 1964 and 330 m were added by the U.S.A. in 1985). There are four deep water berths. Most export of livestock from Somalia is through this port. In terms of refined petroleum products (crude oil is only shipped to the Mogadishu port) the following is the approximate traffic breakdown:

Year	1982	1983	1984	1985
Tonnes	19,440	29,362	37,035	26,100

About three-quarters of the refined products is diesel oil. The product is discharged alongside the oil pier and then pumped to the tankfarm located nearby.

Kismayo

Kismayo (pop. 20,000) in the South is the remaining coastal city having a deep water port. It has four deep-water berths and a total quay length of 620 m. In 1984 11,947 tonnes of diesel oil and 998 tonnes of gasoline were imported through this port. The product is discharged alongside and pumped through a pipeline system to the tankfarm some 1/2 km away. The pipeline is situated right beside the main road which closely follows the contours of the city harbour.

2.1.2 Risks

All three ports are clean and free of any sign of oil pollution. According to the port managers and harbourmasters, no significant oil spill has ever occurred in a Somali port. Small spills have occurred during unloading operations but no visible sign of their effects was evident during the mission's visit. It is acknowledged by the port authorities, however, that small discharges occur regularly enough to justify cleanup equipment and measures being in place to deal with them.

One is somewhat concerned about the exposed pipeline at Kismayo mentioned above, since the pipeline is extremely vulnerable to damage from collisions by motor vehicles on the heavily used road. A spill from the pipeline would immediately flow into the harbour. On the other hand, the pipeline is only filled with petroleum product when an oil discharge takes place, perhaps five or six times a year.

In summary, small operational discharges at Somali ports can occur as regularly as they do at other ports around the world. Although the risks are high, the damage potential is low. Nevertheless, in the interest of port cleanliness and the avoidance of fire hazards, it is agreed that measures should be taken to clean up these spills as soon as they occur.

2.2 Marine Spills from Land-Based Sources

As mentioned, Somalia has very few industries and most that exist (such as tanneries) are not heavy users of petroleum products and hence are not potential sources of marine oil pollution. The three industries that either produce or utilize relatively large quantities of petroleum products are the refinery, the thermal power plant and the Urea plant all clustered together near the coast some 14 km North of Mogadishu. The latter two facilities, which utilize most of the 80,000 - 100,000 tonnes of heavy fuel oil produced by the refinery, are not located and operated such that they can be a source of marine oil pollution even if an accident or plant upset were to occur.

The refinery, however, is a potential source of pollution, although the risks of major discharges into the sea are very low. The refinery is simple (vacuum distillation only) and is often not operating due to a lack of feedstock, as was the case during the mission's visit. Although the rated capacity is 1,360 tonnes a day (8,500 barrels a day) its throughput in 1985 was only 162,000 tonnes. That is, the refinery was run at only 32 percent of its capacity. Somalia obviously has a serious fuel problem and this is simply due to lack of funds to purchase sufficient petroleum commodities to adequately supply the few industries that do rely on such fuels. In any case, the refinery, when operating, does utilize conventional techniques (API gravity separators) to deal with oil-and-water mixtures during the refinery process prior to discharging treated water directly to the sea. Upsets in the plant and in the treatment facility could lead to small, visible discharges of oil into the sea but large, significant spills are not likely.

In summary, there are no significant sources and hence risks of marine oil pollution from land-based industrial sources in Somalia.

2.3 Offshore Blowouts

2.3.1 Sources

Although some exploration drilling has taken place in the offshore waters of Somalia (Singh 1984) no drilling is currently taking place. As in the rest of the world, offshore oil exploration has virtually stopped since the price of crude oil fell drastically in late 1985. There are concession agreements that currently exist in Somalia with respect to offshore drilling, but it is difficult to say if the involved companies (Shell, Elf Aquitaine, Chevron, Occidental) intend to take advantage of these. There is some possibility that Occidental, which has acreage about 40 km off the northern coast, will be drilling in the near future, but this is uncertain.

2.3.2 Risks

If drilling does not proceed, then obviously there is no associated risk of marine pollution. If exploration drilling does begin again then there is some risk of an oil well blowout but this is extremely remote. However, the environmental consequences could be severe. At this time we will assume that no drilling will occur in the near future; if some exploration activity does occur, the probability of it causing a significant oil spill is very low. If contingency plans and a state of preparedness are developed in Somalia for dealing with the more probable occurrence of a major tanker spill in Somalia waters (as will soon be recommended), then these measures will suffice for a spill from an offshore oil well blowout, should one occur. It should perhaps be stated that the behaviour of oil spills from offshore oilwell blowouts is dramatically different from tanker spills, as could be the recommended counter-measures, and if significant offshore drilling does indeed take place in the future, then these differences should be understood. For the time being, however, this is not a major issue or concern.

2.4 Oily Ballast Discharges at Sea

2.4.1 Sources

The seas off Somalia lie within or adjacent to the world's major maritime transportation corridor for crude oil — the route for very large tankers from the Middle East to Europe, the Americas, and East and West Africa. There are two principal crude oil transport patterns in the region, as shown in Figure 7. The first supplies the five refineries in Somalia, Kenya, Tanzania, Mozambique and Madagascar with a total of 6,550,000 tonnes of crude oil annually (UNEP 1982). This route is served by tankers of 20,000 DWT to 100,000 DWT. After discharge at the East African refineries the vessel normally returns to a Middle East port in ballast for the next cargo.

The second pattern involves the supply of crude oil to the European and North and South American markets by very large crude carriers (VLCCs), and to other markets in Africa, Europe and America by medium-size tankers.

Approximately 550-585 million tonnes of oil per year are being transported from the Middle East ports to non-African destinations (UNEP 1982 b, UNEP 1982 c). Taking into consideration approximately 22 million tonnes imported by East and South Africa, the total moving from the Middle East can be estimated at about 590 million tonnes. If it is assumed that about 100 million tonnes move via the Suez Canal (UNEP 1982 b) then Somalia is threatened annually by traffic totalling approximately 490 million tonnes travelling along its East coast and 100 million tonnes along its north coast. Considering first only the East coast traffic, it is estimated that half of the oil is transported in VLCCs averaging 200,000 tonnes and the other half on medium-sized vessels of average 60,000 tonnes. It can be estimated, therefore, that there are approximately 1,200 VLCC voyages a year and 4,000 medium-sized voyages a year along the coast. This would mean an average of 3 VLCCs and 11 medium-sized tankers entering and leaving waters off the Somali east coast in either direction each day. By assuming that the average length of the voyage off Somalia is 2,000 km and the distance covered per day 570 km, we arrive at each vessel staying in the region for 3 1/2 days on each voyage. It can be said, therefore, that there could be 10 VLCCs loaded and 10 VLCCs in ballast, and 40 medium-sized tankers loaded and 40 in ballast off the east coast of Somalia at any one time.

A similar analysis can be done for the Suez traffic along Somalia's north coast in the Gulf of Aden. This would show that there could be 8 medium-sized loaded tankers off the north coast at any one time.

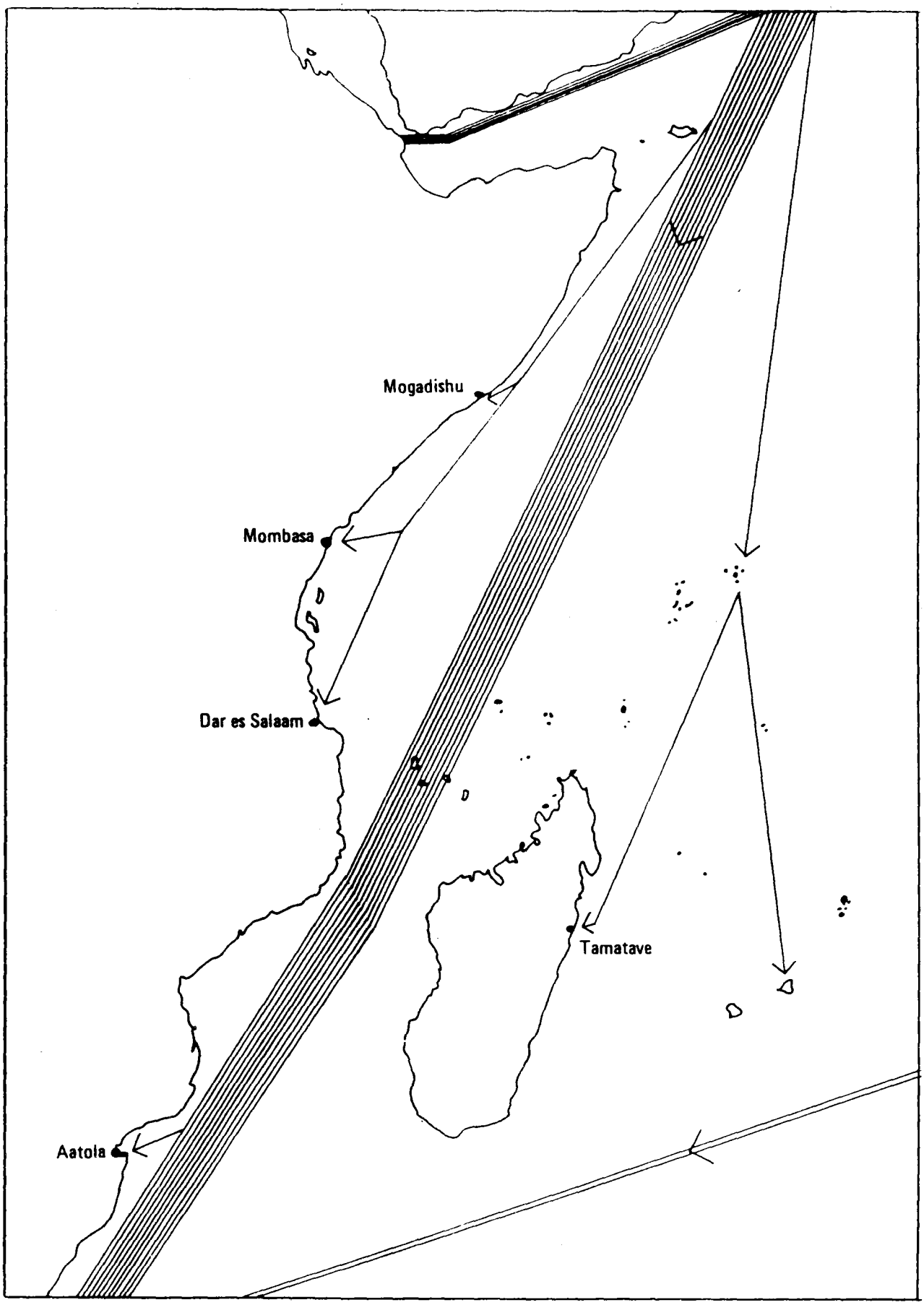


Figure 7. Tanker routes of the region

2.4.2 Risks

Because of the relative calm of both these passages, the absence of a surveillance capability in the area, and the proximity to their loading ports, tankers returning by these routes to the Middle East routinely discharge oily ballast and clean their tanks in the region (UNEP 1982 d). Non-use of the load on top (LOT) technique of separating oily ballast; improper utilization as well as intrinsic limitations of LOT, and failure of some vessels to practise technically innovative means of reducing oil discharges such as segregated ballast tanks (SBT) and crude oil washing (COW) that have been adopted in MARPOL 73/78 may continue to give rise to discharges of oil contaminated ballast and oily waste in contravention to international agreed standards.

It has been estimated that the total annual discharge of crude oil into the sea resulting from normal operations of crude oil tankers on these routes is about 33,000 tonnes (UNEP 1982 b). Circumstantial evidence is clear that routine discharges of oil ballast do indeed occur. Along the coast of Somalia, tarballs are found deposited in significant concentrations (up to about 100 gm/m) on the sandy beaches.

These oil particles are very weathered and non-sticky, and it is clear that their source cannot be close to the coast but rather must be some distance offshore (i.e., the main crude oil shipping corridors) because of their weathered state. (See the mission's Sectoral Report on Marine Pollution for a more detailed treatment of this problem.)

This unfortunate pollution problem for Somalia and the rest of the eastern African region is beyond the practical control of each affected country. A collective, regional capability for oil spill surveillance, detection and identification, followed by legal prosecution, would be an extremely difficult and expensive proposition. It is clearly a problem that can only be solved at the international maritime administrative level. The development of adequate port reception facilities for oily ballast in the Middle East region - provided they are used regularly by ships' masters - will undoubtedly alleviate the situation. The proposal by Democratic Yemen to the 23th Session of IMO's Marine Environment Protection Committee (MEPC) in July 1986 that regulation 10 of Annex I of MARPOL 73/78 be amended to include the Gulf of Aden as a special area under the regulation would effectively prohibit discharges of oil from shipping. The matter will be considered again by the 24th Session of MEPC in February 1987. Acceptance of the amendment is expected to be subject to satisfaction by MEPC that oil wastes reception facilities in the coastal states of Djibouti, Somalia and Democratic Yemen are adequate.

2.5 Major Oil Spills from Tankers

2.5.1 Sources

Very large oil spills from tanker accidents at sea present the greatest oil pollution threat for Somalia and the rest of the East African region and demand the most urgent action for contingency planning at both the national and regional levels. The source of such catastrophic events is laid out in the previous section: (1) the transit of crude oil tankers off both the north and east coasts of Somalia (approximately 10 VLCCs and 50 medium-sized tankers offshore at any given time); and (2) the tankers carrying crude oil and refined products to Somali ports on a periodic basis.

2.5.2 Risks

It is difficult to estimate the probability or risks associated with these tankers having a serious accident. The factors involved include: traffic density, crossing traffic, width of navigable area, visibility and weather, navigational constraints (i.e., shoals, rocks, islands) routing systems and traffic advisory systems, rounding of headlands, navigational aids,

navigational data, hydrographic data, and the nature of the bottom terrain (UNEP 1982 c). The vast majority of historical tanker accidents leading to oil spills have occurred as a result of collisions and groundings (about 75 percent); thus the risk of the transit tankers off Somalia's coast having an oil spill are perhaps lower than in other areas of the world where these same tankers concentrate close to land and to each other as they approach their destinations. In contrast, the individual tankers that deliver crude oil and refined products to Somali ports have a relatively greater risk of having an accident due to grounding or collision, but the traffic frequency is very low relative to other areas.

In summary, despite the high traffic of oil tankers off the Somali coastline, one cannot easily predict that large spills are likely. It is easier to predict that if a large spill does occur and is swept into Somali waters and into nearshore areas and onto shorelines, the effects will be severe not only environmentally but also politically and socio-economically. In other words, although the risk of a major offshore tanker spill might be very low, its consequences and impact will be very high. It is for this reason that a national state of preparedness to deal with such events is called for.

3. EXISTING OIL SPILL CONTROL SYSTEMS IN SOMALIA

The major concern is a large marine oil spill impacting the marine environment and coastal regions of Somalia, and this is the main focus of attention here. The question is: what existing systems are in place in Somalia to prevent oil spills from occurring and to deal with them should they occur? The key organization in the government having the responsibility for developing these systems is the Ministry of Marine Transport and Ports. Before discussing the specific oil spill control activities of this ministry, it will be helpful to briefly describe its organizational history and structure.

3.1 Organization of the Ministry of Marine Transport and Ports

The Somali Democratic Republic became independent on July 1, 1960. From 1960 to 1969 there was no notable development towards a maritime administration (Munye 1985); maritime matters were handled by the Ministry of Transportation and Communications which had both land and marine responsibilities. In the interest of establishing a viable Merchant Marine, the National Shipping Agency was established in 1975, and in 1976 the Ministry of Marine Transport and Ports was established. The current organizational chart for the Ministry is shown in Figure 8 (this is based on three recent publications (IMO 1985, Munye 1985, USAID 1984) which provide somewhat different structures; these are consolidated here).

The business of oil spill control and prevention rests with the Marine Department. Other related responsibilities of the department include search and rescue, dangerous goods management, investigation into marine casualties and representation at IMO meetings. The Director of the Marine Department (currently Dr. Ali H.M. Munye) is essentially the National Harbourmaster for the country. Coastal and marine responsibilities for the Department are handled regionally by five regional harbourmasters located in Berbera, Bosaso, Mogadishu, Merca and Kismayo.

3.2 National and International Laws and Regulations

The existing Somali regulations relating to pollution by ships are very limited and concern only pollution in ports; these regulations are contained in the existing maritime code and in the port regulations (Presidential decree No. 67 of 15 April 1978). In addition, the Somali government is not a party to any international conventions relating to marine pollution for which IMO is depository.

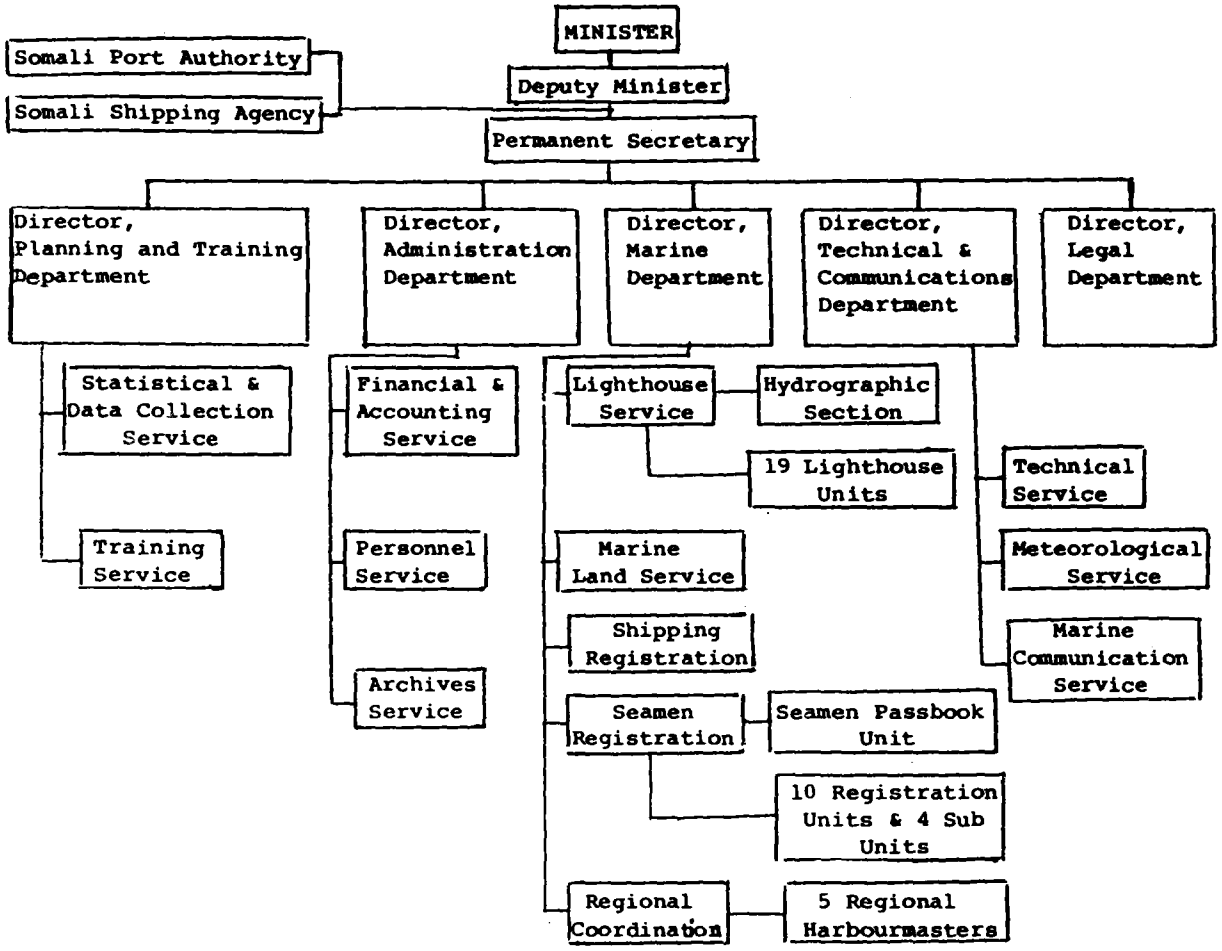


Figure 8. Ministry of Marine Transport and Ports

3.2.1 Operational Discharges by Ships

Ships in ports or at anchorage or within the vicinity of the ports are not under any circumstances allowed to discharge oil and other substances causing pollution or waste into the sea. A fine of shs. So. 200 to shs. So. 5,000 (US$2-US$60) for any violation of the provisions of the regulations is imposed by the port manager. Somalia has no specific regulations which apply outside the vicinity of ports.

The OILPOL 1954 convention was the first international instrument relating to operational discharges by ships. The matter is now dealt with by the convention MARPOL 1973/1978. The purpose of this convention is to control operational spills of oil, noxious substances, sewage water or garbage. The convention applies to all ships flying the flag of a party to the convention, and to all substances considered as harmful. One of the effects of these general provisions is to reinforce the rights and the possibilities of effective surveillance by the coastal state and port state which are parties to the convention. The Somali government should give consideration to accession to this convention.

3.2.2 Accidental Discharges by Ships

(a) The prevention of maritime accidents

The main legal instrument for the prevention of accidents and by way to prevent discharge into the sea of oil or other harzardous substance are the IMO conventions on maritime safety:

- the International Convention for the Safety of Life at Sea SOLAS 1974 amended in 1978, 1981 and 1983;
- the International Convention on Load Lines (LL 1966);
- the International Regulations for Preventing Collisions at Sea (COLREG 1972)

Somalia should ratify COLREG 1972 and SOLAS 1974 with its 1978 Protocol as amended. COLREG 1972 is a code of good conduct at sea which could be ratified without problems and should be introduced into the national legislation. The main objective of SOLAS 1974 is to specify minimum standards for the construction, equipment and operations of ships, compatible with their safety; this also should present no problem for Somalia and should be ratified.

In addition to the above, in the interests of the safe handling of dangerous goods, the Somali harbour regulations should take full account of the provisions of General Assembly Resolution A 435 (XI) on the safe transport, handling and storage of dangerous goods in port areas, which incorporates key provisions of the International Maritime Dangerous Good Code (IMDG Code).

(b) Prevention and control of pollution following maritime accidents

In a view to prevent and control pollution after an accident, the Somali legislation is limited. Port regulations simply state that (1) In the event of a vessel being grounded or stranded the master or the person in charge shall take immediate steps and reasonable precautions to prevent pollution; and (2) In case of submersion of goods or other materials in ports, the persons concerned must provide for their immediate removal. Should they fail to fulfil this obligation, causing danger or hindrance to navigation, the authority will order that removal to be carried out.

If Somalia adopts a new law concerning the territorial sea with a limit of 12 nautical miles, it would be in her interest to ratify the International Convention Relating to Intervention On The High Seas in Cases of Oil Pollution Casualties (Brussels, 1969) and its 1973 protocol relating to intervention on the high seas in cases of pollution by substances other than oil. In addition, Somalia should prepare regulations for intervention in a case of emergency in the territorial sea and maritime demesne.

(c) Liability and compensation for pollution damage

Except for a few provisions in the Maritime Code mainly concerning the liability of the master of a ship, Somalia has no specific law in this matter.

Somalia should ratify the relevant conventions and adopt an appropriate National law in this area. The conventions are:

- International Convention on Civil Liability for Oil Pollution Damage, 1969 - (in force 19 June 1975),

- Protocol of 1984 to amend the International Convention on Civil Liability for Oil Pollution Damage, 1969 - (not yet in force),

- International Convention on the Establishment of the International Fund for Compensation for Oil Pollution Damage 1971 (in force 16 October 1978),

- Protocol of 1984 to amend the International Convention for the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971 (not yet in force),

In summary, the existing Somali legislation relating to pollution by ships is out of date, incomplete and inadequate. (For further details see the Sectoral Report on Marine Environmental Legislation).

3.3 Activities related to Spill Prevention

The most sensible approach for dealing with marine pollution accidents is to prevent them from occurring in the first place. The legislative approach is one necessary step in this regard. The other is to ensure that ship management and technical operations at the ports are satisfactory. In 1983 an IMO Mission to Somalia by Captain A. Erzan-Essien, in his capacity as Inter-Regional Adviser in Technical Ports Operations, evaluated the operations at the port of Mogadishu and made several recommendations to improve operations and safety. Below is a list of the safety-related recommendations; each is followed by a statement regarding whether the recommendation has been implemented, partially or wholly, as of June 1986.

(a) It was recommended that the Somali Port Authority (SPA) establish a Port Marine Operations Division or Port Harbourmaster's Office headed by an experienced Marine Officer with the responsibility for Marine Operations and for assuring that the Port of Mogadishu meets high standards, and that the Harbourmaster should be given some training.

Situation in June 1985

The Harbourmaster's office has been established. The harbourmaster for the port is the Director of the Marine Department, Ministry of Marine Transport and Ports (MMTP). He is an experienced marine officer, but himself agrees that he would benefit from training in several areas in his sphere of responsibility including spill management.

(b) It was recommended that a radio communications system in the Port of Mogadishu (which was then installed in the Pilot's Office) be improved and relocated in a more suitable position, preferably at a permanent location with a good view over the harbour area and the surrounding waters, and that a signal tower and traffic control or communication centre be installed.

Situation in June 1985

These actions have been taken.

(c) It was recommended that the IMO Standard Marine Navigational Vocabulary should be used in all marine communication procedures in the port, and that VHF and R/T radio messages be recorded in a suitable fashion where possible.

Situation in June 1985

These actions have been taken.

(d) It was recommended that the Somali Port Authority set up a special safety unit within the port with respect to the development, control and supervision of the operation of a special dangerous cargo storage area, the handling and movement of dangerous cargo in the port area, and the enforcement of safety rules and regulations; and that such a unit could also be given the responsibility for safety and pollution prevention at the oil berth and the port generally.

Situation in June 1986

No such unit has been established. As indicated above, the Harbourmaster's Office has been established and has the responsibility for many of the above items but, as yet, no plans have been established to implement them, despite the ARIADNE incident.

(e) It was recommended that personnel of the above-noted special safety unit be adequately trained with respect to dangerous cargo.

Situation in June 1986

No action has been taken except for on-the-job training during the ARIADNE incident.

(f) It was recommended that a request be made to IMO for the Inter-Regional Consultant in Dangerous Goods to render assistance in the form of advice and training.

Situation in June 1986

Such a request was made during and after, but not before the ARIADNE incident.

(g) It was recommended that the oil tanker berth be fenced off and separated from the general cargo berths and other cargo handling areas and provided with fire fighting and fire prevention and spillage cleanup facilities, and that optimum use of local resources be considered.

Situation in June 1986

The oil berth is not fenced off but a fire fighting unit and facility have been established. No spill cleanup capability exists.

(h) It was recommended that the existing Port Security Committee of the Port be expanded to include port safety and that a port emergency plan be established with respect to various kinds of emergencies.

Situation in June 1986

An emergency plan was developed during the ARIADNE accident and this would likely be re-activated if a similar emergency were to happen tomorrow.

(i) It was recommended that the most satisfactory system of communications that would meet all requirements of the above-noted emergency plan should be the UHF/VHF telephone system.

Situation in June 1986

It is believed that the UHF/VHF telephone system has been adopted (but only in the ports of Mogadishu and Kismayo).

(j) It was recommended that (1) a proper maintenance system and facilities for all aids to navigation in Somalia be established; (2) Somalia undertake an aids-to-navigation modernization programme; and (3) all necessary associated radio communications facilities needed for operations support, emergency and navigational warning purposes be provided.

Situation in June 1986

Only the last item on radio communications has been acted on.

(k) It was recommended that (1) the International Association of Lighthouse Activities (IALA) Buoyage System be implemented; (2) IALA be approached for assistance; and (3) an aids-to-navigation expert should be sought.

Situation in June 1986

No action.

(l) It was recommended that for safety reasons (to avoid groundings): (1) a study should be done with respect to the hydrographic needs of Somalia followed by hydrographic surveys of the major ports and their surrounding waters; (2) Somalia should request assistance from the International Hydrographic Organization; and (3) that the services of an expert in hydrographic surveying be sought.

Situation in June 1986

No action.

It is clear that operations at the Port of Mogadishu to prevent ship accidents and pollution emergencies are still in need of improvement. It is important that all of the above recommendations should be implemented; this could be accomplished at reasonable cost, except perhaps the recommendations regarding the modernization of Somalia's aids-to-navigation programme.

3.4 Existing Spill Contingency Plans and Capabilities

Before the ARIADNE accident in August 1985, Somalia had virtually no local or national contingency plan to deal with marine pollution emergencies and no technological capability for cleaning up spills. At the present time there is no equipment or material whatsoever for even cleaning up minor oil spills at ports.

When the ARIADNE accident occurred, the Somali government established a response organization (using IMO guidelines for such) and it was operational for several months, and worked well, according to Somali officials.

An outline of the response organization is shown in Figure 9. On the basis of discussions with Somali officials who were responsible for developing the organization shown in the figure it has been agreed for a number of reasons that certain changes are necessary in the plan to deal with future emergencies; these are discussed in the next two sections. Suffice it to say here that the ARIADNE incident was a truly unfortunate event for Somalia, but it served to dramatically educate the government as to the vital importance of national planning for marine environmental emergencies. It also provided the Government of Somalia with a tangible insight into the practical problems of contingency planning and with invaluable experience in pollution response. This hard-earned knowledge and experience make the job of developing future, more comprehensive, contingency plans much easier.

4. APPROACHES TO CONTINGENCY PLANNING AND TRAINING FOR MAJOR SPILLS

4.1 Importance of Planning and Training

The effective response to an offshore oil spill involves three major components. First, a plan of attack must be available which outlines the responsibilities of the response team and its members, communication networks, and lists and locations of useful countermeasures systems available nationally, regionally and perhaps internationally. This so-called contingency plan must be ready in advance to ensure that response is rapid and that actions are performed in a co-ordinated, orderly fashion. The second requirement is that all members of the response team, from the highest management positions to the workers operating the cleanup systems, are properly trained.

This means that the contingency plan is tested in regular training exercises at the management levels and that workers in the field are trained to operate equipment that will be made available during the spill. The third requirement is that the proper quality and quantity of oil spill countermeasures systems (equipment, materials, vessels, etc.) are readily available to deal with the spill.

The emphasis of this study is on national contingency planning and training, and not on the technological aspects of spill countermeasures. It is true that a handful of nations in the world have massive quantities of high-capacity spill cleanup equipment to deal with large marine spills, but most nations, like Somalia, simply cannot afford this. Fortunately, for large oil spills at sea, the lack of sophisticated equipment is not a major handicap, since such spills, in any case, are almost impossible to deal with at source. Rather, experience has shown time and again that the most important element in dealing with these large spills is "Organization". If a country has no oil spill contingency plan or expertise, then chaos is inevitable. If, on the other hand, there is a working contingency plan and if there exists a cadre of trained personnel in the country who understand spills and know how to deal with them, then cleanup can proceed in an efficient manner at great savings of time and money and with minimum environmental damage. Cleanup machines and materials are certainly useful and often necessary in dealing with large spills, but if a government is properly organized beforehand, these equipment and their operators can be quickly accessed from locations outside the affected country on a regional or even world-wide basis.

It is surely with the above thinking in mind that the responsible United Nations organizations (i.e UNEP and IMO) have emphasized the need for countries to develop meaningful contingency plans, training programmes and regional co-operation agreements in advance of purchasing expensive equipment. This is the first priority for coastal countries like Somalia, and it is the basis for emphasizing planning and training in this study.

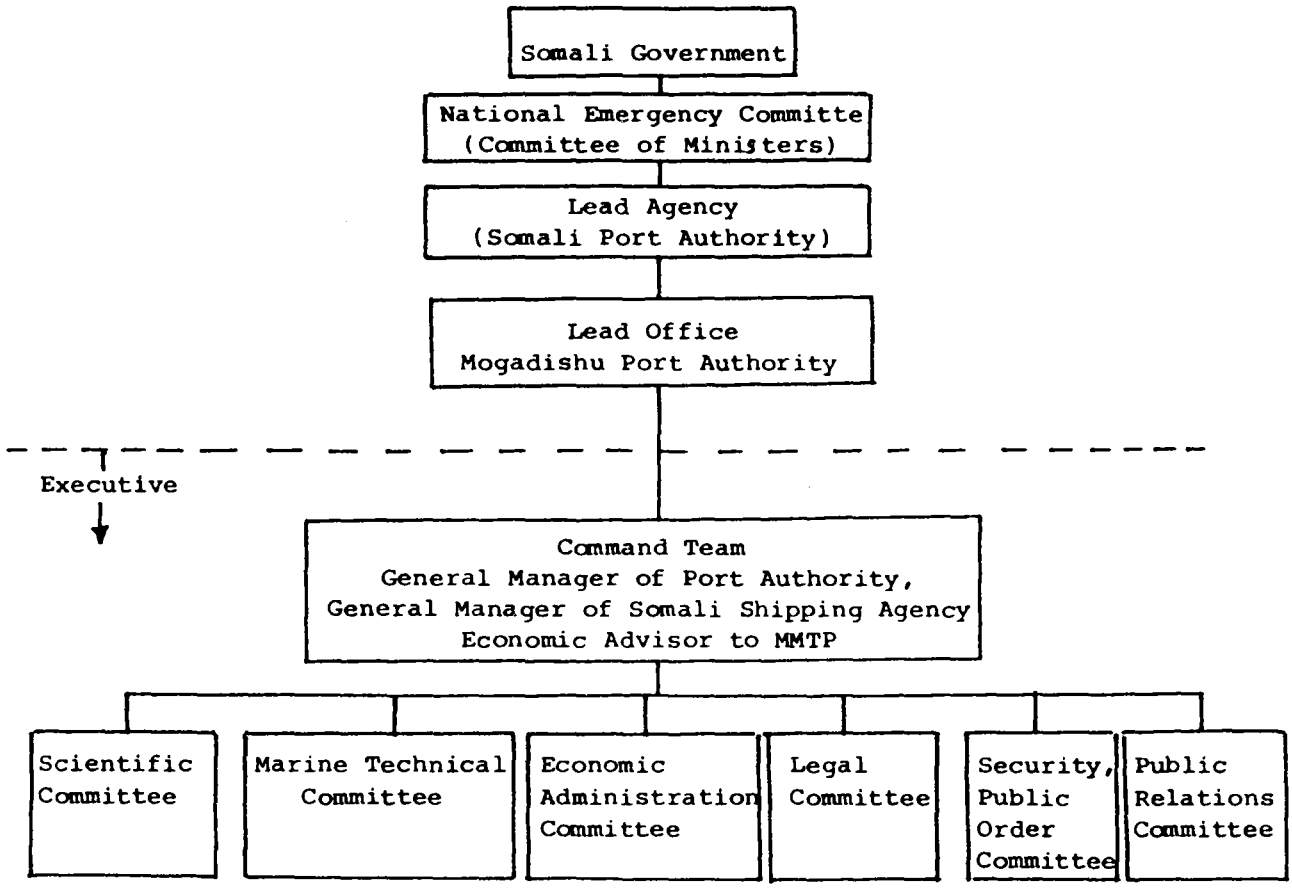


Figure 9. Response organization for Ariadne accident

4.2 Major Oil Spill Scenario

Before discussing the organizational components of a National Oil Spill Contingency Plan for Somalia, it might be useful to paint a picture, in very rough terms, of how a large marine oil spill off Somalia might behave, what its impacts might be, what countermeasures might be adopted to deal with the spill, and how the international community might react to the event. Developing such oil spill scenarios are generally helpful in identifying priorities in the contingency planning process.

We will assume that a fully loaded VLCC in transit from the Middle East or a medium-sized tanker delivering crude oil to Mogadishu has an accident 75 kilometres off the Somali coast during the north-east Monsoon period. A spill of 50,000 tonnes of relatively light crude oil results and after several hours the Somali government is informed of the spill. Soon after the accident the spill spreads rapidly so that after only a few hours it covers several square kilometres of water surface. While spreading and sweeping towards the Somali coastline the oil undergoes a number of "weathering" processes including evaporation which tends to make the oil increasingly viscous. At the early stages of the spill a significant proportion of the oil is naturally dispersed into the water by the rough sea conditions but this dispersion process is quickly attenuated as the oil rapidly forms into a water-in-oil emulsion ("chocolate mousse"), a common phenomenon with tanker spills. This emulsion, like tar balls, is extremely viscous; this means that the surface oil will likely survive to pollute Somali waters and shorelines. The Somali National Oil Spill Contingency Plan and the Gulf of Aden and East African plans are immediately activated once the seriousness of the spill is determined. Because several hours have elapsed since the instantaneous spill occurred, it is recognized that the spill is already large in area and high in viscosity. These factors rule out attempts at using heavy-duty containment and recovery devices at sea or aerial-applied chemical dispersants, both available, but only after 24 hours or more, from sources outside the country.

The first priority for the response team then becomes to determine the extent and location of the spill and to estimate probable points of contamination along the Somali coastline. Military aircraft are tasked with finding and tracking the offshore spill; using the collected information, the response team sets about identifying likely areas for contact and determining protection priorities. Several days of preparing for the onslaught are available since the oil is advancing toward the coast at a rate of only 20 km a day. Initial indications are that the oil will be washed ashore on the north and north-eastern part of the country. This would be fortunate since the coastline there is relatively insensitive environmentally, being comprised of poorly utilized sand beaches which are easily cleanable, and rocky outcrops which are known to exhibit self-cleaning characteristics when polluted by oil.

Unfortunately, it is later determined that the more environmentally sensitive southern portion of the country will be the target of most of the advancing oil. The situation could not be worse since it is known that the coral reefs along this stretch of coastline and the mangroves South of Kismayo will be seriously damaged by the oil. Oil begins to come ashore in places. Highly sensitive areas, identified in advance in the National Contingency Plan, are protected as much as possible by the use of nearshore spill containment booms flown to the area.

According to procedures laid out in the Contingency Plan, an urgent request for assistance is made to international organizations. Experts arrive from IMO, UNEP, the International Tanker Owners Pollution Federation, and from neighbouring countries according to regional agreements. In addition, the government of Somalia enters into discussion with several western countries which offer equipment and expertise to deal with the emergency. At the same time, the government is bombarded by a large contingent of oil spill equipment: manufacturers, consultants, international media representatives, and self-serving salesmen of all sorts who offer instant solutions or demand immediate information. The government is keenly aware that this is an event of international interest.

Once the most appropriate equipment and expertise are selected with the help of advisors, the tasks of cleaning the tens of kilometres of shorelines that are oiled and of disposing of the collected, oily materials, begin. This is done mostly by hand although earthmoving equipment is utilized as much as possible along stretches of sandy coastline. At the peak of the cleanup operation thousands of soldiers and ordinary citizens are involved. The total process takes several months and costs many millions of dollars.

Despite the high cost, post-accident analysis indicates that tremendous savings of time and funds were made because the response effort was co-ordinated and efficient. Needless equipment and unnecessary countermeasures were not utilized; very sensitive coastal locations were protected; the coastline was cleaned adequately and efficiently according to accepted practices, and the best international advice was utilized at all times.

4.3 Guidelines for the Development of a Somali National Marine Pollution Contingency Plan

The roughly-sketched scenario described above tries to demonstrate that a major oil spill is not only an environmental problem but one that can have serious political and socio-economic implications both at the national and international level. It also tries to show that a contingency plan for such major emergencies, to be effective, must be a co-ordinated effort involving practically all agencies within the government, including: Marine Transport, Defence, Finance, Foreign Affairs, Fisheries, Public Works, Commerce and Industry, Tourism, and of course, the Office of the President (as was the case for the ARIADNE incident). Finally, the scenario demonstrates that an effective contingency plan should be action-oriented to cover such aspects of reporting, alerting, assessment, operations, administration, finances, public relations, security and public order, and arrangements with other contiguous states.

An outline of what specific form a Somali National Oil Spill Contingency Plan should take, based on IMO (1984) and Hayes (1985), is shown in the table below. The items in this table are now discussed in the context of the needs and capabilities of the government of Somalia.

Elements of a Contingency Plan

1. SCOPE OF THE PLAN
2. REPORTING
3. ALERTING
4. ASSESSMENT
5. IMPLEMENTATION
6. SPILL CONTROL AND CLEAN-UP
7. DISPOSAL OF CONTAMINANTS
8. RESTORATION OF SPILL SITE
9. RECORD KEEPING AND PREPARATION OF CLAIMS
10. PUBLIC RELATIONS
11. PLAN REVISION

APPENDICES

1. REPORTING FORMAT
2. ALERTING FORMAT
3. IDENTIFICATION OF SENSITIVE AREAS
4. AVAILABLE RESOURCES
A. TRAINED MANPOWER
B. POLLUTION RESPONSE EQUIPMENT
C. VESSELS
D. AIRCRAFT
E. OTHER

Reporting and Alerting

There is a need to identify an agency in the Somali government which will accept reports of spillages of oil or other hazardous substances (major or minor) and alert the relevant government agencies. The agency which receives such reports should be manned on a continuous basis, have telephone and preferably telex facilities. In Somalia, for oil spills in harbour areas, only the Port of Mogadishu is currently equipped to satisfy the above requirements since the other two ports (at Kismayo and Berbera) do not have a 24-hour communication network. Although small spill reporting in ports can still be handled by port authorities, it is recommended that the job for major spills outside port areas be given to the National Police, which is under the authority of the Ministry of Interior. This agency must be provided with a listing of key personnel in each department with at least one alternate listed; home and business telephone numbers should be provided.

Assessment

The government ministry which is designated as the lead agency should ensure that immediate action is taken to assess the gravity of the situation. This can be done most expeditiously by conducting surveillance of the affected area to determine the nature and extent of the pollution and what countermeasures are required. Depending on the type of incident, the surveillance could consist of aircraft overflights at sea, a check by a patrol vessel or inspection of beaches or coastal zones. Because of the varied nature of the shorelines, it is not always possible to reach some areas by road and again, these should be identified so that the inspection may be carried out as rapidly as possible by either vessel or helicopter.

Implementation and Record Keeping

After the initial assessment, the decision should be made as to the countermeasures which should be taken, whether assistance is required from outside agencies and if there is a need to implement regional or international agreements. Any response operations which require deployment of equipment and/or manpower resources should be documented, and accurate records maintained of financial expenditures for eventual cost recovery.

Spill Control, Cleanup and Disposal

The marine operations of spill control and cleanup should be assigned to an agency with experience in ship and vessel operations. The containment and recovery of oil spills on water is a very difficult task, especially in moderate-to-rough ocean conditions and is best left to skilled mariners who have had oil spill control training. Supervisors for shoreline cleanup and dispersant operations can be found in non-marine-oriented agencies, but these individuals must have management skills and receive training in their area of responsibility.

In the contingency plan all the administrative arrangements for customs and immigration clearance for entry of specialized equipment and technical experts from outside the country should be included. At the national level the procedures and mechanisms for charter of aircraft or vessels, use of equipment and manpower from the various government and commercial agencies, beach cleaning procedures, etc., should also be established. Other matters which should be addressed are identification of disposal sites and methods for disposal of recovered oil and oily debris and, as previously mentioned, the priorities for protection and cleanup of the shoreline.

Question of Lead Agency

On the basis of the above requirements, discussions with Somali officials, and IMO guidelines for developing national contingency plans, a draft National Marine Pollution Contingency Plan has been developed, and is described in appendix 1.

This draft contingency plan is similar to that constructed for the ARIADNE incident, which is not surprising since IMO Guidelines were used at the time of the incident by Somali officials in developing a response to the spill. There is one major change, however, between the ARIADNE plan and the recommended one: In the ARIADNE plan the Somali Port Authority was designated as the Lead Agency; for future pollution emergencies it has been decided that the Marine Department of the Ministry of Marine Transport and Ports will be the lead agency, and will supply the On-Scene Commander (OSC) for the operation. This will be the Director of the Marine Department (the National Harbourmaster) who will be assisted regionally by the Regional Harbourmaster(s) in the affected area(s).

The change has been dictated by the fact that the National Harbourmaster and his regional staff are clearly responsible for pollution prevention, oil spill control and other matters related to marine emergencies, and as such should assume the leading role in fighting major spills in the country.

4.4 Training

The best written contingency plans are of little value unless personnel involved in response are properly trained. The person in greatest need of training is the OSC; in Somalia this will be the Director, Marine Department, Ministry of Marine Transport and Ports, a position currently held by Dr. Ali H. Munye, experienced mariner and a graduate of the World Maritime University in Malmo, Sweden.

Experience has shown that the success or failure of the response operations depends to a large extent on the selection of the OSC and his support team. The OSC is the person in charge of the countermeasures phase of the operation. He must be a decision maker and a communicator, and a good manager of people and time. He must be able to organize people into an effective team - working with whomever is available at the moment.

He must be flexible and prepared to alter the organization as the situation changes or more information becomes available. The extent to which he is able to make the best use of the time available will determine in the end the success of the operation. It has been proven over and over again that the response activities in the first few hours determine the final outcome. The OSC requires direct consultation with senior representatives of the agencies involved in the operation, and because of this should already be in a position of authority in his normal position within the government.

Training of the Director, Marine Department, MMTP should thus be given the highest priority. Once trained and motivated, the Director, Marine Department will be in a good position to oversee the training and education of those in the response organization who are both above and below him. At the very least, one person in the country should understand spills and spill management. Without this, response to a future major spill event will be chaotic and unnecessarily costly.

5. SUB-REGIONAL AND REGIONAL CO-OPERATION IN COMBATING MAJOR POLLUTION INCIDENTS

It is well known that pollution from a major tanker incident or oil-well blow-out may affect the coastlines of several countries, furthermore, the extent of the pollution may be such that no single country has the resources to deal with it. Regional co-operative agreements have been promoted by IMO and UNEP as a means of developing a formal commitment by States to enter into such co-operation. In a number of regions permanent emergency centres have been established to co-ordinate such activities, draw up contingency plans and train on-scene commanders and oil-spill clean-up operatives (e.g. Regional Oil Combating Centre, for the Mediterranean, Malta, Marine Emergency Mutual Aid Centre, Bahrain, Sub-Regional Oil-Spill Network, Davao, the Philippines in respect of the Celebes Sea area).

Protocols on emergency co-operation have been adopted under two Action Plans forming part of UNEP's Regional Seas Programme in which Somalia has participated viz Red Sea and Gulf of Aden, and East Africa. In neither sea area has any detailed regional planning been initiated and the effective implementation of these instruments should perhaps be regarded as of potentially medium or long-term benefit to Somalia.

Of more immediate significance is possibly the recommendation of a small Advisory Group convened by the IMO Secretary-General to consider arrangements for combating major incidents or threats of marine pollution, which met from 2-4 April 1986. The Advisory Group, noting the success of IMO, UNEP and UNDP in establishing a sub-region response capability covering the Celebes Sea had suggested that IMO in co-operation with IMO, UNDP and other funding sources explore the possibilities of establishing similar arrangements in other sub-regions of the world, such as the Gulf of Aden, which the Advisory Group believed to be an area exposed to a high level of maritime transit traffic.

The Yemen Democratic Republic delegation to MEPC 23 confirmed the interest of its government in proceeding with the development of a sub-regional response capability in the Gulf of Aden. The IMO Secretariat will shortly be contacting the other two coastal states to ascertain their interest in such a scheme. If affirmative, UNEP will be approached by IMO with a view to convening a sub-regional experts group meeting.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

(a) Somali ports are generally free of oil pollution but small spills occasionally occur as a result of unloading accidents. No ports have spill cleanup equipment;

(b) There is virtually no threat of a significant oil discharge into the marine environment from a land-based source;

(c) Exploratory drilling is currently not taking place offshore Somalia and significant programmes are unlikely in the near future;

(d) At any given time there are approximately 10 VLCCs and 50 medium sized tankers loaded with oil and the same number in ballast sailing off Somalia's north and east coast waters. This traffic represents an oil pollution threat to Somalia;

(e) Tarballs in significant concentrations are found on large stretches of Somali beaches, attesting to the fact that these tankers at sea are discharging oily ballast water during their return voyage to the Middle East (See Sectoral Report on Marine Pollution);

(f) The oil tanker traffic off Somalia's north and east coast presents a not insignificant risk of a major spill occurring and polluting extensive stretches of Somali coastline;

(g) Since 1983 the Port Authority of Mogadishu has made certain improvements in the technical operation of the port to reduce the chance of accidents, but further improvements are required in the area of aids to navigation, hydrographic charting, lighthouse management, and dangerous cargo management;

(h) Somalia does not have a National Contingency Plan for Marine Pollution Emergencies, although the plan developed for the ARIADNE accident provides a good basis for developing such a plan;

(i) Not one Somali government offical has adequate knowledge or training in major oil spill response or management;

(j) Somali national and international-related legislation regarding pollution emergencies is inadequate; The following IMO conventions should be studied and presented to the government for implementation and acceptance: COLREG 1972, SOLAS 1974, TOONAGE 1969, MARPOL 1973/78, INTERVENTION 1969, CLC 1969 and FUND 1971. (See Sectoral Report on Marine Environmental Legislation).

6.2 Recommendations

(a) That oil spill cleanup equipment be purchased for small discharges in the Port of Mogadishu and that personnel be trained in its use. The equipment recommended is:

- 2 over the bow dispersant spray sets
- 2 x 1,000 litre pillow tanks
- 2,000 litre concentrate dispersant
- 200 m of inflatable boom on reel
- 1 portable disk skimmer;

(b) That similar equipment be purchased for the ports of Berbera and Kismayo once it is demonstrated that the equipment for Mogadishu is being properly utilized and maintained;

(c) That the Port Authority of Mogadishu and the Marine Department of the Ministry of Marine Transport and Ports continue to implement all recommendations made by IMO (Capt. Erzan-Essien) in 1983 in the interests of safety and environmental protection;

(d) That the draft Contingency Plan for Pollution Emergencies presented herein be reviewed, amended and implemented by the Marine Department, Ministry of Marine Transport and Ports;

(e) Once completing the National Plan, the Somali government should enter into co-operative efforts with its coastal neighbours to establish a regional marine pollution contingency plan;

(f) That spill management training programmes should be provided through foreign aid funding for the Director, Marine Department, Ministry of Marine Ports. These should include: (1) Attendance at the 1987 Oil Spill Conference in Baltimore, MD, U.S.A. in March (where he will be responsible for identifying suitable equipment and materials for subsequent purchase by the Port of Mogadishu) followed by meeting in the U.S.A. and Canada with counterparts; (2) Attendance at a two-week course in pollution control and cleanup (the BP course for On-Scene Commanders in Southampton, U.K. is recommended); (3) Participation in all regional meetings to develop the Regional Contingency Plans;

(g) Once trained, the Director, Marine Department should be responsible for ensuring that those designated in the National Marine Pollution Contingency Plan have some "awareness" training and that operators of cleanup equipment in the Port of Mogadishu are trained in the use of the equipment purchased.

6.3 Special Recommendation re: the ARIADNE

That a specific contingency plan be developed and rehearsed to deal with chemicals that might be spilled during the final salvage of the remaining wreck, should such an operation take place. IMO should be contacted for advice in this serious matter.

APPENDIX

DRAFT NATIONAL MARINE POLLUTION CONTINGENCY PLAN FOR SOMALIA

This plan is an incomplete, draft version of a National Marine Pollution Contingency Plan for Somalia. It is, of necessity, general in its scope and nature. The Director, Marine Department, Ministry of Marine Transport and Ports is recommended to convene a meeting of those agencies concerned to discuss this draft plan and establish operational and administrative procedures.

The density of marine traffic, especially oil tankers, in close proximity to the coast of Somalia presents a fairly high risk of marine pollution from collisions, stranding and other marine accidents. Such pollution can threaten amenity beaches, sea birds, marine life in the inter-tidal zones including the coral reef and mangrove systems, and the fishery with subsequent loss of revenue and potential protein sources.

The Ministry of Marine Transport and Ports (MMTP) has been designated as the government agency responsible for the implementation and enforcement of the appropriate Marine Pollution Prevention Laws and this contingency plan has been prepared by the Marine Department on behalf of the Minister.

Scope of the Plan

This plan is intended to delineate responsibilities for the operational response to marine incidents which could result in spillage of oil or other noxious materials into the waters of Somalia. Such waters are defined in the (appropriate Maritime Zones Law), which was proclaimed on (date). The Marine Department of the Ministry of Marine Transport and Ports will have lead agency responsibility for any incidents involving shipping and is empowered by law to intervene and take whatever measures are deemed necessary to prevent pollution or to expedite the flow of marine traffic when an accident occurs.

This plan provides the framework for co-ordination of an integrated response by government agencies to protect the environment from the deleterious effects of pollution from spillages of oil or other noxious substances. It is intended to promote the development of local plans in the major ports to respond to such incidents.

The objectives of this plan are:

(a) To develop appropriate systems for the detection and reporting of spillages of oil or other noxious materials or of incidents related to the operation of shipping which could result in such a spillage.

(b) To ensure prompt response is made to either prevent pollution or to restrict the spread of the contaminants.

(c) To ensure that adequate protection is provided for the public health and welfare and the marine environment.

(d) To ensure that the correct response techniques are used to clean up the pollution and that disposal of recovered product is carried out in an environmentally acceptable manner.

(e) To ensure that complete and accurate records are maintained of all expenditures to facilitate cost recovery.

APPENDIX

The following government ministries will act as resource agencies as required to support the actions of the Marine Department, MMTP:

The Somali Port Authority
The Somali Shipping Agency
The Somali Ministry of Defence
The Ministry of Interior
The Ministry of Fisheries
The Ministry of Justice
The Ministry of Foreign Affairs
The National Petroleum Agency
The Ministry of Public Works

Notification and alerting procedures

When an incident occurs which could result in marine pollution or there is an actual spillage of oil this should be reported to the National Police Communications Centre which will advise firstly the Marine Department, MMTP, for action and other departments for information in accordance with the attached list, as shown in Table 1. The reports may also be made to the nearest Port Authority who will then relay the report to the Communications Centre for dissemination.

Organization (Figure 10)

The Director of the Marine Department, MMTP, has the overall responsibility to ensure that appropriate response is made to any incident in Somali waters. He will direct the various aspects of the operation and will be assisted by the Regional Harbourmaster(s) in the affected area(s), who will be the on-site representative(s) for the Marine Department and act to co-ordinate all activities. He will pass regular situation reports to the National Police Communications Centre and will also relay requests for additional resources through this centre.

The regional Harbourmasters of the Marine Department are appointed as Pollution Prevention Officers and will lead initial response to incidents within the port limits in their areas of responsibility; if additional assistance is required they should request same through the Director, Marine Department, MMTP.

The designated pollution prevention officers are responsible for:

(a) directing the employment of needed resources for prevention of pollution, containment, clean-up and disposal of any pollutants and restoration of the site;

(b) providing a focal point of information for all agencies concerned;

(c) preparing cost analyses and a detailed report covering all aspects of the spill; and

(d) collecting samples for possible analysis.

The National Police will make the facilities of the Communications Centre available to receive and disseminate reports of marine accidents or pollution. If it is deemed necessary, one or more patrol craft will be dispatched to the incident site to act as the on-scene command centre with the mandate to intervene if so ordered by the Minister of Marine Transport and Ports.

The Somali Air Force will provide fixed-wing aircraft or helicopters to conduct surveillance or provide logistic support in movement of men and materials to the incident site. They will also provide a ground to air communications link at the site for use by the OSC.

APPENDIX

Table 1. Reporting and Alerting Listings

Agency	Telephone numbers	
	Business	Home
Marine Department, MMTP		
First alternative		
Second alternative		
The Somali Port Authority		
First alternative		
Second alternative		
The Somali Shipping Agency		
First alternative		
Second alternative		
The Ministry of Defence		
First alternative		
Second alternative		
The Ministry of Interior	(NUMBERS SHOULD BE FILLED)	
First alternative		
Second alternative		
The Ministry of Fisheries		
First alternative		
Second alternative		
The Ministry of Foreign Affairs		
First alternative		
Second alternative		
The Ministry of Justice		
First alternative		
Second alternative		
The National Petroleum Agency		
First alternative		
Second alternative		
The Ministry of Public Works		
First alternative		
Second alternative		

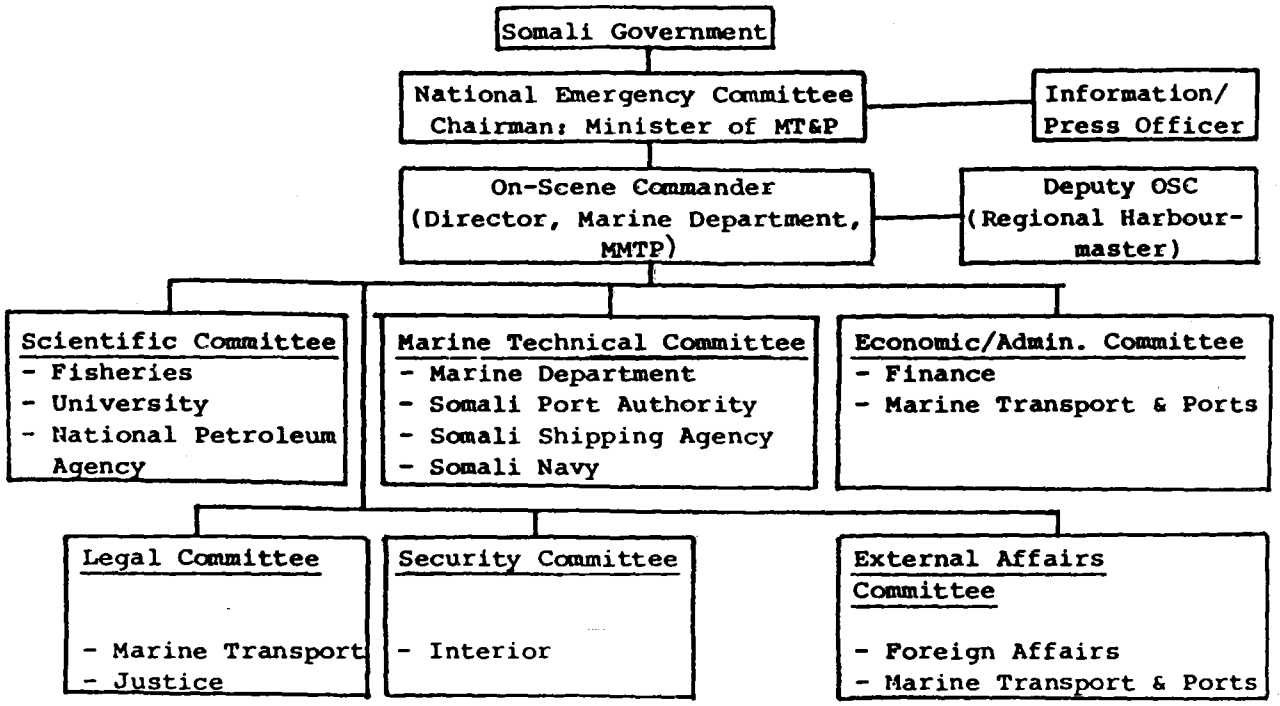


Figure 10. Proposed organization for major marine pollution response in Somalia

APPENDIX

The Somali Port Authority will provide tugs and pollution control equipment at the incident site and, if required, will rig one or more tugs with dispersant spraying equipment.

The National Petroleum Agency will provide facilities for storage of recovered oil or water-in-oil emulsions and will arrange for storage and eventual disposal of the recovered oil.

The Somali Shipping Agency will, if required, provide support from their own fleet or by charter vessels and technical experts to advise the Director of the Marine Department, MMTP.

The Justice Department in co-operation with the Somali Shipping Agency and Ministry of Foreign Affairs will be responsible for negotiations with the vessel and cargo owners and insurers and will also conduct all negotiations regarding compensation and indemnification.

The Ministry of Fisheries will provide scientific advice to the Director of the Marine Department, MMTP, regarding species at risk, shore-line sensitivity, use of dispersant chemicals, beach cleaning methods, etc.

The Ministry of Public Works will provide earth moving equipment and trucks for any shoreline cleanup programme required.

In order to facilitate the foregoing division of tasks, the Marine Department will form an advisory committee with representation from all these agencies. This Committee will formulate procedures for provision of resources and technical assistance and will address the various administrative and logistic problems which can be foreseen.

Spill control and clean-up procedures

An accurate assessment of a spill incident is essential before appropriate spill controls and clean-up procedures can be implemented. Generally, containment and recovery are preferred, but in some instances it may be necessary to use dispersant chemicals. Details of these various methods of oil spill clean-up may be found in Part IV of the IMO Manual on Oil Pollution, "Practical information on means of dealing with oil spillages".

Disposal of contaminants

Arrangements should be made for reception, storage and disposal of recovered oil or oil in water emulsions. Depending on the type of oil, e.g. crude, refined or residual, it can be stored, separated and either refined or sold as fuel. With regard to contaminated debris, this can be disposed of by burning or burying. Technical assistance should be obtained in the selection of disposal sites close to the shore-line resources.

The available resources in Somalia are listed in Table 2; agencies should provide periodic up-dates to the Marine Department reflecting any new acquisitions.

Use of Expert Advisors

Discussions should be held with the Advisor on Marine Pollution, International Maritime Organization, to identify experts (and alternatives) who are able to provide unbiased expert advice during a major spill incident in the following specialized subject areas: containment and recovery equipment and techniques; dispersants; and shoreline cleanup and disposal. These experts, under the functional direction of the IMO advisor in the country during the spill, will assist the OSC in dealing with foreign equipment manufacturers, consultants and others wishing to provide technological or advisory aid. The names and telephone and telex numbers of these experts should be in the Contingency Plan, as shown in Table 3.

APPENDIX

Table 2. Available Resources

Location	Tugs	Pilot Boat
Port of Mogadishu	Hamer I, 22 m, 1,400 H.P. Hamer II, 22 m, 1,400 H.P. Juba, 21 m, 800 H.P.	Sahan, 9 m, 250 H.P.
Port of Berbera	# 1, 1.400 H.P. # 2 1,400 H.P.	
Port of Kismayo	Wama I, 25 m, 1,500 H.P. Wama II, 15 m, 1.500 H.P. Wama III, 15 m, 1.500 H.P.	
Somalia Air Force		
Somalia Navy		
Others		

Table 3. Foreign Expert Advisors

Name	Telephone	Telex
IMO Expert		
First alternative		
Second alternative		
Containment and Recovery Expert	(NUMBERS SHOULD BE FILLED)	
First alternative		
Second alternative		
Dispersant Expert		
First alternative		
Second alternative		
Shoreline Cleanup and Disposal Expert		
First alternative		
Second alternative		
Others		

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ANNEX IV

SECTORAL REPORT

ON

MARINE LIVING RESOURCES

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CONTENTS

1. GEOGRAPHICAL AND OCEANOGRAPHIC FEATURES

The coastline of Somalia is about 3,000 km long. There are two major coastal areas. These are the North coast bordering the Gulf of Aden, and the East coast on the open Indian Ocean.

1.1 Topography of the North Coast

This coast is about 1,000 km long, between the border with Djibouti (Zeila) and Ras Asir. The coastline consists of a series of sandy beaches, broken at intervals by rocky outcrops or cliffs which often extend into the shallow waters. There are no fringing coral reefs along the coast, because of seasonal occurrence of cold water currents and turbidity from upwelling areas. Coral reefs and outcrops are mainly confined to the extreme western part of the Gulf of Aden (Gulf of Tadjura and Perim Island), outside Somali waters.

The only islands at the North coast are a group of islands close to the border to Djibouti, and Mait Island. The northern continental shelf is very narrow, generally between 10 and 15 km. Small banks, within the 200 m depth contour, are present off Mait and Alale, extending 20 and 60 km off the coast respectively. The area of the northern shelf is roughly 7,000 km^2. No major river systems enter the Gulf of Aden. Fresh waters enter the sea during isolated fresh floods and stream beds, or wadis, remain dry for the greater part of the year. In localities where heavier outflows occur from adjacent mountain areas, inlets or khors are formed. The run-off from the land appears to have insignificant effect on the marine environment. The North coast is generally unbroken, without natural harbours. The larger khors (Alale, Habo, Kandala) however, offer safe anchorage for the smaller fishing vessels, which may enter and leave the inlets at the flood tide. A good harbour, which has recently been extended is present at Berbera. Bosaso which at present only has a jetty will soon have constructed a pier which will allow calls from ocean going fishing vessels.

1.2 Topography of the East coast

This coast, between Ras Asir and the Kenyan border (Chiamboni), is about 2,000 km long. The northern part of this coastline, South to Ras Mabber, is dominated by rocky cliffs with no or very narrow beaches. Further South the shoreline consists of the higher inland plain sloping towards the shore and ending in sandy beaches. From Alale and southwards to the Kenyan border live coral reefs are present forming a frequently interrupted barrier generally situated from 100 to 1,000 m from the shore, but up to 7 km in the Kismayo region.

The continental shelf is at its widest between Ras Asir and Ras Mabber, extending up to 60 km from the shore. Further South, the shelf is narrow, between 15 and 30 km South to Alale, then decreasing to only 6 km between Mogadishu and Ras Audally, thereafter gradually increasing to 13 km off Kismayo and again narrowing to 7 km towards the Kenyan border. The shelf area between Ras Asir and Ras Mabber is roughly 11,000 km^2 and from Ras Mabber to the Kenyan border roughly 21,500 Km^2. The inreef areas between Adale and the Kenyan border is roughly 1,400 km^2. (The shelf areas are useful to roughly assess productive potentials). One main river, the Juba, enters the ocean just North of Kismayo.

Apart from its effect on the relatively small river delta and the immediate surrounding coral reefs, the river runoff is not assumed to have any significant effect on the marine coastal environment. The East coast offers no natural harbour conditions, but good harbours have been constructed at Mogadishu and Kismayo. A pier has been constructed at Brava, but has deteriorated and is now practically not used.

1.3 Oceanography

The South-west Monsoon, blowing along the East coast of Somalia from May to August, determines the dominating oceanographic conditions in the region. The monsoon generates a surface current running along the entire East coast during that period. In the area from Ras Mabber and northwards the surface current deviates from the coast, and the water in the coastal zone is replaced by cold nutritious water from greater depths. This phenomenon, which is called upwelling, is especially located between Ras Mabber and Ras Hafun, but the nutrient rich water spreads on the relatively wide shelf between Ras Hafun and Ras Asir. Upwelling also occurs in this period between Ras Asir and Socotra. Between Ras Hafun and Ras Asir the Somali current turns West passing mainly South of Socotra. The upwelling off North-Somalia is of more limited extent, of shorter duration and shows greater annual fluctuations compared to the upwelling off southern Arabian peninsula in the same period.

At the North coast an eastern surface current flows along the coast during the North-east Monsoon. No upwelling occurs in this region, but during the South-west Monsoon, the north coast, especially its eastern part receives an inflow of upwelled water from the Ras Hafun region, from a slow westward surface current on the North coast.

1.4 Production

Close to the equator the production has been reported to be quite low, 0.082 gram carbon per m^2 surface, while further North, between 4^o and 11^o N, values ranging from 1.115 to 3.384 gC/m^2 per day have been reported (Smith, 1984). On the basis of the level of primary production, the shelf waters off Somalia can be divided into the following main categories: (a) the highly productive area between Ras Mabber and Ras Asir, comparable to any of the world's major upwelling areas; (b) low productive areas with little or no net influx of nutrients, viz the western part of North coast and the East coast South of Obbia. These two regions can more be compared to the shelf off Tanzania and Kenya, another area with relative low carrying capacity for living marine resources. Between these two distinct areas, transition zones are occurring, the importance of which varies with the annual strength of the upwelling. The north-west coast from Ras Asir to Bosaso receives some influx of upwelled waters from the Ras Hafun region during the peak of the monsoon (July-August) and in the region between Ras Mabber and Obbia regional pockets of upwelling have been reported, but not on a regular annual basis (Smith, 1984).

1.5 Biotopes (environmental regimes)

On basis of the available data it seems reasonable to divide the Somalia coastal marine environment into five biotopes

1.5.1 The North Coast from Zeila to Bosaso

This region is probably quite uniform and shows little seasonal variation in the marine resources.

1.5.2 The North Coast from Bosaso to Ras Asir

This region receives some beneficial influence during the peak of the South-West Monsoon, when nutrient rich water from the Ras Hafum area is brought into the coastal waters of the North-east coast. This creates favourable conditions for seasonal blooming of plankton and seasonal migrations of pelagic fish into the area. However, the region does not have a carrying capacity for year round high abundances of fish.

1.5.3 The North-east coast, from Ras Asir to Ras Mabber

This region shows the most extreme variations in the environment. During the upwelling large areas of the shelf are covered with relatively cold (17°C), nutrition rich, but oxygen depleted waters. During intensive periods of upwelling, oxygen demanding demersal fish species, which normally occupy the shelf, are forced to migrate, either closer to the shore or out of the area. Occurrence of mass mortality in the region has been reported (Foxton 1975), probably caused by intensive upwelling, trapping fish in bodies of oxygen depleted waters. The less mobile benthic fauna in this region is likely made up of species with high temperature and high oxygen tolerance. During the South West Monsoon the primary production is very high, even exceeding the intensity in the Peru current (Smith, 1984). But as the upwelling is of relatively short duration, and as main parts of the phytoplankton are relatively quickly carried off the shelf and into oceanic areas, only a small fraction of the primary production is transformed into biomass of small pelagic fish. In the Peru current the upwelled waters are longer trapped on the continental shelf and thus a higher fraction of the primary production can be converted into fish biomass. Nevertheless, as it will be shown later, the fish densities off the North-east coast are among the highest in the world.

1.5.4 The Central-east coast, from Ras Mabber to Obbia

This region is characterised by sporadic local upwelling, which hinders the establishment of coral reefs in the area. As the intensity of the upwelling shows great annual fluctuations, the area does not have high densities of fish on a permanent basis, but can sporadically favour growth of small pelagic fish that have migrated from the northern areas.

1.5.5 The South-east coast, from Obbia to Chiamboni

This region is characterised by the presence of coral reefs. The area does not show any major seasonal variations, has a steady-state community characteristic for tropical areas without upwelling. Seasonal occurences of large pelagic species, tuna and spanish mackerel does not alter significantly this general picture.

2. THE MARINE LIVING RESOURCES

2.1 Distribution

2.1.1 Large Pelagic Fish

These are the species of tuna and big mackerel, mainly yellowfin tuna (Thunnus albacares), longtail tuna (Thunnus tonggol), bigeye tuna (Thunnus obesus), bonito (Sarda orientalis) skipjack (Katsuwonus pelamis) and spanish mackerel (Scomberomorus commersoni). Their main area of distribution is at the north-east coast between Bosaso and Ras Asir, and are usually caught inshore. The seasonal variations in abundance are considerable, confirming the oceanic migratory pattern of the species. There are two peaks in the landings, viz. in November and in March. During the South-west Monsoon the abundance of tuna is assumed to be low (Losse 1970).

At the south-east coast big pelagic fish as spanish mackerel and tuna make important contributions to the artisanal catches. The primary season for spanish mackerel is March - June and for tuna, October - November.

2.1.2 Small Pelagic Fish

The dominating species are Indian oil sardinella (Sardinella longiceps), rainbow sardine (Dussumieria acuta), scads (Decapterus russelli, D. macrosoma), mackerel (Scomber japonicus), horse mackerel (Trachurus indicus) and lesser quantities of anchovies (Engraulis japonicus,

Stolephorus indicus). The main distributional area of these species are at the north-east coast between Ras Mabber and Ras Asir. Part of the stocks can make seasonal migrations into the Bosaso - Ras Asir region. Outside these two regions the presence of small pelagic fish is scattered and does not form a basis for any fishery

2.1.3 Demersal Fish (bony fishes)

The demersal fish fauna of Somalia consists of several hundred species. The diversity of species is highest in the coral reef region from Adale to the Kenyan border. The main commercial species groups are scavengers (Lethrinidae), groupers (Serranidae), snappers (Lutjanidae), grunts (Pomadasyidae) and seabreams (Sparidae). Of less importance are threadfin breams (Nemipteridae), lizard fishes (Synodontidae) and goat fishes (Mullidae).

These commercial demersal species make important contributions to the artisanal fisheries all along the coast. However, on the basis of the very limited information available, no permanent areas of high densities of demersal fish can be pointed out.

2.1.4 Sharks and Rays (Elasmobranchs)

Sharks play an important role in the Somalian traditional fishery. They are present all along the coast but are caught mainly off the North coast and especially in the southern part of the east coast where they often represent 40 percent of the catch. The principal species groups are hammerheads (Sphyrnidae), grey sharks (Carcharhinidae) and mako shark (Lamnidae).

2.1.5 Lobsters

A variety of spiny lobsters of the genus Panulirus is found off the entire coast of Somalia. They are caught by divers in shallow waters and occasionally by gill nets. The highest densities are found among the coral reefs at the South-east coast. Two species of deep sea lobsters are also present, Puerulus sewelli and P. carinatus, which are encountered at depths between 150 and 400 m along the East coast.

2.1.6 Shrimps

Small quantities of penaeid shrimps are found in the shallow waters in south-east Somalia, particularly between the mouth of Juba river and the Kenyan border. Presence of deep sea shrimps (name unspecified) has been reported by a Spanish research vessel in 1981. The shrimps were located on the East coast in the 100 - 200 m bottom depth zone, particularly South of Mogadishu.

2.1.7 Marine Turtles

The main marine turtles are the green turtle (Chelonia mydas) and the hawksbill turtle (Eretmochelys imbricata). Little is recorded in detail about the distribution and the abundance in Somali waters, but previous observations indicate a high number of turtles both on the north and the east coasts, particularly between Bosaso and Habo in the north, off Hordia and between incidental by-catches as the animals get entangled in the fish nets. The turtles are consumed locally and the shells are sold to tourists for a good price. During the sixties a turtle canning factory was operational in Kismayo. During 1967 - 68, 6,800 turtles were caught off Hordio, close to Ras Hafun. During the visit of this mission to the towns Merca, Brava and Kismayo, turtles were reported to be frequently caught by artisanal fishermen, roughly estimated to 2-3 turtles per fisherman per day at sea.

2.1.8 Whales

Have been frequently reported by the purse-seiners operating off north-east Somalia during 1985 - 86. Details are not known, but the area is historically known to be inhabited by the humpback.

2.1.9 Other Resources

From the seas of Somalia catches of oysters, squid and cuttlefish are reported. The status of these resources is not known and more data is required. It is likely that they do not form substantial populations. In the waters of the People's Democratic Republic of Yemen, which shares similar features with the waters of Somalia, there is an important fishery for cuttlefish (Sepia). Although cuttlefish is reported from trawling operations in Somalia, it is considered as by-catch and likely the stock is substantially less than in the PDRY.

2.2 Estimates of Abundance of Living Marine Resources Based on Resource Surveys in Somali Waters

Since the mid-sixties several fishery resource surveys have been carried out in Somali waters. The main surveys are listed below.

2.2.1 R/V Thetis (Greece)

A freezer trawler that carried out exploratory trawl surveys in the region from Mait to Eil in the period from January - December 1966. The total catch was about 3,310 tonnes, taken at a mean rate of 24.9 tonnes a day. Seabreams and scavengers were the principal components in the catches. The main fishing grounds were on the north-east coast where the average catch varied between 2.8 and 4.3 tonnes. On the basis of the area swept by the trawl gear and the catches obtained, average densities of demersal fish have been calculated (Fisheries Development Limited 1982). For the north coast this is 2.3 tonnes a km^2 and for the north-east coast 4.8 tonnes a km^2. These estimates tend to be overestimates as fishing effort was concentrated at the richest fishing grounds.

2.2.2 R/V Zheleznyakov (USSR)

This vessel carried out experimental fishing surveys on the north coast and in the Ras-Hafun area in the period August 1970 - October 1971. The main target was the tuna resource at the north coast, but some limited trawling on the demersal fish was also carried out. The reports from the surveys describe in general the fish distribution and the influence of the environmental factors, but no estimate of abundance has been made.

2.2.3 R/V Nisshin Maru 52 (Japan)

A commercial freezer trawler, which carried out fishing activities between March 1970 and August 1971, mainly in the area from Ras Asir to Ras Hafun. No resource evaluation has been made on the basis of the fishing activities, but catch rates were reported within the range 82-472 kg an hour trawling.

2.2.4 R/V Dr. Fridtjof Nansen, (Norway)

This research vessel carried out acoustic surveys, under a FAO/NORAD/UNDP project, covering the entire Somalian coast five times in the period March 1975 to November 1976. The estimates of the small pelagic fish ranged from 240 to 800 thousand tonnes for the East coast, average estimate 490 thousand tonnes. For the north coast the estimate ranged from 4 to 180 thousand tonnes, average estimate 80 thousand tonnes (Kesteven et al 1981). The dominating part of the pelagic

stock was located between Ras Asir and Ras Hafun. Estimates of demersal biomass have also been made. The average biomass for the East coast was 335 thousand tonnes and for the north coast 65thousand tonnes. These figures also include some fairly high densities of cardinal fishes (Synagrops sp.), without any commercial value.

2.2.5 SOMALFISH

SOMALFISH was a Somali/Soviet joint venture company which carried out bottom trawling mainly off the North-east coast for demersal species, but also in a narrow belt at deeper waters for deep-sea lobster. The fleet consisted of 10 trawlers which caught about 8.7 thousand tonnes of demersal fish in the period 1975-77. The data collected from these activities do not seem usable for resource evaluation.

2.2.6 Amoroso e Figli

An Italian fishing company operated with three freezer trawlers off the north-east coast during the years 1978 and 1979. The catch rates were reported to vary between 4.0-4.4 tonnes/boat-day of commercially valuable demersal fish, and 0.3-0.6 tonnes/boat-day of lobster.

2.2.7 R/V "Isla de Lanzarote" (Spain).

This vessel carried out an extensive trawl survey on the whole east coast in the period February to April 1981. The only report made available to the Ministry of Fisheries, Mogadishu is in Spanish, and has so far not been made use of. The report estimates the demersal biomass of valuable commercial species (groupers, snappers, scavengers, seabreams) of the east coast at 31 thousand tonnes, under the assumption that the catchability coefficient of the fishing gear is equal to 1.0 (the same as applied during "Dr. Fridtjof Nansen" trawl surveys). The average density estimated is 1.16 tonnes per km^2 for the whole survey area, about 30 percent of the density estimated by "Dr. Fridtjof Nansen" on the north eastern part of the shelf. The latter estimate includes all demersal fish, also non-commercial. The Spanish survey has gathered a lot of data that should be further processed.

2.2.8 F/V Clabucet.

A Romanian factory trawler which operated in the Ras Asir-Ras Hafun area, with prospecting surveys for the development of a pelagic trawl fishery on the small pelagic resources of the area. The research was carried out from November 1983 to October 1984 and a considerable amount of data was collected on catch rates, biological characteristics of the species and fishing techniques. The data collected are not suitable for reliable estimation of the abundance of the resources. Initially, as part of the project, some coastal trawlers carried out trawling off the North coast. Due to difficult sea conditions and heavy loss of gear on the rough grounds, these activities were stopped quite early.

2.3 Discussion on Abundance of Fish Resources in Somali Waters

The only information on abundance of small pelagic fish seems to be the "Dr. Fridtjof Nansen" surveys. Table 1 summarizes the results concerning small pelagic fish along the east coast.

Table 1. Small Pelagic Fish Along the East Coast

Period	Area	Survey Frequency	Biomass (1,000 tonnes) Range	Average
1975-76	whole East Coast	5	240-800	490
1984	Ras Asir - Ras Mabber	2	115-245	180

Although the area covered in 1984 is more limited, it encompasses the main part of the stock. The drop in the estimates between the series of surveys seems to indicate a considerable reduction in the size of the small pelagic stocks. All pelagic fish stocks vulnerable to a fluctuating environmental regime are known to show long-term variations in abundance, the stock of anchoveta off Peru and the herring in the north-east Atlantic are well known examples. It is likely that the fish communities inhabiting the shelf off North-east Somalia form no exception to this, especially as the upwelling in the Somali Current is known to vary much both in intensity and duration, compared to the other upwelling areas in the Indian Ocean. Two hundred and fifty thousand tonnes seems to be a reasonable estimate for the level of the small pelagic resources in 1984.

On the north coast the level of the small pelagic resources seems to fluctuate considerably. During the five "Dr. F. Nansen" surveys in 1975-76 three coverages gave estimates of 30 thousand tonnes or less, while the two remaining surveys gave both close to 180 thousand tonnes. The latter surveys were carried out in March 1975 and January-February 1976, and it is possible that this corresponded with a season of high abundance. The three coverages with low abundances were carried out in the season between April and October. The small pelagic resources on the North coast have not been properly identified by trawling, and it might be possible that considerable amounts of the estimated biomass consists of cardinal fish (Synagrops sp.) with very low or no commercial value. Until more information is acquired we cannot indicate the potential for development of fisheries on small pelagic fishes off the north coast.

Assessing the level of the demersal fish resources in Somalia is made difficult by several limitations. The only systematic resource surveys carried out are the "Dr. F. Nansen" surveys and the Spanish "Isla de Lanzarote" in 1981. The acoustic surveys on the demersal fish give estimates of limited value as the biomass figures incorporate at times considerable amounts of species with low commercial value, such as cardinal fishes (Synagrops sp.) and ponyfishes (Leiognathidae). Trawl surveys give better estimates of the commercial exploitable biomass. The only surveys that fall in this category are the Spanish survey and the later "Dr. F. Nansen" surveys in March and August 1984. Data from commercial or exploratory fishing activities can also be used to roughly assess the level of the resources, but as these activities are mainly concentrated in areas with high densities of fish, the estimates tend to be overestimates if made representative for the whole shelf. Furthermore, the properties of the fishing gear and the intensity of the fishing is less accurately recorded in commercial fishing activities than in systematic resource surveys. Nevertheless, the first can give indications on the level of the resources. Of the fishing activities in Somali waters, the results from the F/V Thetis, and the Italian trawlers "Antonietta Madre", "Amoroso 3" and "Amoroso 4" can give some information in this respect.

The Spanish survey gives an estimated density of 1.16 tonnes/km^2 of commercially valuable species as average value for the East coast. The limited "Dr F. Nansen" surveys gave 5.2 and 4.0 tonnes/km^2 for the shelf between Ras Asir and Ras Mabber. This includes all demersal species, also species of low or no commercial value. The commercial valuable fishes i.e. seabreams, scavengers, groupers, snappers, grunts, threadfin breams and goatfishes made up 66 percent and 46

percent of the demersal biomass during the first and second survey respectively. This gives estimates of 3.5 and 1.9 tonnes/km^2 of commercial species for the two coverages in the area, Ras Asir-Ras Mabber.

On the basis of the catches from the F/V Thetis the mean densities were estimated at 2.3 tonnes/km^2 on the North coast and 4.8 tonnes/km^2 on the east coast (Fisheries Development Limited, 1982). However these results are from aimed trawling on the highest concentrations and therefore tend to be overestimates. Likewise, the three Italian trawlers operating in the period 1978-79, had an average catch rate of 4.2 tonnes boat/day of commercial fish. If one assumes an effective fishing time of 15 hours a day, a trawling speed of 4 knots and an effective width of the trawl of 40 m, the catches indicate densities of about 0.95 tonnes/km^2. A trawl width of 30 m would indicate 1.3 tonnes/km^2. These rough estimates are summarized as follows:

	Estimated density commercial species (tonnes/km^2)
Spanish survey, whole East coast	1.2
"Dr. F. Nansen", Ras Asir-Ras Mabber, March 1984	3.5
"Dr. F. Nansen", Ras Asir-Ras Mabber, Aug. 1984	1.9
"Thetis", fishing operations, East coast, aimed trawl	4.8
Italian fishing operations, Ras Asir-Ras Mabber, aimed trawl	0.95-1.3

The "Dr. F. Nansen" trawl surveys were quite limited in effort and therefore suffer from low precision in the estimates due to statistical variance. The main fishing and survey activities in Somalia have been carried out in the Ras Asir-Ras Mabber region, where the highest densities of fish occur due to the beneficial influence of the upwelling system.

The above figures point to an average density for the Somali shelf between 1 and 4 tonnes/km^2, and perhaps values between 1 and 2 tonnes/km^2 are more probable. The shelf off the east coast is about 24,500/km^2 and off the north coast 3,200 km^2. Applying densities of 1 and 2 tonnes/km^2 to these areas gives estimates from 25 to 50 thousand tonnes for the east coast and 3.2 to 6.4 for the north coast.

2.4 Estimates of Sustainable Yield of Fishery Resources

The rate at which a standing stock can be harvested is dependent upon a number of factors, among which growth rate, longevity (or natural mortality) and age at first maturity are the main ones. Small pelagic species, which are often associated with environmental regimes of high productivity, can usually be harvested at a greater rate than demersal fish, which usually have longer life span and lower growth rate. As a first approximation, a harvest level of 50 percent for the small pelagic biomass and 25 percent for the demersal would represent a "radical" harvest level while 30 percent and 20 percent respectively would be representative for a conservative level. Applying these percentages to the biomass estimates given above, rough figures of yield are as follows (thousand tonnes):

Exploitation rate	Radical	Conservative
Small Pelagic fish (1984)	120	75
Demersal fish, east coast (commercial species)	6-12(24*)	5-10(20*)
Demersal fish, north coast (commercial species)	0.8-1.6(3.2*)	0.65-1.3(2.6*)

* most optimistic, but less likely estimates.

The purpose of these calculations is not to assess the yield, as for this the available data are too limited. They have more the character of first calculations to roughly set the order of magnitude of the harvestable resources.

In the 1986 year report from the Ministry of Fisheries the expected annual yield is given as follows (thousand tonnes):

Tuna and Mackerel	8
Small pelagic fish	100
Large demersal	40
Sharks and rays	30
Spiny lobster	
Shallow waters	0.5
Deep sea	1.5
Shrimps	0.4

Based on the available information, the above figures seem to be of the right order of magnitude except for the estimates of "large demersal" and "sharks and rays", which could be overestimates. If by "large demersal" are meant the commercially valuable species this would imply the same limited category as estimated above. The expected annual yield from the Ministry comes out 3 to 6 times higher than the yield indicated above. The 40 thousand tonnes seem to indicate a serious overestimate of the potential harvest of the commercial demersal resources. A yearly harvest of 30 thousand tonnes of sharks and rays would imply a standing stock of these species in the order of 120 to 150 thousand tonnes in Somali waters. Though any data based on sharks and rays are lacking, the general impression is that this figure is quite high. In order to set a rational harvest level, a programme for systematic acquisition of data from the fishery activities should be implemented. This should be given high priority.

3. THE FISHERIES

3.1 Artisanal Fisheries and Fishing Communities

Artisanal coastal fishery has a long tradition and fishing communities are found scattered along the entire coast. In the early 1970s the government organized the fishing communities into cooperatives with common ownership of boats, fishing gear and processing facilities. The fish was bought at fixed prices and all trade taken care of by the cooperatives agencies. Recently the cooperative arrangement has been made more flexible. Fishing boats out of order have been rehabilitated and sold to the fishermen. Boats and fishing gear are increasingly kept under the economic responsibility of the individual fishermen. A flexible price system has been introduced, and the cooperatives trade agencies are increasingly competing with private fish traders.

Following the drought in 1973-74, the Government organized part of the affected nomadic population, which had lost its herd and its main basis for survival, into resettlement communities at a number of sites along the coast. They were trained in fishing skills and were provided with fishing vessels and gear by the Government. These resettlement villages have merged into the cooperative system although they still have their own administrative unit in the Ministry of Fisheries.

The Somalian coastline has been divided into seven fishery development zones. These are: 1) Kismayo, 2) Mogadishu, 3) Eil, 4) Bargal, 5) Bolimog, 6) Las Koreh and 7) Berbera. Figure 1 shows these zones together with the positions of the cooperatives/resettlement villages and the number of fishermen at each location. Included are also the number of different types of fishing vessels in each development zone, except on the north coast where some overlapping occurs. Source of the information in the figure is the Ministry of Fisheries.

Statistics on annual landings from the artisanal fishing fleet are incomplete and only rough estimates are available. With the introduction of mechanized boats in the early 1970s annual catches were increasing from about 5,000 tonnes to a peak of 8,000 tonnes in 1975. Due to lack of maintenance and spare parts for the 500 new boats that were distributed to the fishermen, 60 percent of them were out of order after two years. By the late 1970s the annual production was back to 5,000 tonnes. The reported annual production from 1980 to 1985 was as follows:

1980	:	4,000 tonnes
1981	:	4,255 "
1982	:	4,390 "
1983	:	5,280 "
1984	:	7,724 "
1985	:	4,067 "

Source: Ministry of Fisheries.

3.2 The Industrial Fishing Fleet

The trawlers operating in Somali waters have been engaged in exploiting the resources of deep sea spiny lobster (Puerulus sp.) between 150 to 400 m bottom depth and high valued commercial demersal fish in the 20 - 200 m bottom depth zone. Due to the predominantly narrow shelf and several locations with rocky or coral reefed bottom, areas suitable for trawling for commercial fish species are quite limited. Figure 2 shows the main trawable areas in Somali waters.

In the mid 1970s deep sea trawling was carried out by SOMALFISH, a Somalian/USSR joint venture company running 10 factory trawlers of about 680 GT. With the ending of the partnership in late November 1977 the annual production dropped from a peak of 3,400 tonnes of fish and 1,150 tonnes of crustaceans, mainly deep sea lobster, to 235 and 20 tonnes respectively in 1978. Since then several companies have been given concessions to fish in Somali waters, Italian, Japanese, Greek and Egyptian companies. A Somalian/Italian joint venture (SOMITFISH) was established in 1981, and was run for two years with three Italian stern trawlers. At present, 1986, two Italian trawlers and two Japanese vessels are operating in the area under license. SOMITFISH is now being refinanced while the three trawlers are undergoing rehabilitation. Two new Italian trawlers and a mothership will be added to the company soon. With the reestablishment of the joint venture some of the licensed operations will probably expire. The following figures are given for the production of the industrial fleet since 1980 (tonnes):

	Fish	Crustaceans
1980	8,530	1,800
1981	4,792	476
1982	3,904	436
1983	5,356	559
1984	11,363	552
1985	11,938	462

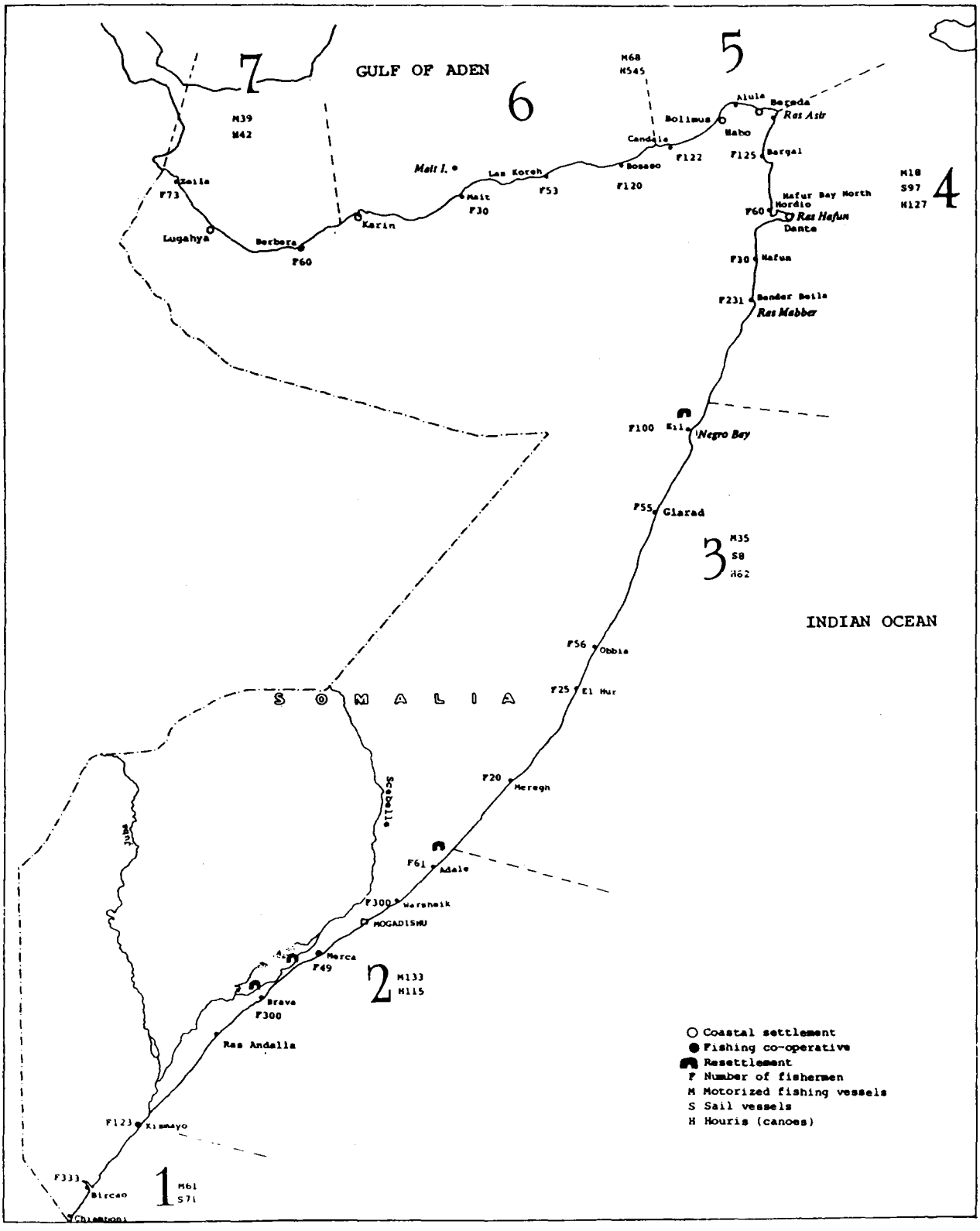

Figure 1. Fishery development regions of Somalia. (Source: Ministry of Fisheries)

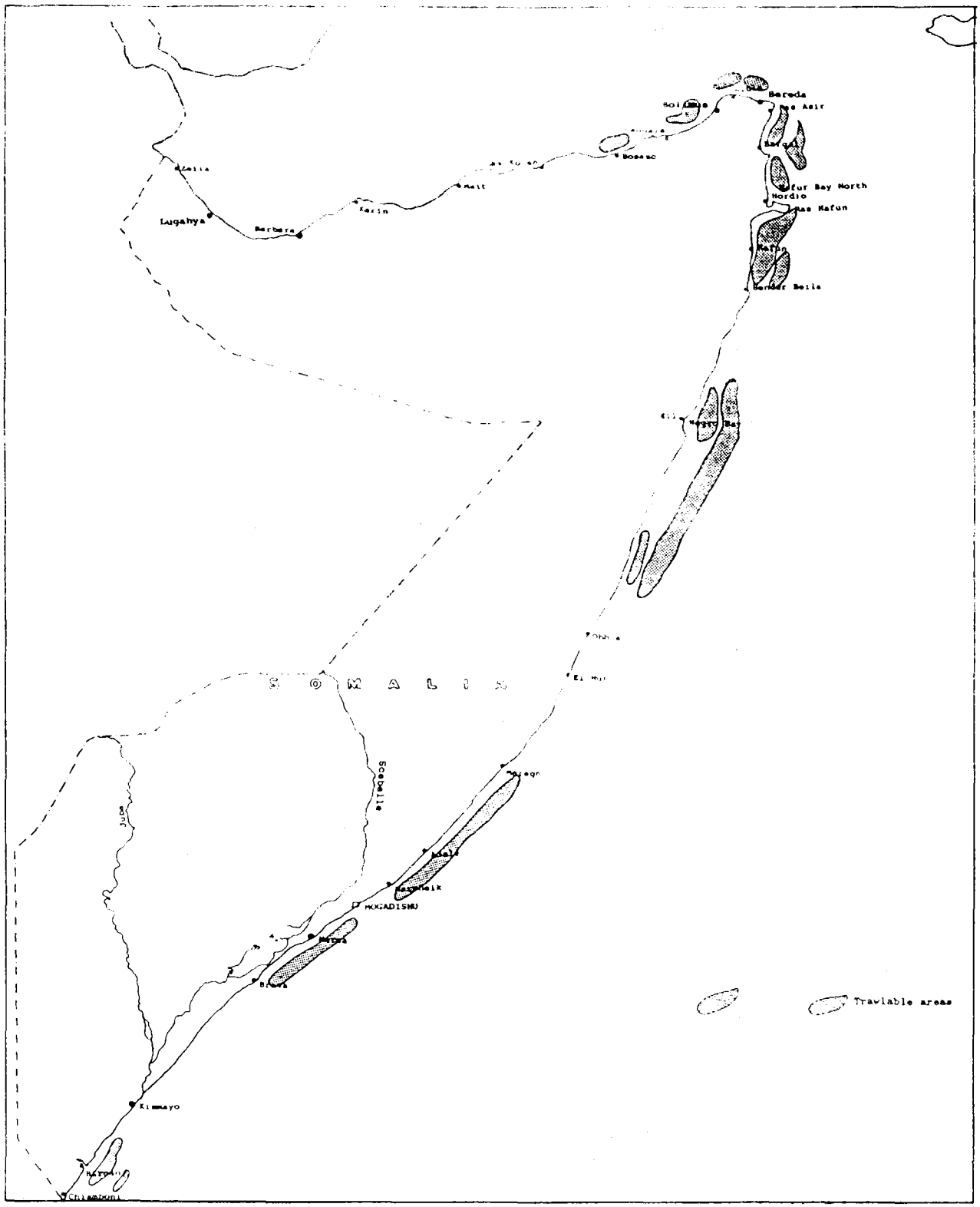

Figure 2. Trawable areas of Somalia

3.3 Present Fishery Development Projects

Three main development projects, Somali Marine Products (SMP), North-west Coast Fishery Development (NWFD) and North-east Coast Fishing Enterprise (NECFISH), are run as agencies under the Ministry of Fisheries and they all have coastal settlements as development target.

3.3.1. Somali Marine Products (SMP)

The core in this project is a 750 tons cold store located at Kismayo. The freezing capacity is up to 10 tons a day, and ice machines can produce up to 4 tons of ice a day. The project has two transport vessels to collect fish from the coastal settlements in the lower Juba region. The installations include three outpost stations, at Kulmis, Burgao and Ras Chiamboni, with cooling facilities and fuel tanks to provide fuel to the fishing fleet. The project is run as an agency under the Ministry of Fisheries and was initiated through grant aid of the Federal Republic of Germany. The cold store was opened in March 1984 and has, through its first 28 months of operation, handled 1,242 tons of marine products:

Lobster	11.5%
Grouper	17.0%
Snapper	4.0%
Various reef fish	61.0%
Sharks	5.0%
Other	1.5%

The group "other" consists of tuna, kingfish, blue marlin and barracuda.

Production 1985 versus production target for 1986 is as follows (SMP, 1986):

	1985 Production tonnes	1986 Target tonnes	% Increase
Lobster	55.9	149.7	168
Grouper	61.2	429.5	601
Snapper & other	21.2	161.1	660
Various reef fish	340.9	314.9	-8
Shark	28.2	21.3	-32
Total	507	1,076	112

At present the project buys all its products from independent fishermen and from the cooperatives. Except from the foundation laid down in facilities by grant aid, the project aims at being profitable after an initial start up period. The enterprise also takes part in rehabilitation of broken down vessels selling these later to the fishermen. Somali Marine Products has under construction small (10 m) trawlers, which will be able to operate both inside and outside the reefs. The company has further plans for development of some larger (20 m) trawlers with cold-storage capacity, intended for work all the way up to the Ras Hafun area. However, the project is mainly intended to promote development of the inshore fisheries in the lower Juba region. Its objectives as taken from the 1986 report, Ministry of Fisheries, are as follows:

(i) To provide buildings, machinery and equipment for the use of the fisheries cooperatives of the region, fishermen and companies and to engage in the processing, storing and marketing of marine products in both domestic and export markets.

(ii) To promote increased domestic fish production through regular supplies of good quality marine products to local markets at reasonable prices.

(iii) To improve the socio-economic status of the fishing communities through establishment of on-shore facilities and organized marketing, which will be provided by the project.

(iv) To increase foreign currency earnings from the export of greater volumes of marine products, processed and stored in accordance with sound commercial practice.

Possible environmental effects from the project

Fishing effort is reduced considerably during the period of the South-west Monsoon and the artisanal fishermen usually restrict their activities to the limited area inside the reefs. The production records from SMP for 1985 show that the five months May to September only account for 25.5 percent of the total production for the year, and 19 percent of the lobster production. In the interest of both the company and the fishermen to smoothen out the fluctuations in production, this might imply a very high fishing pressure inside the reefs, with possible local overfishing. The interaction between the fish communities inside and outside the reefs is not well known, but it is likely that the shallow areas function as nursery areas for juvenile stages of species which predominantely inhabit the outer side of the reefs. The shelf area inside the reef makes up only about 10 percent of the total shelf to the 200 m bottom contour in the region Eil-Chiamboni. During a one day visit to the cold store in Kismayo in June, it was observed that a considerable fraction of the day's catch was made up of small scavengers (Lethrinus nebulosus), about 20 cm in length. The company has on its own initiative established 17 cm as the minimum length it will accept. The small fish are mainly caught with beach-seines and the company is introducing somewhat bigger meshes in the seines in the near future. Intensive fishing on small sized fish by beach seining will not likely endanger the species, as a certain minimum level of the stock will be protected among the reefs, which are inaccessible to both trawls and beach seines. But a rational optimal harvest of the same species outside the reefs might suffer as an effect of the possible overfishing at young stages. It is recommended that the company takes steps to start monitoring the state of the stocks both inside and outside the reef. The company has already a well functioning system for recording the daily intake of fish into the production, also with the number of men and boats involved in the fishing activities. Simple but valuable data about the state of the stocks would be obtained by taking samples of length distributions from the most important species at regular intervals at selected sites both inside and outside the reefs.

From the production targets for 1986 it is seen that the company aims at increasing its production of high market value fish considerably. Production of lobster is planned to be increased by 168 percent, groupers 600 percent and of snappers and big pelagic fish by 660 percent. On the other hand the less commercial valuable fish groups reef fish and sharks will be reduced by 8 and 32 percent respectively. In total, the production is planned to be increased by 112 percent. It is not clear to the mission how this shift in emphasis towards valuable fish species is to come about. If it is by increasing the effort by non-selective fishing gear as trawls and beach seines, a problem of high discards of less valuable fish might be raised. If the increase is obtained by heavier effort from passive fishing gear as hand lines, long lines and gill nets, less problems in this sense will likely follow.

The company aims at a considerable increase in production in the years to come. It gives reasons to concern that no serious assessments of the carrying capacity of the environment has been made. The general assumption is that the present level of fishing activities is far below the level of optimum yield. This is not necessarily the case. The rough assessments made earlier in this report indicate a harvest level of 200-500 kg of commercial valuable species per km^2 on an annual basis for the shelf off the east coast. The shelf areas from Brava to Ras Chiamboni is approximately 2,400 km^2. This gives an annual optimum yield of between 480 and 1,200 tonnes of the commercial species. The production target of SMP for 1986 of groupers and snappers is 535 tonnes. The rough calculations made here do not have the character of an assessment, but should give reasons to immediately start actions to estimate the level of the resources. With the introduction of small-sized trawlers in the near future the company has an excellent tool to both estimate the resources and to monitor the effects of fishing. By setting up standardized trawl hauls at regular intervals at selected sites the state of the stocks could be followed. By using one of the trawlers to carry out a 14-day trawl survey in the region Brava - Chiamboni once a year, the level of the demersal fish fauna can be estimated and monitored. It is recommended that SMP apply for assistance to set up such surveys.

If the maximum sustainable yield is reached in the near future, the introduction of several trawlers into the project can have socio-economic side-effects. The purpose of the trawlers seems to be to smoothen out the seasonal fluctuations in the production as they are able to operate also in the monsoon season. But if the combined effort from the trawlers and the artisanal fisheries gives overcapacity in relation to the resources, problems of distributing the fishing effort between the two categories might arise. This again shows the necessity of assessing the true level of the resources as soon as possible.

3.3.2 North-West Coast Fishery Development Project (NWFD)

This is a project situated on the north-west coast, and is intended to develop the artisanal fisheries in the region by establishing basic infrastructure for collecting, storing and distributing fish to local markets. Training and workshop facilities are also available to the fishermen. The project is run under the Ministry of Fisheries, receives financial support from UNDP to lay down the infrastructure. Technical and management expertise are provided by FAO in the initial period. A 400 tonnes freezing store is under construction in Berbera as grant aid from DANIDA. It has a freezing capacity of 4 tonnes a day. The freezing plant is supposed to be operational from the start of the fishing season in September 1986. At the present stage (June 1986) the intake of fish by the project is limited to about one tonne a day, which is distributed in the region. Retail shops are set up in Hargeisa, which seems to be a market with potential for expansion. As the project is in its initial phase a long term level for the production has not yet been set. The project should have an assessment of the level of the resources potential as soon as possible. The shelf area between Zeila and Mait island is about 5,000 km^2 and if one as a first approximation use the rough estimates on density and yield made earlier in this report a yearly harvest of high market value fish of the order of one to 2.5 thousand tonnes is suggested.

3.3.3 North-East Coast Fishing Enterprise (NECFISH)

This project, run as an agency under the Ministry of Fisheries, was established in 1984 and receives funds from IDA for the start up process. A 25 percent share in the project, initially to be covered by the Arab Development Fund has been taken over by DANIDA. The project's aim is to initiate fisheries development in the region Bosaso-Kandala-Alale in a programme that has two components: a) to develop an industrial fishery on the small pelagic resources off the north-east coast, b) to stimulate the artisanal fisheries in the region by raising an infrastructure for collecting and processing high quality fish, intended for the export market, and by providing technical assistance and training to the local fishermen.

The offshore industrial component aims at fishing up to 50 thousand tonnes of pelagic fish a year with a 15:85 percent split between large pelagic (tuna, kingfish) and small pelagic (predominantly Indian oil sardinella). All catch is intended for consumer markets, mainly in the Middle East. When fully developed, the enterprise would use six purse seiners on a full year basis. At present, the offshore component is in an exploratory phase involving two hired purse seiners to provide information on catch rates, resource availability and species composition. After one year of operation the results have been discouraging. The main problem is that the small pelagic fish does not aggregate in sufficiently large schools to make purse seining feasible. The vessels also have problems with the seasonally strong currents in the Ras Hafun area, which make purse seining difficult, if not impossible. Insufficient engine power of the purse seiners also makes them less suitable for purse seining on fast swimming large pelagic species. The exploratory phase which will be run for another year will be slightly modified. In addition to purse seines the vessels will have installed trawls and bottom and surface gill nets. The two vessels have each one fisheries biologist onboard during their entire period of operation and all activities have been well documented and a lot of data have been collected. The offshore component of the project, even though it does not look promising for the moment, should not, if it would succeed in its aims, imply any overexploitation of the small pelagic resources.

The inshore component is still in its preparatory phase. DANIDA has agreed to set up a cold store in Bosaso, and this will form the core of the artisanal component. Eight mechanized boats are being rehabilitated with new engines and will be operational when the fishing season starts in September 1986.

The annual artisanal catch in the project area (Bosaso-Alale) is at present of the level of 100-200 tonnes. The project has plans for an annual production of 1,600 tonnes after the third year of operation, and should be fully developed with 4,000 tonnes after 7 years (World Bank, 1984).

The shelf in the region Mait Island - Alale is 1,940 km^2. If this was considered to be the operational area for the fully developed project a yearly harvest intensity of 2.1 tonne/km^2 should be expected. To sustain such a high yield a standing stock of the order of 8.4 to 10.5 tonnes/km^2 of commercial valuable fish would be required.

This mission has not come across any survey data which indicate such high densities in Somali waters. The target for the third year of operation, 1,600 tonnes seems to be justified based on the limited but available information. It is a serious drawback for all the projects aimed at developing the fisheries on demersal species in Somalia, that so little and fragmented information is available on the true level of the stocks. Both NECFISH and the whole fishing sector in Somalia would probably benefit greatly, if the combined purse seiners/trawlers now working for NECFISH in the project area would spend some of their remaining time, say 1 month, to carry out a systematic trawl survey in the area Bosaso-Ras Mabber.

4. RESEARCH AND STATISTICS

4.1 The State of Fisheries Research in Somalia

The organization plans for the Ministry of Fisheries is given in Figure 3. The Department of Research, which is headed by a director is divided into three sections 1) Laboratories and research 2) Library and documentation, 3) Translations. The department has no laboratories and is at present not carrying out any research activities. Documentation from previous surveys is in many cases lacking, reports have disappeared from the department. There are no modern copying facilities available for internal or external spreading of information. No personnel with background training in fisheries science are at present working in the Department of Research.

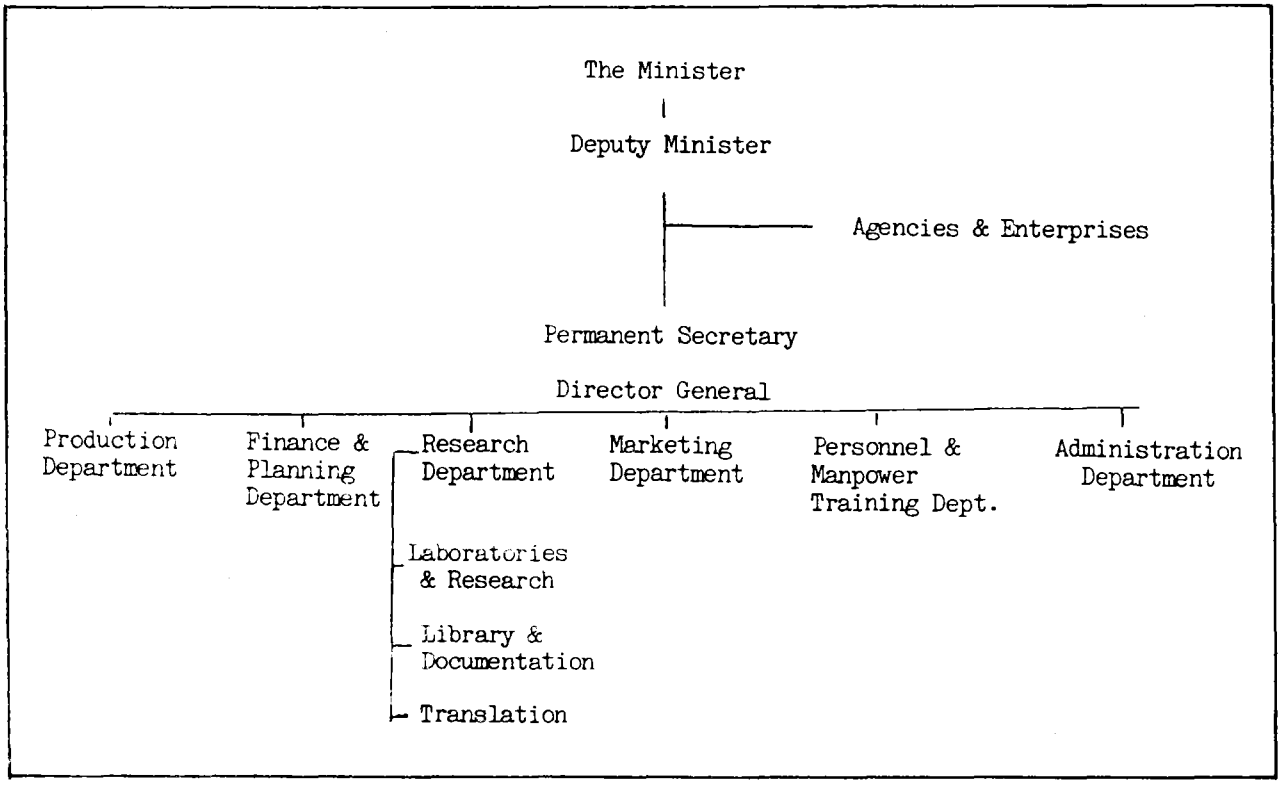

Figure 3. Organizational plan for the Ministry of Fisheries

One person has received training in fisheries science and is now working abroad. Two students are at present in Southampton, England, to study marine science, oceanography. Several persons now working in the Ministry have received training abroad, mainly Japan, in the field of fishery technology, processing and co-operative management. There are for the time being no concrete plans for survey activities in Somalia waters except that Japan will carry out a limited survey in the region Brava-Mogadishu during the next year. Further details on this survey were not given. The Department of Research does not carry out any biological sampling in fishing harbours or at fish markets.

During a joint IOC/FAO/SIDA/SAREC marine science mission to Somalia in September 1977, plans for an institute of marine research under the administration of the Ministry of Fisheries were presented (IOC/UNESCO 1978). A site North of Mogadishu was chosen for the new building and US$ 55,000 were allocated for equipment. The institute, which in 1977 was expected to be completed in 1980, has not been raised and during the visit of this mission in 1986 no plans for the institute were presented.

4.2 Fishery Statistics

Production from the three main fisheries projects is well documented. Especially Somali Marine Products, which is the only one that has passed the initial stage and has good documentation on catch per day per cooperative, number of men and boats involved, etc. At the factory in Kismayo, production is recorded daily by main fish categories. No sampling of size distributions are at present carried out. The offshore operations by NECFISH are well documented. Biologists are onboard the two vessels and reports from all surveys have been produced. A lot of data has been gathered from the operations. However, the statistics produced by the licenced trawlers are very poor. The Ministry of Fisheries receives information only on total catch and days at sea for a whole fishery operation period. Observers, with responsibility to report to the Ministry of Fisheries, are on board all trawlers. They are given forms to record the daily activities of the vessels, but the forms are not filled out.

5. CONCLUSIONS AND RECOMMENDATIONS

A serious limitation in the preparation of this report has been the lack of reliable information on the precise abundance of the demersal fish stocks in Somali waters. There are at present three ongoing fishery projects in the country, with all prospects for considerable future expansion. The need for assessment of the resources is therefore evident. The available information indicates that the level of the demersal resources might be lower than expected. The Spanish trawl survey in 1981 and catch records from the Italian trawlers operating in the period August 1978 to May 1979 suggest an average density within the range one to four and more likely one to two tonnes per km^2. The precision of this estimate is quite low, but it seems to be the best information available.

At present, the ongoing fishing activities seem to be within safe limits of what the resources can sustain. The prospects for development in the next 2-3 years seem also to be safe. But long-term development plans might over-exploit the resources considerably if they were realized. The given indications of a demersal fish biomass lower than assumed should be sufficient to set into action a programme to improve the knowledge of the state of the demersal resources. These considerations do not apply to the stocks of small pelagic fish, the abundance of which seems well estimated, and for which all plans for exploitation are within safe limits. There does not seem to be any rare marine species with exclusive distribution within Somali waters which is threatened by human activities. Hence no immediate total protection measures are needed for any species. There are reasons for concern over the heavy fishing of marine turtles that takes place in the coral reef areas, either aimed or as a coincidental by-catch. More information is needed about the number of turtles caught and their standing stocks. More detailed information on this subject and recommendations for action are covered in the Sectoral Report on Marine Protected Areas and Reserves.

Fishery research in Somalia is at present virtually non-existing, and major investments in education, training, and research facilities seem necessary before the country can undertake the necessary activities to monitor and manage its own marine resources on a scientific basis. Until this happens, some few and less costly activities should be carried out, such as systematic collection of previous reports and data, and a certain minimum collection of new data. This should at present be linked to the ongoing fishery development projects in the country, which themselves would benefit from the results from the scientific activities.

The knowledge of the state of the fish resources, the demersal ones in particular, can be improved by a series of actions, all to be worked out concurrently. The following main steps should be taken:

A. Collect reports and background data from all resource surveys carried out in Somalia and establish a system for copying, filing and securing storage of these data. This could be done as follows:

   (a) Contact all relevant institutions and request a list of reprints and data related to fisheries research in Somalia. The request can include a special checklist for reports and data of special importance that are lacking.

   (b) On the basis of the list received, request for a copy of important missing reports and data.

   (c) Make sufficient copies of the reports and store a master copy of reports and data under the responsibility of a librarian. Master copies should not be personal copies. Catalogue all data and reports.

   (d) Make an English translation of the Spanish survey report.

B. Make a critical evaluation of the reports and use them to assess the abundance of the resources.

   (a) Request a fishery resource assessment expert to evaluate the reports and see what further use can be made of available data, and if recommended carry out further analysis of data. Assess the resources on the basis of available information.

C. Enforce proper statistical reporting from the commercial trawlers.

   (a) The demand for proper statistical reporting should be built into the terms of the license/contract with economical implications if certain minimum requirements are not fulfilled.

   (b) Establish mechanisms which will stimulate the observers on board the commercial trawlers to proper reporting to the Ministry of Fisheries.

D. Carry out systematic trawl surveys.

   (a) In cooperation with NECFISH, plan and carry out a trawl survey with one of the trawlers now operating in the project area in the exploratory phase of the programme. Use the biologists already on board as cruise leaders and authors for the reports from the surveys if necessary under the assistance of an advisor in the planning and reporting phase.

(b) Request, through FAO, one of the countries with traditions in fishery science for assistance from an associated expert to be stationed in Kismayo.

(c) In cooperation with Somali Marine Products and Ministry of Fisheries this expert would carry out trawl surveys in the Kismayo region with one of the new 10 meter trawlers that soon will be included in the project.

(d) The expert is also to be responsible for carrying out sampling of the catches at the fishplant in Kismayo and for using the available data for stock assessment/monitoring of the stocks.

E. Select promising candidates to form a future core of fisheries scientists in Somalia, set up an educational programme for these candidates and give them education and training abroad.

(a) Request assistance from FAO on which criteria to select candidates. Test candidates motivation and capability for training in fisheries biology at higher level.

(b) Through FAO apply for seats in relevant institutions (i.e. North Sea Center, Denmark and Bergen University, Norway).

(c) Train the students for future work in fisheries biology and use them as national counterparts in future joint surveys (acoustic or trawl surveys).

F. Select a team of people to form the future core for collecting fisheries statistics in Somalia and train these candidates in statistical techniques and basic fish taxonomy/classification.

(a) Request FAO to set up a training course in fisheries statistics, sampling methods and fish taxonomy.

(b) Select candidates for future placement in Berbera, Bosaso, Mogadishu and Kismayo and with sufficient background to attend the courses.

(c) Set up a systematic sampling programme of the four above mentioned sites.

Somalian fishery biologists receive training and experience in planning, conducting and analysing of trawl surveys through their assignments as counterparts to foreign experts. Later on they will take over full responsibility for trawl surveys for monitoring purposes.

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ANNEX V

SECTORAL REPORT

ON

MARINE PROTECTED AREAS AND RESERVES

BY

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CONTENTS

1. GENERAL DESCRIPTION OF SOMALI COASTAL AND MARINE AREAS

1.1 General

Somalia lies on the eastern coast of the African Continent (Figure 1). Its coastline forms the Horn of Africa and is thus divided into a northern component (Gulf of Aden) and a southern component (Indian Ocean). The North coast is about 1,000 km long and the southern component is about 2,000 km long making it one of the longest national coastal areas on the continent. The country straddles the equator, but its major portion lies North to about 12°N. It is typically dry and is covered in semi-desert grassland and shrubland, bushland thickets dominated by Acacia and Commiphora. The coastal areas of Somalia contain habitats for three endangered marine species excluding the great whales that inhabit the Indian Ocean. These are, the Green Turtle (Chelonia myday), the Hawksbill Turtle (Erotmochelys imbricata) and the Dugong (Dugong dugon).

1.2 Oceanography

The nearshore marine environment of Somalia is dominated by the South-West Monsoon (April to October), the North-East Monsoon (November to March) and their effects on the oceanic current patterns of the western Indian Ocean as shown in Figure 2.

The westward flow of the South Equatorial Current is deflected northward and southward by the East African coast near the border to Tanzania and Mozambique. During April to October the northward component, the East African Coastal Current (EACC), flows along the coast of Tanzania, Kenya and Somalia toward the coast of Yemen and Oman. Near the island of Socotra the EACC merges with the water mass moving North-east from the Gulf of Aden called the South West Monsoon Current. During November to March the North-east Monsoon generates a southward-flowing current along the Somali coast called the Somali Current. This current meets the EACC near the Kenya-Somali border where they are deflected eastward and merge to form the Equatorial Counter Current. In the Gulf of Aden a South-west flowing current is generated called the North East Monsoon Current. During the South-West Monsoon the EACC is strongest with current speeds of about 300 cm s^{-1}. This causes an upwelling on the EACC's West flank with surface temperature below 20°C and salinity in the range of 35 parts per thousand. By comparison the prevailing surface temperature in waters further off the Somalia coast is in the range of 24-27°C. The higher nutrient content of this upwelled water induces a high productivity along the Somali Coast relative to the waters off Kenya and Tanzania.

More detailed information concerning the oceanography of the Somali coastline can be found in UNEP Regional Seas Reports and Studies nos: 6, 8, 10, 11, 12, 50, 57 and 64; and in sectoral reports on Pollution, Marine Pollution Emergencies and Fisheries.

1.3 Coastal area types

In general the land area contiguous to the shoreline of the Somali coast consists of:

(i) flat, sand and gravel covered, coastal plains of varied width and usually occurring at the mouth of wadi systems;

(ii) mountains with precipitous cliffs that form a rocky shoreline; and

(iii) coastal dunes that are active, i.e. have no vegetation cover, or are covered with thorn-bush scrub and acacia woodland.

At the shoreline of the dune and coastal plain systems there is generally a sandy beach. In the North from the Somalia-Djibouti border to Ras Asir and from Ras Asir South to around Eil the beach sand is derived from wind and water eroded rock. From South of Eil to the Kenya border the beach sand is partially or fully derived from eroded pleistocene or contemporary coral reefs.

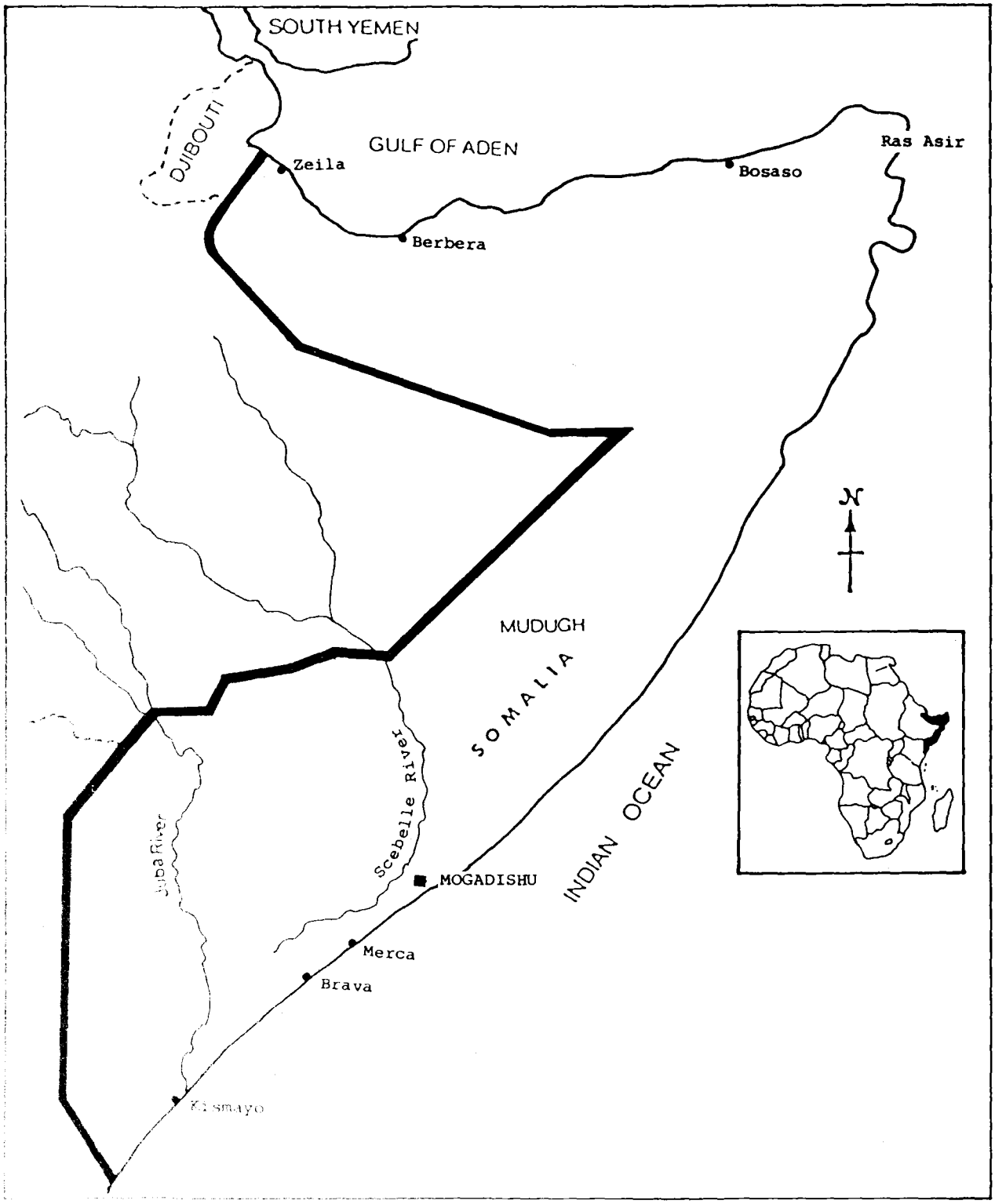


Figure 1. Map of Somalia

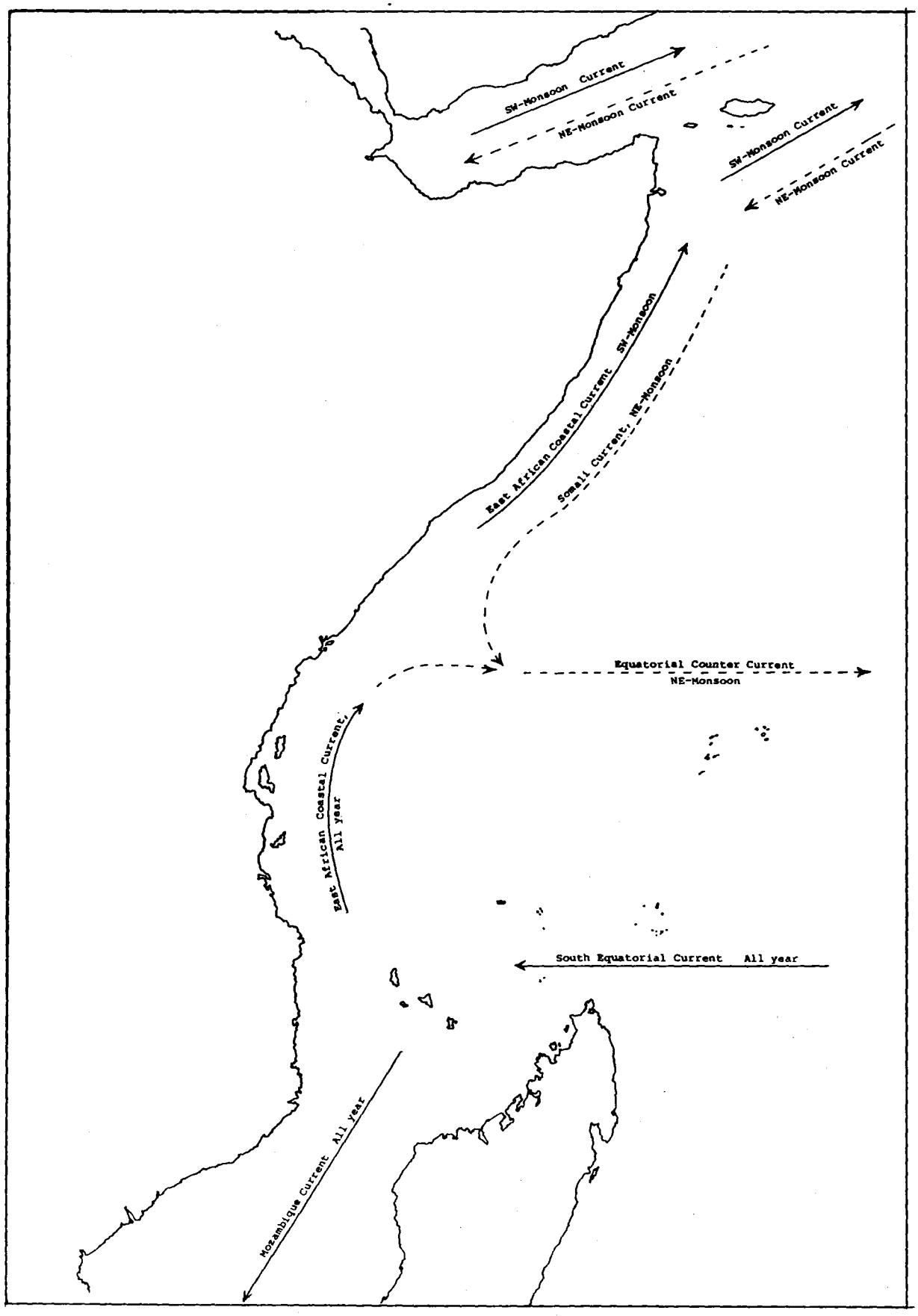


Figure 2. Major currents along the East African coast

From Meregh South to the Kenya border the shore overlies a pleistocene fossil coral platform. This platform continues southward through Kenya and Tanzania and most of Mozambique. The platform is generally 0-3 meters above present sea level and along much of the East African coast it forms the land-ward extreme of coral beaches or a rocky cliff at the shoreline. In the latter areas the cliff face extends underwater to about 1-5 meters in depth. From Kismayo to the Kenya border this old coral platform has been eroded leaving a series of islands lying parallel to the present shoreline. These islands and the shallow waters between them form a barrier system inshore of which there is effectively a reef flat typical of the kind inshore of the living fringing reefs further South in Kenya, Tanzania and Mozambique. North of Kismayo similar islands occur only near Merca and Brava. The islands are about 1 km offshore (a map showing the location of this offshore island system is presented with information on coral reefs and mangroves in Figure 5.

A diagrammatic representation of the major coastal backshore and foreshore types is presented in Figure 3.

The near- and off-shore areas of Somalia can be divided into four somewhat distinct regions.

From the Djibouti border to Alale the sea floor has a gradual slope to a depth of 15 to 250 meters and forms a shelf generally less than 5 km in width running roughly parallel to the shoreline. Beyond this shelf, bottom depth increases rapidly to about 1,000 meters. Near shore the bottom is primarily sandy but changes to fine sediment with increasing distance from shore to the shelf edge.

From Alela to the area between Ras Hafun and Bender Beila the slope of the bottom is much less pronounced than to the West of Alela and the edge of the shelf extends out to and surrounds the island of Socotra. This part of the coastline has many rocky cliff areas which extend 1-10 m below sea level at the shoreline.

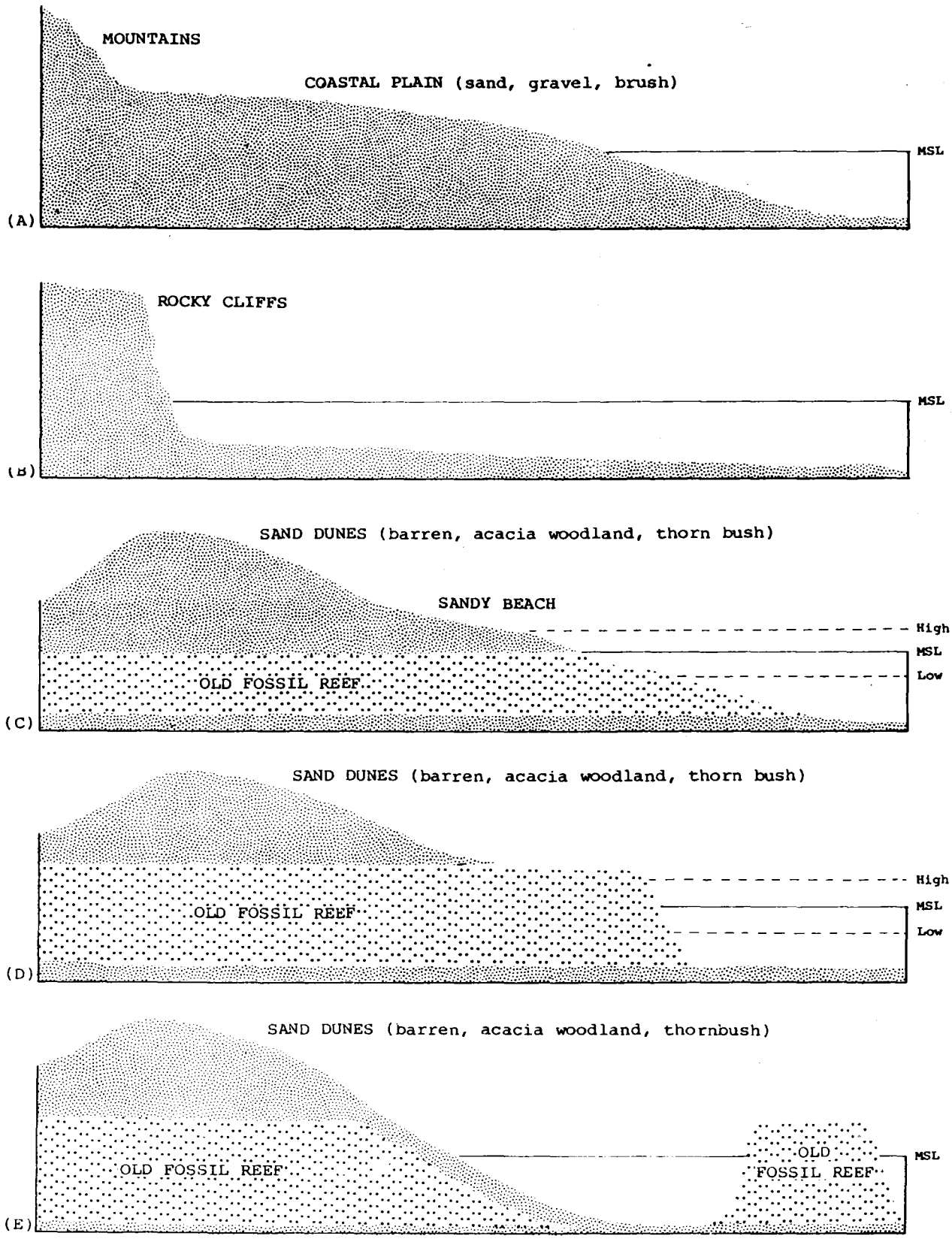
From Bender Beila South to Chiamboni the shelf is fairly narrow but the transition from the upper shelf to 1000 m depth is less preciptous than on the North coast. The 200 meter contour, which generally defines the upper limit of the shelf slope, runs roughly parallel to the coastline about 8-20 km offshore. The 1,000 m contour which defines the lower limit of the shelf slope is roughly 30-50 km offshore.

From Adale South to Chiamboni there is a fringing reef system which consists of eroded fossil reef on which is superimposed live coral reef. Between Adale and a point about 20 km south of Merca this reef is breached only off Mogadishu and lies generally 500 m to 1.5 km offshore. From 20 km South of Merca to Kismayo the fringing reef is noticeably less than 500 m offshore and in several places converges with the shoreline so there is no reef flat. South of Kismayo the fringing reef is broken by a series of fossil-coral islands lying 500 m to 1.5 km offshore which are un-eroded portions of the old pleistocene coral platform which extends southward along most of the East African coast (Figure 4).

1.4 Marine Biotopes and Species

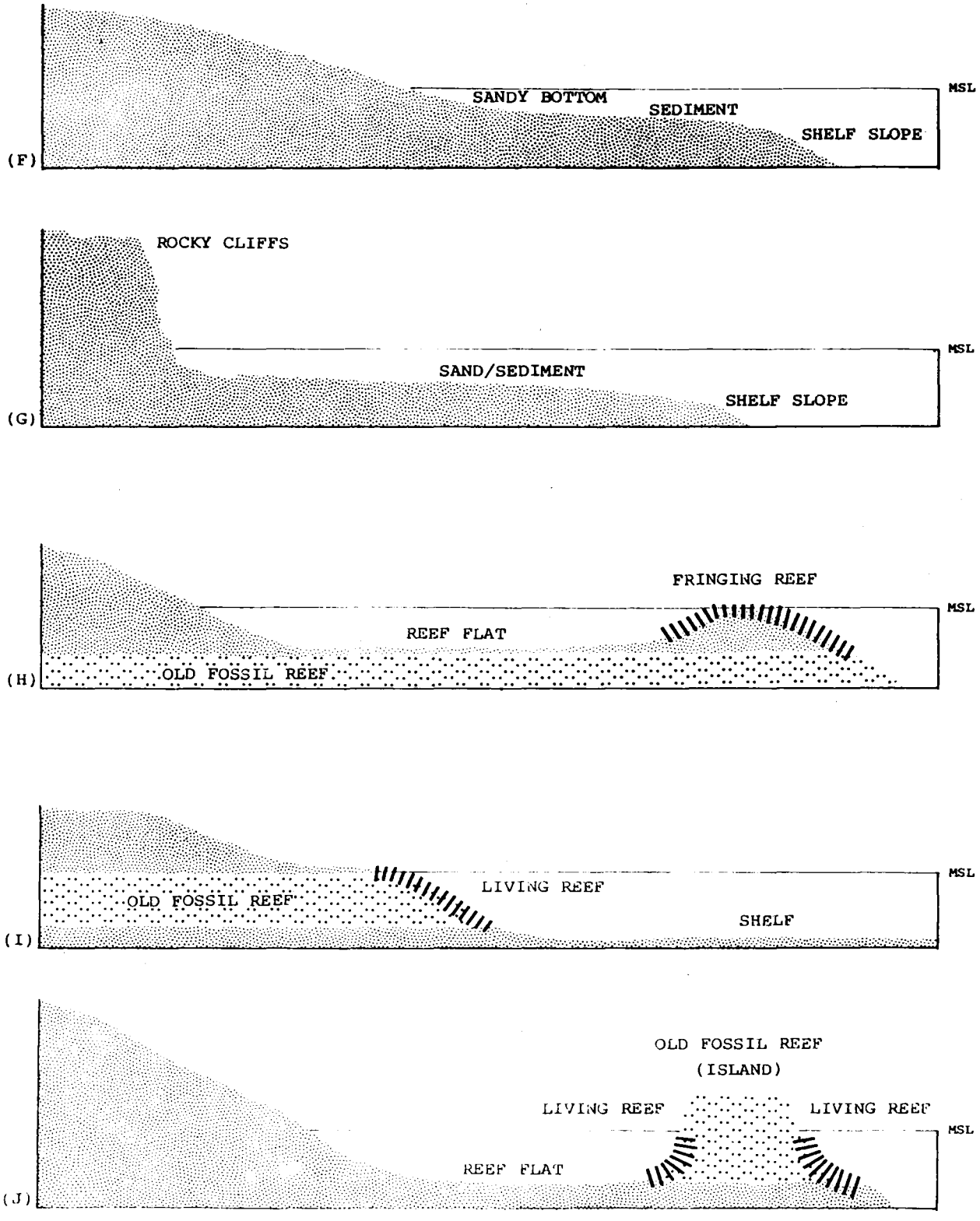
1.4.1 Introduction

There is no information available in the scientific literature which systematically describes the marine and coastal biotopes and marine species of Somalia. There are reports of fisheries investigations which have taken place off Somalia. Most of the information in these reports concerns pelagic and demersal fisheries and are reviewed in the Sectoral Report on Marine Living Resources. At least one of these reports contains information on the inshore fishery along the southern coast of Somalia. The range of species taken (e.g. snappers, groupers, spiney lobster), sheds light on the coral reef/reef flat system in that area.



MSL = Mean Sea Level

Figure 3. Types of coast, foreshore and offshore in Somalia



MSL = Mean Sea Level

Figure 3. (continued)

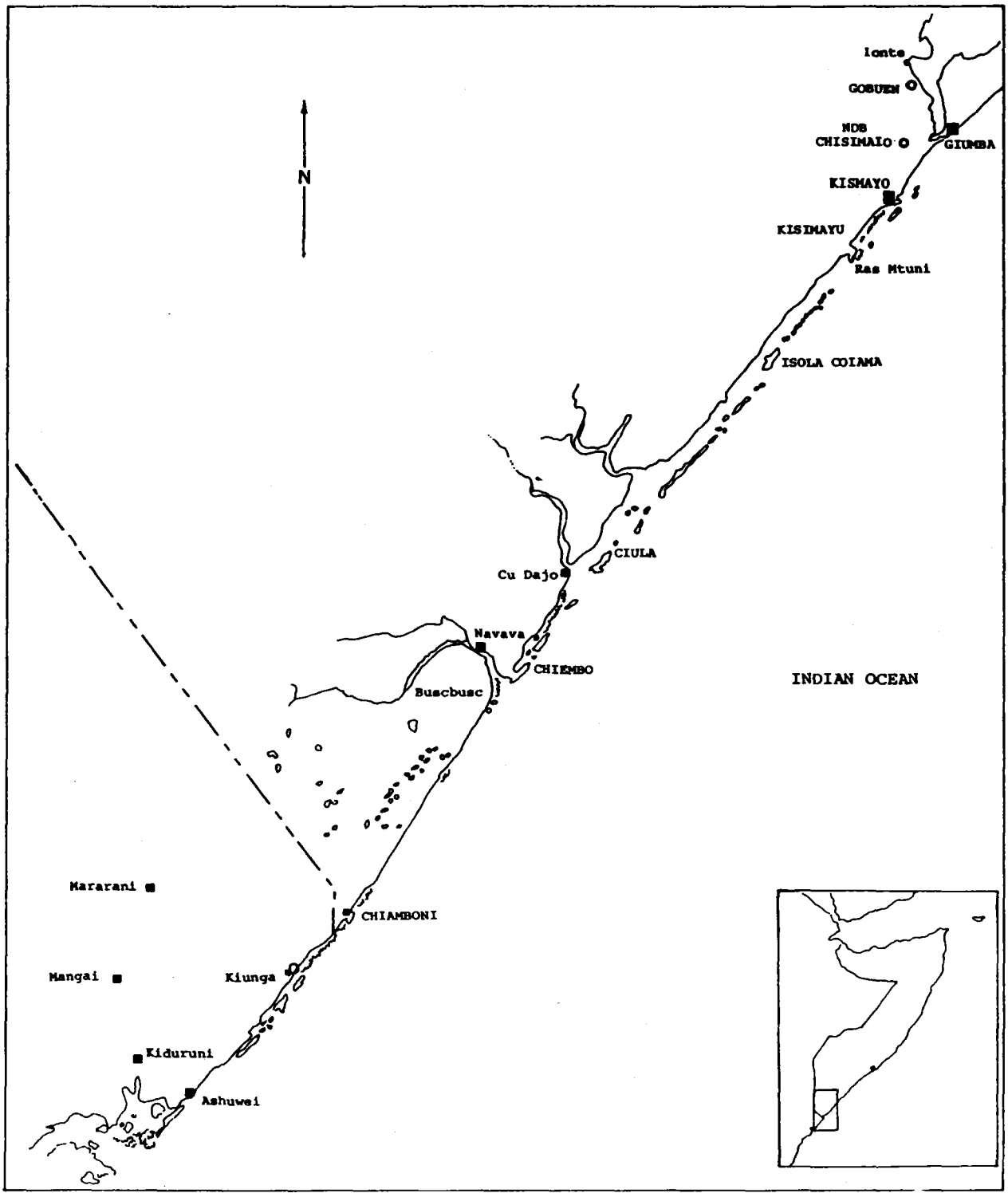


Figure 4. Somali coast south of Kismayo

The summary of information presented here is based on personal observations during the mission (Berbera, Mogadishu, Gezira, Merca, Brava and Kismayo) and on interviews with government officials, researchers, fishermen, and individuals familiar with the coastal areas of the Somali coast. In addition certain information is extrapolated from reports on other areas of the East African and Arabian coast which have coastal ecosystems most likely to be similar to certain areas in Somalia.

1.4.2 Sandy Beaches/Rocky Shores

Sandy beaches and rocky shores occur along the full length of the Somali Coast. On the North coast (Gulf of Aden), both systems are roughly of equal distribution in length. The beach 5 km East of Bossaso is considered to be typical of the sandy beaches of the northern Somali coast. The beach sand is mainly derived from wind and water eroded rock. There is no fringing reef. The mouth of a large wadi system constitutes the backshore. This is made up of a mixture of sand and eroded rock and gravel. Thorn and other scrub-bush also occurs there. In the tidal zone the beach consists of medium-grained sand mixed with broken shell material. Broken pieces of bivalves, cuttle-fish bone and the pearl oyster, Pinctada, are found in the beach rubble. The beach has a gradual downward slope which continues offshore. There are a few scattered outcrops of accreted sandstone containing shell rubble both above and below the tide line. Shore birds, ghost crabs and halophytic beach grass were conspicuously absent. Detritus on the beach consists mainly of small wood branches; it contained no sea-grass, algae, or coralline algae fragments. The beaches along the Indian Ocean coast South of Eil consist of sand derived from eroded rock and carbonate sands derived from broken shell and reef material. The former predominates North of Mogadishu and the latter along shore South of Kismayo. South of Eil the backshore consists predominantly of large sand dunes which are either barren or covered with Acacia or thorn bush. The beaches are populated with ghost crabs. In many areas during the South East Monsoon there are very large deposits of sea grass (Poisidonia). Also during the South East Monsoon there are deposits of Portuguese Man-of-War at the upper tide line. Beach detritus contains materials derived from corals, coralline algae, and molluscs. There are outcrops of pleistocene coral in a few places. In some areas a low cliff or headland is formed by this old coral platform which occurs anywhere from the backshore of the beach to the shore line.

On the Gulf of Aden coast from Djibouti to Ras Asir and thence southward to the South of Eil the rocky shores are formed by mountains which meet the sea at the foreshore. Between Eil and Meregh the rocky shoreline is made up of a pleistocene coral platform which extends along most of the East African coast as far South as southern Mozambique. South of Kismayo a series of rocky islands derived from this platform occur parallel to the shoreline (see Fig. 5). Chitons, limpets, crabs (Pachygrapsis spp.) and snails were observed on rocky outcrops visited in Gezira, Merca, Brava and Kismayo. The rock oyster, Crassostrea spp., which is common throughout the Indian Ocean where it occurs on mangrove stands and rocky shores, was not visible on any of the exposed rocks in the areas visited except in well protected, enclosed locations such as in Kismayo harbour. Information on the rocky shore communities along the Gulf of Aden coastline and North of Eil to Ras Asir is not available.

1.4.3 Coral Reefs

There is a fringing coral reef from a few kilometers South of Adale to Chiamboni. There is a break in the reef off Mogadishu. Between Warsheik and a point South of Merca the reef runs parallel to the shoreline at about 500 m - 1.5 km offshore. South of Merca to a point just North of Kismayo the fringing reef is only a few meters offshore. South of Kismayo to Chiamboni the reef is again 500 m - 1.5 km offshore and is broken by the series of coral islands mentioned in the previous paragraphs (Figure 4).

There is no published information about the coral species occurring on the Somali coast. Nonetheless, the Somali reefs are the northward extension of the fringing reef parallel to the Kenya and Tanzania coastline. In those reefs the coral consists primarily of Porites spp., branching Acropora spp., Pocillopora spp., colonies of Cyphastrea spp., Galaxea spp., and Millepora. Other reef species include Ophicoma crinaceus, E. Matthaei and Diagema spp., Echinothrix, the large blue starfish, Linkia spp., and the giant clam Tridacna squamosa. Conspicuous molluscs are the tiger cowrie, Cypraea tigris and the large oyster Pinctada margaritifera. A number of souvenir shops were visited in Mogadishu which had specimens of shells of many of these organisms on sale. Proprietors of these shops insisted that merchandise was from southern Somalia. In addition, observations of reef fish landed by fisherman working along the southern Coast at Merca, Brava and Kismayo indicate that the species found on Somali coral reefs are typical of those found on other reefs of the western Indian Ocean to the South.

1.4.4 Mangroves

Isolated stands of Avicenna Marina have been reported to occur behind sand spits along the North coast of Somalia. None were seen during the mission and interviews with personnel from the Ministry of Marine Transport and Ports working in the area indicated there are not extensive stands.

Mangroves occur in tidal creeks along the coast of southern Somalia. One isolated, very small stand of mangrove was observed South of Gezira; no mangrove was observed at Merca, Brava or Kismayo. Satelite and aerial photographs held at the National Range Agency show no evidence of mangrove occurring along the coast between these locations. South of Kismayo there are three fairly large tidal creeks that are fringed with mangrove stands. These stands appear to be fairly narrow (less than 20 meters). These areas are part of a fairly developed system of coastal mangrove located just across the Kenya border at Chiamboni which extends southward to Lamu Island. The coastal area near the Kenya border (Boni and Dodori National Reserves) is known to contain the mangrove Rhizopora mucronata mixed with coastal lowland forest (Sterculia, Chlorophora, Memecylon) and lowland dry bush containing Manilkara, Diospyros, Encephalartus and Euphorbia in drier areas. Thus it is highly probable that a similar distribution exists in the areas between Kismayo and Chiamboni. Interviews held with a number of merchants in the Kismayo market who were selling mangrove poles they had harvested, bear out this assumption and corroborate estimations that the mangrove forest of Somalia is fairly limited.

1.4.5 Seagrass

There is no information concerning the distribution of seagrass in Somalia. In the Indo-west Pacific about 50 species are known to occur. Generally they occur on soft-bottom substrates in the intertidal and shallow sublittoral. Nevertheless some species, e.g. Halophila stipulacea and Thalassodendron ciliatum occur down to 20 or more meters.

No seagrass beds were observed East of Berbera on the North coast of Somalia. In addition there was no evidence of seagrass detritus of the beach areas visited. Likewise interviews with personnel from the Ministry of Marine Transport and Ports indicate that the Green Turtle and Dugong, both of which feed on seagrass beds, are not frequently found in the area. Nevertheless bottom topography and the extensive potential for soft bottom substrates along the North coast of Somalia make the occurrence of significant quantities of seagrasses highly probable.

Along the South coast of Somalia at least from Adale to Chiamboni seagrass beds occur extensively. Large masses of detrital material derived from seagrass was observed at Gezira, Merca, Brava, and Kismayo. Similar observations are commonly made along the Kenya and Tanzania coasts.

1.4.6 Marine Mammals

Several cetacean species are known to occur in the Western Indian Ocean including the Blue, Fin and Humpback whales. Although there are no systematic records reporting their occurrence, purse-seiners operating off the Somali coast during 1985-1986 indicate they frequently sighted Humbacks. Fishermen interviewed during the mission in Merca and Brava indicate they often see whales. One small Humback (estimated weight of 15,000 kg) was beached in Brava harbour during June 1985. There is one record of a stranding of the most elusive cetacean, Longman's Beaked Whale (Mesoplodon pacificus), on the North coast of Somalia in the 1960s.

Dugongs (Dugong dugon) have been reported to occur throughout the Western Indian Ocean and the Red Sea and Gulf of Aden. Generally they are associated with seagrass beds on which they feed. No studies of their distribution in Somalia has been made but there are a few indications of their presence. The Ministry of Marine Transport and Ports indicates that they are very occasionally sighted along the North coast of Somalia. In 1960 there was a report of a herd of 600 dugongs around the Chiombo area in the South of Somalia. Fishermen at the co-operatives in Merca and Brava indicated that while they are rarely seen they are thought to be present in the mangrove areas between Kismayo and Chiombo. Fishermen interviewed at the Kismayo market indicated that although dugongs are not hunted they knew of their whereabouts and could find them if desired. (A painting of a dugong was present on the murals of the fishermen's co-operative buildings in Brava.) The Fleet Manager at Somali Marine Products in Kismayo indicated that no dugongs are seen to be taken by fishermen working the southern Somali coast but their presence is common knowledge. South of Chiomboni near Lamu there are still sightings of dugongs reported by coastal inhabitants but most indicate there numbers are much less than 20 years ago.

1.4.7 Marine Turtles

Green, Hawksbill, Ridely and Leatherback Turtles are known to be present in the western Indian Ocean in fairly substantial numbers. There are no studies of the distributions of any of these species in Somalia. It can be presumed that many or all nest on some of the many sandy beaches of Somalia. During the visit of the mission to Gezira, three Hawksbill turtles had been landed and were being butchered and distributed to local villagers. The fishermen indicated that turtles were common along the coast and that as many as 2-3 turtles could be taken by each fisherman daily. Similar estimates were given by fishermen in Merca, Brava and Kismayo. In souvenir shops in Mogadishu, shells of Green and Hawksbill turtles were common. Several of the Mission's Somali counterparts indicated that turtle shells are a very common house decoration throughout the country. During the mission there was no evidence of turtles nesting on any of the beaches visited and none of the fishermen or coastal residents could give information on the whereabouts of nesting beaches. Neither was there any evidence that coastal residents harvest turtle eggs.

1.4.8 Fisheries

Artisanal fishing is scattered along the entire Somali coast. Since the 1970s the government has encouraged and supported the development of fishing co-operatives. During the 1973-1974 drought the government resettled many of the nomads along the Somali coast and has made efforts to train them in fishing skills and provide them with equipment. Because of weather conditions, fishing effort is confined to the North East Monsoon. Thus, fishing days per year are limited to between 140-150. There are several development projects which aim to increase the efficiency of the local fishing effort (described in the sectoral report on Marine Living Resources). From a conservation point of view the most important fishing efforts involve the catching of turtles (described in the previous paragraph) and the artisanal fishing that takes place on the reefs in southern Somalia.

Observations and interviews at the fishing co-operatives at Merca and Brava and in the cold stores of Somali Marine Products in Kismayo indicate that the most important species caught in the coral reef areas include a number of sharks (Hammerhead, White Tipped reef sharks, mako), Lethridinds (scavengers), Serranids (groupers), Lutjanids (snappers), Pomadasyids (grunts) and Sparids (seabreams). Along the coast South of Kismayo there is extensive fishing for a number of rock lobsters of the genus Panularis. In 1985 the production of lobster recorded by Somali Marine Products was 55.9 tonnes. The Fleet Manager indicated that a considerable additional amount of lobster is caught in the southern area of Somalia but is sold to fish brokers from Kenya who move the catches across the border to Lamu, Malindi and Mombasa.

Fishing for lobsters is confined to the reef flat area between the shoreline, the offshore islands and the fringing reef, and to the shallow areas outside the reef. There are about 400 active fishermen working in the area between Kismayo and Chiamboni according to records of Somali Marine Products. By contrast the number was between 1,000 and 1,500 ten years ago. Lobsters are taken by hand by divers who free-dive. It is estimated that a single diver can take as many as 8-10 lobsters per hour. There are virtually no facilities for SCUBA diving in the fishing areas that are used or even accessible by divers. Somali Marine Products has set a minimum size-limit of 23 cm (eye to tail) and 460 gm on the lobsters it will purchase. The amount of lobster under this limit which is sold elsewhere could not be determined.

1.5 Conclusions and Recommendations

Detailed descriptions of the marine biotopes, marine species and their distribution in Somalia are not available. Such descriptions form the basis for conservation action and are badly needed for Somalia. While much information can be extrapolated from information on nearby regions, particularly the North Kenya coast and the western Indian Ocean this would not provide the detailed information needed to take specific steps.

It is recommended that a survey of the coast of Somalia be undertaken for the purpose of mapping the distribution of key littoral and marine habitats. This survey should be undertaken in several stages. The first stage should be a survey of the fringing reef area between Adale and Chiamboni. The second stage should cover the North coast from Djibouti to Ras Hafun; and the third stage from Ras Hafun to Adale. During the first stage emphasis should be given to the area between Kismayo and Chiamboni since this is the area that is most affected by development activity and exploitation of marine resources in the coastal areas at present.

2. EXPLOITATION OF MARINE SPECIES

At present the most important exploitation of marine species from a coastal conservation point of view involves marine turtles, dugongs, coral reefs and mangroves. There is no published information concerning the extent to which this exploitation takes place nor are any records kept regarding the numbers of persons involved in exploiting these resources. The information here was gathered through interviews and personal observations during the mission.

2.1 Marine Turtles

Although there are no accurate records of marine turtle catches they may be very significant. At Gezira it was estimated that there are 20 active fishermen each of whom catch as many as 3-4 turtles per week. At Merca the estimate was forty fishermen catching as many as 15-25 per month each. At Brava the estimate was forty fishermen catching as many as 15-25 per month each. At Brava the estimate was forty fishermen catching 1-2 per day. Between Kismayo and Chiamboni there are 400 fishermen catching an estimated 3-4 turtles per week. It is difficult to assess the probable accuracy of these figures but assuming that 500 fishermen (between Gezira and Chiamboni) are catching 0.5 turtles per day (close to the lowest estimated rate of catch) during 150 days of active fishing, the total catch would be around 3,500-4,000 turtles per year. It was

not possible to determine all the species commonly caught but most of the shells observed in shop displays were from Green and Hawksbill turtles.

It is not possible to make a similar estimate of turtle catch for the northern coast of Somalia but it is probable that the overall catch is not as high due to the very limited number of active fishermen there at present.

2.2 Marine Mammals

While there are no records of catches, nor did any of the fishermen interviewed give any indications of active exploitation of dugongs, it is probable that they are hunted, at the very least, on an incidental basis, in the southern coastal area around Chiamboni.

There is no effort to harvest whales in Somali waters. On extremely rare occasions, beached whales are utilized.

2.3 Fisheries

The fishing for lobsters along the coral reefs between Kismayo and Chiamboni produces at least 50 tonnes of lobster a year. In the near future the production could rise to more than 150 tonnes a year. The increase could be made possible by the recruitment of more, active, fishermen, or by the gradual replacement of free-diving by SCUBA. There is no information available on which to determine the sustainable yield of the lobster fishery.

Other aspects of the fisheries in Somalia are presented in the Sectoral Report on Marine Living Resources.

2.4 Coral Reefs

Coral reefs are exploited for mollusc shells. In Mogadishu there are about 20 shops dealing in these shells. It was not possible to estimate what the sales of these shops amount to each year or the origin of the shells. While shop owners insisted that none were imported from Kenya or Tanzania most shops did contain other souvenirs from those two countries. The most common shells were Lambis spp., Charonia spp., Conus spp., Tridacna spp., and Cassis cornuta. Interviews with fishermen in Merca, Brava and Kismayo indicated that shells are only incidentally harvested during other fishing activities. Given the movement of other fishery products across the border at Chiamboni it is likely that some shells are also exported to brokers that are known to exist in Lamu, Malindi and Mombasa. Harvesting of coral to be used for ornamental purposes was not observed nor did any of the shops selling other reef products have coral for sale. By contrast live coral is removed in the reef areas off Mogadishu and other southern coastal ports to allow passage of vessels and to increase flushing of the water inside the reef to remove domestic wastes. One notable example is offshore of the slaughter house in Mogadishu where offal and other wastes are ejected directly onto the beach and the reef flat.

2.5 Mangroves

Mangrove poles were observed throughout Mogadishu, Merca, Brava, Berbera where they are commonly used as scaffolding material and roof supports in buildings, particularly older, traditional structures. The origin of these poles could not be localized. One of the experts in the Range Agency of the Ministry of Livestock, Forestry and Range speculated that they generally came from areas South of Kismayo, most probably around Lamu, Kenya and the Rufigi River basin in Tanzania where there is known to be an active trade in these products. There they are harvested, collected by brokers and shipped seasonally to the North coast of Africa and the Arabian peninsula on dhows.

Mangrove poles are sold at the market in Kismayo. They are cut in the areas South of Kismayo. Based on discussions with local merchants in Kismayo the number of persons involved in cutting and trans-shipping poles from these areas to Kismayo is limited to around 50. Merchants also indicated that harvesting of mangrove in Somalia is very limited compared to that taking place further South in the Lamu area of Kenya. The reasons given were that the supply of larger diameter, longer mangrove poles was very limited. One merchant-cutter indicated that in the southern most part of Somalia there are larger poles, but most of these get sent South to Lamu. It was not possible to obtain enough information on which to base estimates of the total harvest of mangrove poles.

According to personnel in the National Range Agency, the mangrove in southern Somalia is grazed by camels, but there is no information concerning the extent to which this takes place.

2.6 Conclusions and Recommendations

With the exception of fisheries records kept by fish brokers such as Somali Marine Products in Kismayo, and those of some joint-venture fishing companies, there is no active effort to monitor the exploitation of marine and coastal species in Somalia. Speculative estimates of the catches of marine turtles indicate these species are possibly being exploited at an alarming rate. In the case of the lobster fishery along the South coast there is no information which could be used to estimate sustainable yields. There is limited but ongoing harvesting of ornamental shells. While there is very little knowledge available concerning the extent of the mangrove system or its use, it is being exploited. Finally the exploitation of dugong is probably taking place to at least a limited extent South of Kismayo.

In spite of the situation mentioned above, over-exploitation of marine species is probably not serious at present, with the possible exception of marine turtles and the coral reef lobster fishery. This is largely due to the limited number of people actively exploiting various marine species as well as the limitations of the artisanal methods used. In the case of the mangrove harvesting it is probably also due to the poor quality of poles available and the distance they have to be transported to market. Any significant effort to increase the number of persons utilizing these marine resources or the modernization and mechanisation of methods used in their exploitation could lead to quick, and possibly very significant depletion of stocks. For example the employment of SCUBA equipment in the lobster fishery or the active marketing of turtle meat could deplete populations of these species very rapidly.

It is recommended that a regular effort be made to monitor the taking of marine turtles, ornamental shells and lobsters. In addition a survey should be made to determine the nesting sites and species distribution of turtles along the Somali coastline. A programme of tagging of turtles should be implemented. On the basis of information gained, turtle fishing should be highly regulated and maybe prohibited. Parallel to this a programme should be initiated to educate fishermen about alternatives to catching turtles.

A survey of the lobster fishery in southern Somalia should be undertaken to estimate the extent of its sustainability. In addition the mangrove system in southern Somalia should be surveyed to determine its composition and aerial extent on the basis of which a plan for its management can be formulated. Finally, an effort should be made to locate and quantify the dugong population, particularly between Merca and Chiamboni. The Government of Somalia should request assistance of IUCN in order to do this as part of its co-operative project with UNEP concerning conservation of dugongs in East African coastal waters.

3. MARINE CONSERVATION IN SOMALIA

3.1 Marine Protected Areas and Species

At the moment, there are no existing or planned marine or coastal protected areas in Somalia. There are no laws or licensing practices concerning the taking of dugongs, marine turtles or ornamental shells. The size limit on lobsters purchased by brokers is self-imposed; there are no legal regulations governing their harvesting.

3.2 Legislation and Regulations

3.2.1 National

There is no national legislation in Somalia concerning the establishment and management of any marine protected area; nor are there any national laws or regulations governing protection of marine species or ecosystems.

3.2.2 International

According to the Legal Advisor to the Ministry of Justice Somalia is not a party to any global convention governing the conservation and protection of marine and coastal species including:

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);

Convention on Wetlands of International Importance Especially as Waterfowl Habitat (RAMSAR); and

Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

In June 1985 Somalia signed the Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region; and the Protocol concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region. Somalia expects to ratify the Convention and the Protocol before the end of 1986. Somalia has also signed the Convention of the Conservation of the Red Sea and Gulf of Aden Environment in 1982. The Government expects to ratify the convention before the end of the year.

3.3 Conservation and Management of Marine Protected Areas

There is no single ministry, other government unit or other organization in Somalia which is specifically responsible for the conservation and management of marine ecosystems or species. There are four Ministries which have jurisdiction over various activities or areas closely related to conservation of marine species or ecosystems. Their marine conservation related mandates are summarized below and explained in more detail in the Sectoral Report on Environmental Legislation.

3.3.1 Ministry of Livestock, Forestry and Range

Within the Ministry of Livestock, Forestry and Range is the National Range Agency which is responsible for National Parks. To date 14 terrestrial areas have been designated for various types of protection including national parks, biosphere reserves and forest reserves. To a large extent they exist only on paper and are not under active management and control. Five of the designated areas are bordered by or adjacent to the Somali coastline (and could therefore possibly provide administrative infrastructure to adjacent marine reserves). These are: (1) Awdhegle-Gandershe; (2) Daalo Forest Reserve; (3) Jowhar Warshek; (4) Lac Badana (Bush Bush National Park); (5) Zeila.

The National Range Agency maintains a Range School at Afgoi. At present the classes are limited to forestry and range management. There are no on-going classes specifically oriented toward park or reserve management but there are plans to initiate a wildlife course that will undertake field work at a small, newly established nature reserve near the school.

3.3.2 Ministry of Marine Transport and Ports

The Ministry of Marine Transport and Ports has jurisdiction for marine activities in Somali coastal waters. In practice its jurisdiction is extended inland 400 meters from the shoreline. It is actively engaged in port development and control in every major coastal settlement on the Somali Coast. In addition, it is the Somali National Focal Point for the Eastern African Action Plan.

3.3.3 Ministry of Fisheries

The Ministry of Fisheries is responsible for the development and management of fisheries resources for Somalia. Among its many specific functions it has mandates to obtain benefits from marine resources and formulate laws regulating fishing in Somali Waters and to organise fishing rights. The Ministry is also the Focal Point for the Action Plan for the Red Sea and Gulf of Aden.

3.3.4 Ministry of Tourism

The Ministry of Tourism is actively seeking to develop a viable and modern tourism industry. The 1984 Tourism Act specifically mentions the development of tourism including the acquisition of 'land, inland or coastal, beach properties, etc.' for the purpose of creating or expanding tourist infrastructures. The Act also has provisions for 'the protection, preservation and utilization of historic, cultural and artisanal resources; the protection and preservation of ecology and environment; and strict urban and regional planning for zones of touristic interest to include game parks, land and sea parks, sanctuaries, etc.' The Ministry has plans to develop tourism in proximity to the proposed Lac Badana (Bush Bush) National Park near the Kenya border. It is foreseen that this development would include parts of the National Park, offshore islands and coral reefs. In addition there are plans to develop a tourist resort area close to Mogadishu on one of the near-by beach areas.

3.4 Conclusions and Recommendations

There are no specific mechanisms in Somalia for the designation, administration or management of marine and coastal protected areas. Nevertheless there are several ministries that have jurisdiction over various activities and areas related to marine and coastal conservation.

The Somali Government should take steps to adopt a formal mechanism to establish, manage and administer marine and coastal protected areas. This mechanism should include provisions for surveying potential areas; preparing management plans for those areas; and administering the management of those areas on a day-to-day basis. The Ministries of Livestock, Forestry and Range, Marine Transport and Ports; Fisheries; and Tourism should be involved in the formulation and implementation of the mechanism. One of these ministries or other government body should be given the mandate to implement the management plans for marine and coastal protected areas.

In the near-term it is recommended that the National Range Agency, in light of its mandate to oversee National Parks, should take the initiative. When specific areas have been designated and management plans are formulated, the jurisdiction and day-to-day management of an area may be assigned to another ministry or department depending on the situation. For example a reserve in the proposed tourism zone near Mogadishu could be managed by the Ministry of Tourism, while the

coral island, reef area in southern Somalia could become a Marine Park or Reserve that is an adjunct of the Lac Badana National Park and therefore be managed by the National Range Agency. National administrative and legal mechanisms are discussed in more detail in the Sectoral Report on Environment Legislation.

4. ACTION STRATEGY FOR MARINE CONSERVATION IN SOMALIA

4.1 Introduction

The designation, establishment and management of marine and coastal protected areas and conservation of marine species in Somalia is a completely new area of endeavour for the Government. As a first step Somalia has signed the Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region in 1985 together with the Protocol concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region. Parties to the Convention and Protocol are obligated to undertake certain actions at the national level in order to conform to the requirements of those legal instruments. Somalia is also a signatory to the Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment which carries some similar obligations.

Outlined below are specific steps which Somalia should take to follow-up on these obligations as they relate to Marine Species and Marine and Coastal Protected Areas. This is not intended to be an exhaustive list of activities but is limited to specific, urgent actions that should be undertaken during 1986-1988.

4.2 International and Regional Conventions

(a) Somalia should ratify the following:

The Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment;

The Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region;

The Protocol concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region.

(b) Somalia should sign and ratify the following:

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);

Convention on Wetlands of International Importance Especially as Waterfowl Habitat (RAMSAR); and

Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

(c) Somalia should request the advice and assistance of UNEP and IUCN in implementing the actions in (a) and (b) above if needed.

4.3 Establishment and Management of Marine Reserves and Protected Areas

(a) A national programme for training personnel in marine conservation should be formulated. During 1986/87 at least two individuals should be identified to receive training in marine protected area management. Persons identified should participate in subsequent activities in order to receive on-the-job-training.

(b) A survey of the coast of Somalia should be undertaken for the purpose of mapping the key littoral and marine habitats. Priority should be given to the reef area between Adale and Chiamboni with emphasis on the coral island-reef-mangrove system South of Kismayo. The information should be used to prepare an atlas of marine biomes and species of Somalia.

(c) A national plan for the establishment of marine protected areas should be formulated on the basis of information gathered in the survey mentioned in (b). Included in this National Plan should be the administrative mechanism by which marine protected areas can be managed on a day-to-day basis.

(d) Without waiting for the formulation of the national plan mentioned in (b) specific surveys of the proposed tourism developments near Mogadishu and Lac Badana National Park should be undertaken for the purpose of proposing Marine Protected Areas at those sites.

(e) Management Plans for the two areas mentioned in (b) should be formulated. This should include agreement on the day to day management and administration of the areas by a designated authority within the Government. The management of the proposed Lac Badana National Park and the adjacent marine area should be integrated into one management plan and be administered by one authority.

(f) Laws governing the designation, establishment and management of marine protected areas and reserves and for the conservation of important marine species and habitats should be drafted and negotiated.

4.4 Conservation and Management of Marine Species

(a) Fishing for marine turtles should be monitored to determine the number and species being taken. The Government should seriously consider prohibiting the taking of marine turtles in Somalia and determine alternative sources of food for the affected population. A programme of tagging and recapture of turtles should be undertaken to help determining their movement around the Somali coastline.

(b) A survey of the dugong population of Somalia should be conducted. High priority should be given to the area between Kismayo and Chiamboni.

(c) A study should be conducted of the sustainable yield of the Spiny Lobster fishery between Kismayo and Chiamboni.

(d) A survey should be undertaken of the harvesting and marketing of molluscs. An effort should be made to restrict this activity by formulating appropriate national regulations and implementing a programme of surveillance.

4.5 Eastern African Action Plan

As a result of deliberations of the Conference of Plenipotentiaries for the Eastern African Action Plan (Nairobi, June 1985), the governments accorded highest priority to those elements of the Action Plan related to the conservation of species and habitats. On this basis IUCN has been asked by UNEP to draft a project proposal for the period 1986-87 that aim to satisfy these priorities. In compliance, a project on the Promotion of the Establishment and Management of Protected Coastal and Marine Areas in the Eastern African Region (EAF 5) has been prepared for discussion by the Bureau of the Eastern African Action Plan which will meet during 1987. This project would provide an excellent vehicle for accomplishing a number of the activities in the Action Strategy delineated above. At the meeting of the Bureau the Government of Somalia should request that the Action Strategy for Marine Conservation in Somalia be incorporated in the project.

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ANNEX VI

SECTORAL REPORT

ON

COASTAL AREAS DEVELOPMENT AND MANAGEMENT

BY

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CONTENTS

1. THE SOMALI COASTAL ZONE

1.1 Basic Definition of the Coastal Zone

There is no official definition of the coastal zone of Somalia. However, the influence of the marine environment on the terrestrial environment and the influence of land based activities on marine affairs are recognized. Provision has been made in the Maritime Code - Law no.1 of 21/2/1959 - giving the Ministry of Marine Transport and Ports (MMTP) powers over land utilization within a 200 m wide belt of land (The "Maritime Domain") starting at the high water mark. This has subsequently been extended to 400 m.

While the 400 m wide belt of coastal land does represent a precedent for controlling land based activities, it does not form a comprehensive definition of the land and water resource systems which may play a significant role in coastal and marine resource development and management. A more practical general definition of the landward component of the coastal zone would include the sand dune systems and lower reaches of the various coastal plains, including the inter-riverine flood plains of the lower reaches of the Juba and Scebelle rivers. This broader definition incorporates both a wide range of coastal ecosystem types and environmental factors which have a direct bearing on coastal and marine resources. It also provides a demarcation of resource systems within which different government ministries and agencies play a major role in the development of economic activities.

A wider zone, therefore, helps to define areas or resources subject to competing and often conflicting demands which, if not resolved, can lead to loss of resource production and environmental degradation. This is most clearly illustrated by the case of livestock grazing in the lower reaches of the Indian Ocean coastal area. During the Jilaal dry season livestock grazing focuses upon the riverine valleys of the lower coastal plain where there are good permanent water supplies and associated home based croplands. The sand dune areas and more humid coastal strip provide both forage and a chain of sweet water wells adjacent to the coastline. These wells are used during the dry season to water livestock from the drier areas inland of the dune system. They also support the migration of herds between the dry season grazing areas near the coast and the more remote inland rangelands used during the wet season. A direct and highly significant relationship exists between the vegetation and water resources found near the coastline and livestock grazing which dominates many inland districts. It is therefore very important to look at functional relationships between coastal resources and economic activities when attempting to define the Somali coastal zone. Definition of a zone *per se* is of much less importance than the delineation of management units that incorporate factors which play a significant role in the development of coastal and marine resources and sectoral economic activities.

Definition of the marine sector of the coastal zone should also give recognition to features such as the continental shelf and upwelling areas. The continental shelf is narrow and rarely exceeds 15 km except for a limited area on the northeast coast between Ras Asir and Ras Hafun where it extends between 60 and 80 km from the shore. Estimates of the continental shelf area range between 35,000 and 40,000 km^2. A broad zone defined by legal definitions such as the 200 mile limit or exclusive economic zone may well encompass major coastal and marine ecosystems such as coral reefs, however there will remain problematic issues such as the management of pelagic fish stock which are free to migrate across national frontiers. Again, the functional relationships between economic resource opportunities and the natural systems which support their sustained production are more important than definitions of zones.

1.2 General Character of the Somali Coastal Zone

1.2.1 The Coastal Plain and Continental Shelf

The coastal zone of East Africa is generally characterized by a relatively narrow continental shelf and a coastal plain between 15 and 20 km wide. The Somali coastal plain does not form a continuous landform throughout the coast and varies in width considerably in different locations. The coastal plain in the North is some 15 km wide to the west of Berbera and narrows considerably towards the "Horn of Africa" where it is bounded by the escarpment of the Gollis range of mountains. The coast facing the Indian Ocean is also bounded by mountains in the North which rise directly from the sea at different points creating an intermittent and often very narrow coastal plain. Further to the South the plain extends some 90 km inland (Figure 1).

There are only two permanent rivers which drain to the sea along the entire 3,300 km of Somalia's coastline, the Juba and the Scebelle. Both are found on the southern coast and their inter-riverine and associated flood plains provide the richest agricultural lands in Somalia for crop production. Livestock grazing, based mainly on nomadic pastoralism, forms an important activity in the more arid coastal areas.

1.2.2 Climate

Climatic conditions generally have a more significant influence on land uses, such as agriculture, within the coastal zone than landforms. Marked monsoonal conditions give rise to significant fluctuations in rainfall which can vary widely from month to month. There can also be intense periods of rain which give rise to large volumes of surface water run-off and associated inundation of coastal floodplains of the two major rivers and flash flooding in Wadis.

The mean annual rainfall for Somalia (Figure 2) varies considerably between different areas and can be generally described as semi-arid to arid for a band along the coast. The North coast can be characterized as arid receiving some 100 mm of precipitation per year. The Indian Ocean coast to the North of Mogadishu receives between 100 and 200 mm of precipitation per year and has been described as "Sahara-Sahelian". The area South of Mogadishu is described as having a "Sahelian" climate with annual precipitation ranging from 400 to 500 mm.

Humidity at the coast is relatively high (70-80 percent) throughout the year. Together, these factors reduce the extremes of climate which may be found in more inland areas. Care should, however, be taken in the consideration of climatic factors which prevail at this period in time. Long-term climatic data suggests that the area to the north of Mogadishu has been subject to increasing aridity and this forms a significant contributing factor in the destabilization of the extensive coastal sand dune system in this area (UNSO, 1980). There is also a danger that in an agricultural nation such as Somalia, climatic factors will be over-emphasized in evaluations of development opportunities. There is strong evidence to suggest that the water-resources derived through the climatic regime of the region can meet current and forseeable development needs in Somalia. The management of water-resources and land use activities plays an equally important a role in achieving sustainable development as do constraints such as periodic droughts.

1.2.3 Soils

As might be expected in an arid to semi-arid region with major areas of sandstone and sandy limestone, there are widely occurring sandy soils with both fine and coarse textures. A large proportion of soils which have been mapped have severe limitations for crop production or irrigation development. This, coupled with droughty conditions, has led to the development of nomadic herding of livestock as the predominant agricultural land use.

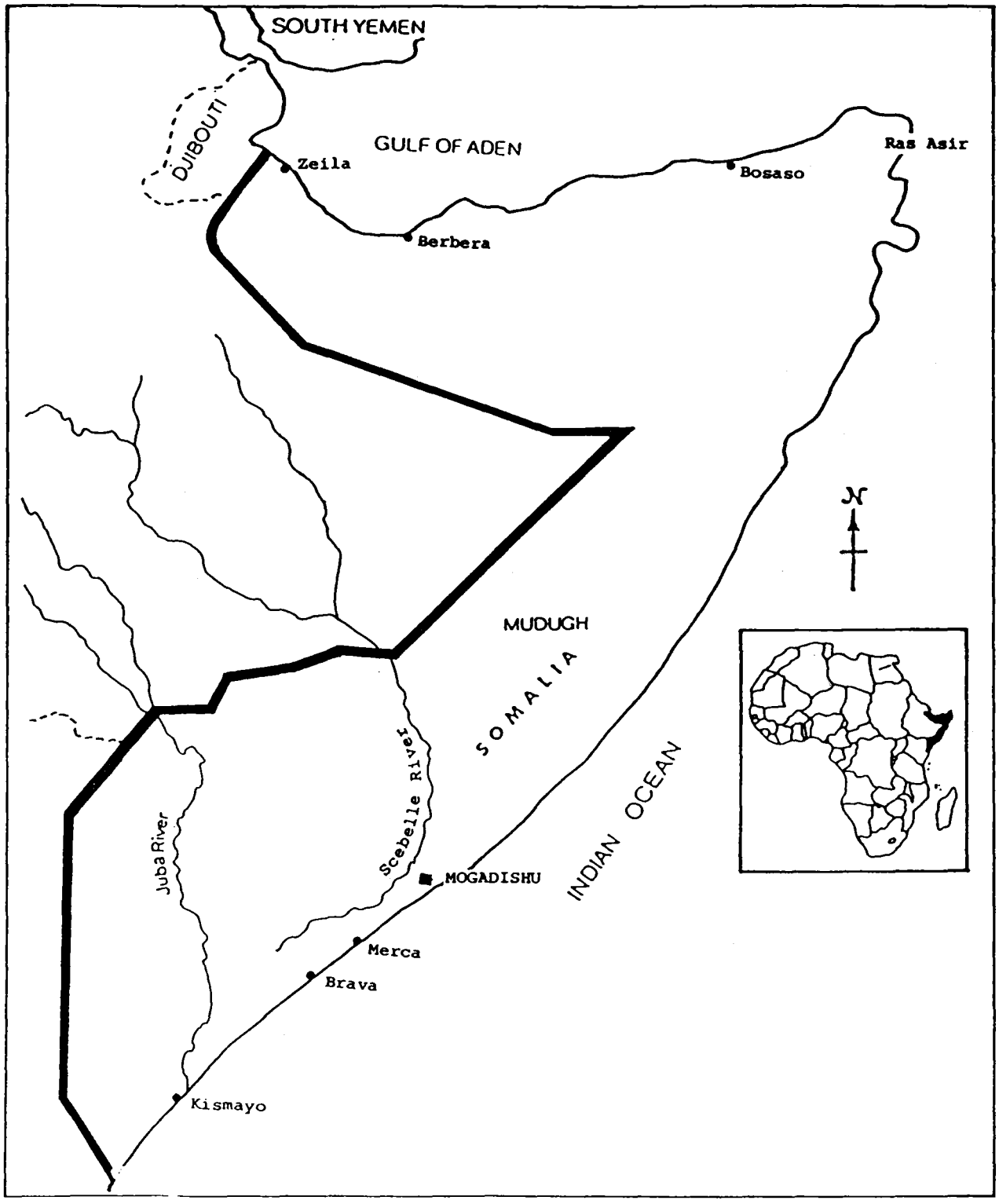

Figure 1. Map of Somalia

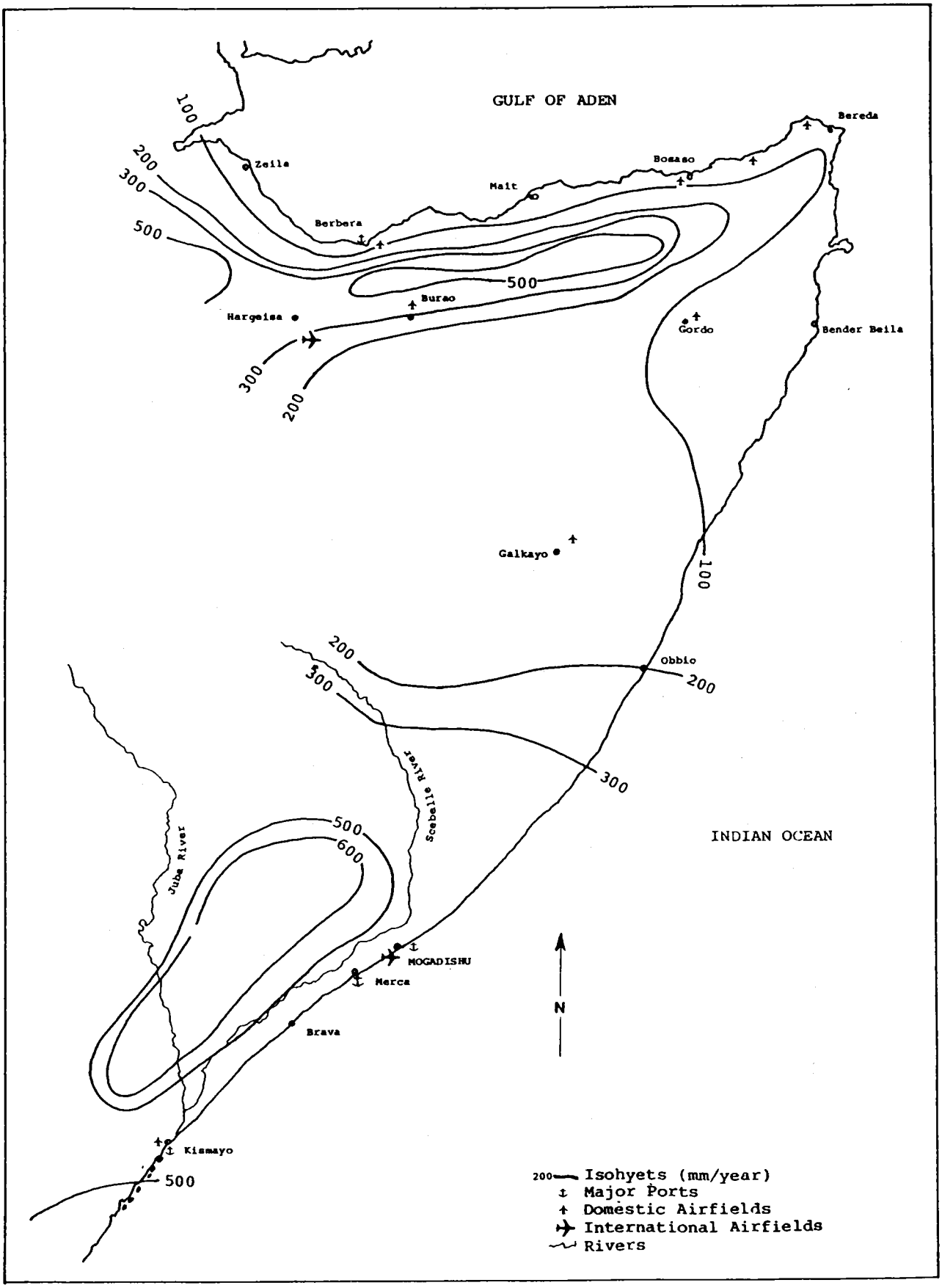

Figure 2. Somalia mean annual rainfall

The more suitable soils for permanent cultivation have higher levels of fertility, more fully developed structures and high base saturation rates which make them responsive to fertilizers and other agricultural inputs. Such soils are found in the broad coastal plains of the South where favourable slopes and the supply of water from the two main rivers and extensive aquifers (natural underground water reservoirs) have facilitated the development of irrigation.

The area suitable for intensive irrigation is, however, limited. Problems can arise from the marginal quality of some water sources during dry periods and poor soil drainage conditions, either of which can lead to the build up of mineral salts in the soil.

Large areas of the southern coast are dominated by sandy soils. These soils are often found in association with sand dunes which can be extremely sensitive to disturbance by grazing animals or human uses such as road development or tourism. These soils not only have limited agricultural potential, including very low rates of grazing pressure, they also are found in environmentally fragile areas requiring sophisticated levels of management expertise and control over development activities. The remobilization of formerly stable sand dunes is a particularly severe problem in coastal and inland districts of eastern Somalia where they are estimated to extend over some 5,000 km^2.

1.2.4 Water Resources

The availability of fresh water is the major constraint limiting the development of agriculture and its subsector livestock. Rainfall is the major source of fresh water resources found within flowing rivers, lakes and aquifers. Hydro-geologic surveys in Somalia indicate the presence of potential water bearing geological formations.

Coastal Groundwater Supplies and Urban and Industrial Development

In coastal areas groundwater forms the major source of domestic and industrial water. However, there appears to be limited detailed information on ground water resources; no water development strategy linked to agricultural, domestic or industrial uses; and little control over private well drilling or extraction rates. Lack of control over the treatment and disposal of industrial wastes and the absence of municipal sewerage systems, other than septic tanks, threatens the quality of groundwater resources in urban areas such as Mogadishu. The report on municipal and industrial pollution (see Land Based Sources of Marine Pollution) points out that all of the wells within the city of Mogadishu are potentially polluted by human wastes and it is believed that chromium (a heavy metal) may be reaching groundwater supplies from wastes discharged by a local tannery. Fortunately, much of the public water supply is drawn from deep wells located some 5 km inland of the city which are said to be free from pollution.

There is an extensive system of some 130 shallow wells right along the coast from Mogadishu to Kismayo. Such wells are also found to the North of Mogadishu. These sweetwater wells (10 m deep or less) are often located only a short distance from the high tide line. The source of water in the underlying aquifers is thought to come from direct infiltration from precipitation and seepage from the Juba and Scebelle rivers. (FAO/Lockwood, 1967). The rates at which these aquifers are recharged is not known.

The use of the shallow coastal wells to water livestock creates a series of focal points which tends to concentrate animal tracks/migration routes across fragile dunelands. The development of new wells and watering holes in the areas inland of the dune sytems may help to reduce the impact of grazing animals and the consequent remobilization of sand dunes and lessen the hazard to inland agricultural lands and settlements.

The hazard of pollution to groundwater supplies from domestic sewage and industrial wastes is increased in areas where the porous sandy soils overlay limestone. This is the case in Mogadishu and there is little information available concerning sources of the local aquifer recharge or infiltration channels formed in porous limestone which provide routes for the rapid seepage of surface water and untreated domestic and industrial wastes.

A further management factor which does not appear to be receiving sufficient attention is the salinization of groundwater supplies through wells being located too close to the sea, through rates of extraction exceeding recharge rates or through the effect of major exploitation of groundwater for agriculture inland of urban areas. The paucity of information on water quality in coastal aquifers poses a danger that the largely unplanned urban and associated industrial development which will be focused in sites near to the sea could lead to over consumption of water resources.

Agricultural Development of Groundwater

The use of deep wells to provide irrigation water at times of low flow in Scebelle river basin forms the only large-scale exploitation of groundwater for agriculture. A UNDP Groundwater Survey (1973) lists some 120 boreholes and recent estimates (World Bank, 1985) suggest that the total now exceeds 200. The major constraint on development of the Scebelle groundwater system is the marginal suitability of the water for irrigation. The quality could be further reduced if rates of pumping exceed natural recharge rates and even poorer quality water is drawn in from the older consolidated areas of the coastal plain.

Shallow wells are a feature of most agricultural areas and rural settlements. The use of shallow wells for irrigation is most widely practised in the northern region where they have been recently developed to support small-scale horticulture. Most of these horticultural activities take place in upland areas away from the coast and their impact on coastal aquifers is likely to be very small. However, should any major expansion be contemplated, the total water availability and its quality should be carefully assessed including linkages with coastal aquifers.

The Somali Government is placing major emphasis upon the development of groundwater resources, and within the Ministry of Mineral and Water Resources a "Water Development Agency" has been established with the mandate to explore and develop groundwater resources. In discussions with the Director of Water Resources at the Ministry, it was stated that the Water Development Agency is not employing a systematic drilling programme. The same observation is made by the World Bank Agricultural Sector Review (1985) which is also highly critical of the high percentage of wells which are drilled which do not yield water or which become inoperative. A less ambitious programme of well drilling with more effort being given to the assessment of groundwater potential is presented as an option by the World Bank (1985).

There appears to be a basic procedure by which proposals to drill wells are subject to elementary environmental impact analysis. We were not able to obtain detailed information on such procedures, but it is significant that there are no water laws and private well development may not be subject to such environmental assessments. FAO is helping to draft a Water Law and it is hoped to have it in force by 1987. This law may help to coordinate water development activities.

Surface Water

The Scebelle and Juba rivers form the major source of surface water for agricultural development in Somalia. The Scebelle is already used to supply major irrigation schemes, and it is calculated that the present water flow could meet the requirements of these schemes if an irrigation efficiency of 45 percent were achieved (World Bank, 1985). However, current irrigation efficiencies are low (20 percent - 30 percent) and planned expansion of the area under irrigation could not be adequately served. The World Bank Agricultural Sector Review (1985) recommends that all major expansion of irrigation schemes along the Scebelle system be stopped, and efforts should be concentrated on raising existing standards of irrigation efficiency.

The Juba is the only river which regularly flows to the sea, however, the water requirements of existing and committed irrigation schemes are calculated by the World Bank (1985) to exceed the unregulated flow. A major dam is planned at Bardere on the Juba to provide additional irrigation water. Theoretically the dam could supply sufficient water to allow a three-fold expansion of the area under irrigation.

Due to the significant salt content of the Scebelle, even during high flows, great care must be taken in providing and maintaining proper land drainage in association with irrigation development. The Jowhar Sugar Estate has utilized Scebelle water for irrigation for over sixty years. The lack of adeqaute drainage has resulted in the progressive salinization of the soil and the eventual loss of several thousand hectares of formerly productive land. Soil salinization is also evident at the Sobloale agricultural settlement scheme (Land Resources Development Centre, 1986).

Due to practical problems of implementing the Bardere scheme, including the shortage of qualified Somali water resource and irrigation engineers, the World Bank (1985) suggests that implementation of the scheme in its present form is not advisable. While the Bank does not dispute the long-term need for the dam, it is argued that it is more important to increase irrigation efficiency elsewhere.

It does not appear that any work has been done to determine the impact of the construction of the dam on the adjacent coastal area. Two points which should be considered are (1) the effect on freshwater flows to the mangrove South of Kismayo, and (2) potential alterations to coastal aquifer recharge rates resulting from increased water consumption for irrigation purposes in the middle section of the river basin.

Although the Scebelle does not regularly flow to the sea, it does feed a large area of freshwater wetlands located between Coriolei and Awai. These wetlands may play an important role in groundwater recharge cycles and in supporting large numbers of diverse species of wildlife. Increased consumption of water upstream to feed irrigation schemes may increase the irregularity of the river's flow to the sea, may reduce the extent and viability of the wetland habitat for wildlife conservation and may lead to increased saltwater intrusion into river channels and groundwater supplies. This last point should also be considered in the case of the Juba.

1.2.5 Minerals

Exploration: Exploration for minerals has been taking place for some 40 years. A variety of minerals have been discovered including tin, manganese, copper, lead, zinc, gold, zircon, coal, kyanite, uranium, iron and non-metallic minerals and glass sands. Recorded mineral deposits in areas immediately adjacent to the coast are limited to placer deposits of ilmenite-zircon at Kismayo in the southern region. However, black mineral sands similar to those at Kismayo were observed on the beach to the East of Berbera and samples have been taken for analysis. In the northern region there are sulphur deposits and gypsum-anhydrite deposits. Further inland from Berbera there are asbestos, feldspar and mica, berylium and miobium deposits. Further to the East of these are manganese and copper deposits within 20-30 km of the shoreline. In the area inland of Bosaso there are tin deposits.

Development: Apart from the development of cement and the asbestos cement factories at Berbera and numerous small scale lime kilns, the only major effort to develop minerals has been the construction of a tin mine and ore processing facility at Majayaham inland from the North coast. This plant operated from 1972 to 1979 producing only a few hundred tons of processed ore.

Proposals: There are proposals in the 1982-86 National Development Plan to resume exploitation of the industrial salt deposits located near Hafuna on the northern Indian Ocean coast. Efforts are also being made to develop the uranium reserves to the West of Mogadishu.

Potential coastal impacts: Reactivation of the salt workings and loading facilities at the coast near Hafuna may entail extension to the docking areas and related port development. Should the project receive financing, as is hoped through the EEC, an environmental impact assessment should be included in the project's financial and technical specifications.

Oil and gas: Oil and gas exploration has taken place in onshore and offshore areas. Some 34 wells have been drilled with only limited evidence of oil or gas in 15 of the wells. No offshore drilling is taking place at present although agreements with Shell, Chevron and Occidental contain rights to drill for oil in northern coastal land and water areas.

In discussions with the Ministry of Mineral and Water Resources the opinion was expressed that, if oil and gas exploration expands, the focus of operations will be in inland locations within the northern region. The Ministry of National Planning's report on the State of the Somali Economy (1984) makes reference to attempts to delimit a natural gas field near Afgoi inland of Mogadishu in the southern region. However, there are no current plans to develop this potential energy source.

Donor assistance: Between 1979 and 1984 UNDP funded a project to strengthen the National Geologic Survey which produced the following results:

- establishment of a modern geo-chemistry laboratory;
- establishment of a mineralogical-petrological lab;
- establishment of a cartographic facility;
- mineral exploration;
- preparation of new geological maps at a scale of 1:100,000; and
- manpower training.

Constraints and conflicts in mineral development

Shortage of fuel and security problems are cited as factors hindering geological exploration. There is also some conflict of interest between the Harbour Master's Department at the Ministry of Marine Transport and Ports and the Ministry of Minerals and Water Resources concerning the exploitation of limestone and sands near the coast. The Harbour Master's authority over the 400 m wide belt of coastal land gives him greater powers over mineral operations than the Ministry of Mineral and Water Resources. This conflict may be exacerbated if mineral sands are exploited in coastal areas.

1.3 Coastal Ecosystems

The National Rangeland Survey (Resource Management and Research 1982; 1984) provides a classification of coastal landforms and associated ecological features for most of Somalia. Although the maps and written descriptions are helpful in identifying land based coastal ecosystems, no information is provided on marine based ecosystems such as lagoons, coral reefs or seagrass beds. The classification is also of limited use because it is primarily intended to convey the utility of the ecosystem types for livestock grazing. Therefore mangrove is identified but defined in terms of potential camel fodder. It is also difficult to accurately determine the extent of unique coastal features such as mangrove using the classification and more detailed surveys and mapping will be required to adequately map coastal ecosystems for resource development purposes because a unique feature of most coastal resource systems is their ability to support a series of economic uses at the same time. For example mangrove - if well managed - can sustain fuelwood production, provide food, shelter, spawning and nursery grounds for commercially valuable fish species and provide protection from coastal storms.

The National Tsetse and Tryponosomiasis Control Project (Land Resources Development Centre, 1986) provides very valuable information on coastal land and water systems and their potential use for agriculture. This study goes further than the Rangelands Survey in defining development options based upon terrestrial ecosystems. The area surveyed extends from the Kenya border to the North of Mogadishu, however the central and northern regions are not covered by this study.

Other sources of information, such as studies by the International Union for the Conservation of Nature and the World Wildlife Fund, help to draw attention to coastal and marine ecosystems in terms of the wildlife and conservation value. These sources are fully discussed in the sectoral report on Marine Living Resources and Protected Areas.

Based upon the information contained in all of the above materials, a list of coastal ecosystems and some of the major management concerns related to their development appears in Table 1.

2. UTILIZATION OF THE COASTAL ZONE

2.1 Fisheries

The development of fishery resources is being given high priority in Somalia primarily as a source of exports. Emphasis is also being given to the development of fisheries to provide food and to form the economic base for fishing cooperatives and the resettlement of people displaced by drought. By 1981 there were an estimated 4,000 full-time and 10,000 part-time fishermen in 21 cooperatives (Lewis 1981).

Fisheries production increased substantially during the early 1970s and then fell off due to the withdrawal of the Soviets from industrial fishery and lack of spare parts for the powered artisanal boats. Between 1982 and 1984 the total catch increased from 8,730 tonnes to an estimated 18,000 tonnes (MNP, 1984). The artisanal contribution to total production was 52.7 percent in 1982 and 44.4 percent in 1984. This does not necessarily mean that artisanal fisheries are playing a decreasing role, industrial fisheries have grown in production mainly through an "open door" policy which encourages foreign vessels to fish in Somali waters under licence. Royalties from these licences earned Somalia some US$.481,000 which represents an estimated 20 percent of the value of the fish caught in 1984. In terms of employment, food production for domestic needs and contribution to GDP, artisanal fisheries may well play a far more important role than industrial fisheries.

Fish exports were valued at US$.434,286 in 1984 (MNP, 1984). The development of the export market is limited by the type of fish available and efforts are being made to produce high quality-high value exports which can compete in the world market.

Within the Ministry of Fisheries there is a "Coastal Development Agency" which was set up to implement the development of resettlement fishing communities in Adale, Brava, El Ahmed near Merca and Eil. This agency also trains fishermen and helps existing fishing communities to improve catches and marketing. The responsibilities of this agency extend well beyond fisheries and include the provision of health clinics and education at the four resettlement sites.

Donor assistance to the fisheries sector has taken different forms ranging from gifts of sophisticated vessels to the provision of cold storage facilities, ice-making plants, jetties, etc. These are dealt with in detail in the Marine Living Resources report. The impact of these projects has generally been positive and no coastal management issues of any major significance have resulted. However, there is a general lack of information about the relationship between the coastal and marine environment and fisheries resources. For example, the shrimp fishery in the Juba Delta is identified as a valuable resource but there is no basic information available as to the life cycles of the shrimp, nursery areas, food sources etc. If the shrimp stocks are

Table 1. Major Coastal Ecosystems in Somalia

POSITIVE VALUES FUNCTIONS & CATEGORY	USES	DETRIMENTAL USES & PRACTICES	ADVERSE ENVIRONMENTAL CONSEQUENCES
Agroecosystems	food production livestock production timber products fuel	overgrazing by livestock overexploitation of forests inappropriate application of fertilizers, pesticides & herbicides deforestation	soil erosion loss of soil fertility sedimentation downstream pollution & contamination within ecosystem and downstream infilling of wetlands, estuaries, seagrass, siltation of reefs
Freshwater ecosystems (including lakes, marshes, rivers wetlands, streams)	natural flood control & storage water supply and recharge nutrient and sediment sinks water bird habitat food production building & energy materials	conversion to dry land conversion to wet agriculture sedimentation from soil loss irrigation withdrawal flood control channels	increased flooding degradation of habitat infilling & water pollution downstream infestation by aquatic weeds reduced fishery yields reduced water quality
Beaches (including associated beach forests)	nesting habitat for birds, sea turtles recreation tourism fishing habitat (recreational & subsistence) timber & fuel from protection from coastal hazards	coastal structures aggravating beach erosion exploitation of eggs & adult turtles excessive beach & reef mining conversion of beach forest & dunes to urban use oil pollution	decline in sea turtles loss of beaches degraded tourism value damage to coastal structures & buildings reduced fishery values loss of habitat, timber & fuel increased coastal erosion
Sand dunes	grazing for wildlife and livestock fuelwood and charcoal fuel for limekilns link between beach and agro-ecosystems	overgrazing sand extraction deforestation road building	destabilization of dunes and encroachment of sand onto roads, settlements and agricultural land. Loss of grazing, wildlife habitat, fuel

Table 1 (continued)

POSITIVE VALUES FUNCTIONS & CATEGORY	USES	DETRIMENTAL USES & PRACTICES	ADVERSE ENVIRONMENTAL CONSEQUENCES
Estuaries and/or tidal creeks (including associated mud flats and embayments)	nutrient influx to coastal waters fisheries production nursery & spawning areas for some coastal fish links to mangroves, sea-grasses, pelagic & demersal fisheries	urban pollution (sewage, thermal) industrial pollution hydrologic modifications (upland irrigation and water withdrawal) over-exploitation of resources	reduced fishery production reduced habitat for adults and fry of fishery species infilling & sedimentation reduced estuarine habitat degradation of water quality
Mangroves	sediment filter nutrient filter fishery resources (fin & shellfish) net transfer of production to coastal fisheries breeding & spawning grounds for some coastal species links to seagrass, coral reefs shoreline protection buffer for tidal swamps timber fuel	conversion to dry land excessive upland soil erosion over-exploitation of wood over-exploitation of fishery resources	degraded coastal water quality loss of most values, functions & uses loss of degradation of habitat due to sediment infilling reduced fishery production reduced nursery habitat secondary impacts to reefs, seagrasses, swamps
Seagrass beds	nutrient filter net transfer of production to coastal fisheries feeding habitat for green turtles, dugongs, nursery grounds for coastal fisheries links to mangroves, coral reefs fishery production, esp. finfish	coastal urban pollution -- thermal & domestic sewage industrial pollution coral mining (excessive) excessive upland soil erosion overexploitation of fisheries inappropriate coastal development construction & dredging oil pollution	degradation of habitat loss of habitat due to infilling loss of habitat due to hydraulic changes displacement of seagrasses reduced fishery production loss of fry & breeding habitat

Table 1 (continued)

POSITIVE VALUES, FUNCTIONS & CATEGORY	USES	DETRIMENTAL USES & PRACTICES	ADVERSE ENVIRONMENTAL CONSEQUENCES
Coral reefs	links to seagrass, mangroves, beaches & coral islands shoreline protection beach sand replenishment, production high internal productivity shellfish production finfish production lobster production spawning grounds for fish tourism & recreation ornamental species, (shells, corals, fish, etc.)	coral mining sedimentation dredging & filling over exploitation industrial discharges fishing with poisons & explosives urban pollution oil pollution water pollution	coastal erosion degraded tourism loss of nursery and spawning habitat for fish destruction from sedimentation, filling & dredging degradation from water pollution destruction of habitat
Demersal ecosystems	high productivity in up-welling areas & coastal areas high prawn and finfish production	possible over-exploitation of inshore reef fishery	loss of fishery habitat reduced fishery production deep water lobster resource is extremely vulnerable to over-exploitation
Pelagic ecosystems	high productivity in up-welling areas high yield migratory species	N/A	N/A

dependent upon the Juba Delta for part of their life cycle, agricultural development within the watershed may have a significant influence. The contamination of the river water with herbicides and pesticide and changes in the flow of water due to irrigation development may have a negative effect on the shrimp's habitat and food sources.

The only extensive stock assessments carried out in Somali waters deal with offshore fisheries. However, major donor assisted projects have been implemented which rely basically on inshore fish stocks. An example is the fish processing plant at Kismayo. Originally this project was based on assessments of offshore fish stocks and the management plan calls for the development of this part of the fishery. However, due to unforeseen cultural factors, there is little prospect of local fishermen extending fishing efforts into offshore waters. Therefore the project derives the bulk of its fish and lobster from coral reef related fisheries. This means that projects are being planned with inadequate information on fishery resources and their medium to long-term economic viability is at risk if the fish stocks are subject to unsustainable harvesting pressures or reduced due to poor environmental management such as the dumping of dredge spoils near coral reef areas.

Furthermore, the coral reef and other inshore fisheries areas may act as breeding, nursery or spawning areas for offshore fish stocks. Poor management of these inshore stocks, or the environment which supports them may have a detrimental effect on offshore fish stocks and the industrial fishery. Fisheries management at present can only be related to potential controls over harvesting pressure. Without more detailed environmental information to explain the resources base of the fishery it will be impossible to institute a management programme which can promote the sustained development of the resource.

2.2 Agriculture

Given the character of the soils and climate in Somalia, some 13 percent of the land is considered arable. Due to limitations imposed by water supplies and social and physical infrastructure, only one-tenth of the potentially arable land is cultivated. Only 25 percent of the Somali population are settled farmers and most are located in broad flood plains of the Juba and Scebelle rivers and in the more inland 'Bay' region. The Bay region is a major focus for rainfed agriculture.

All export crops (mainly bananas and fruit) are located on irrigated lands. There are some 50,000 ha of controlled irrigated land in the South much of which is in the coastal plain. Rainfed agriculture, including areas seasonally irrigated by floodwaters, predominates in the area under crops.

Livestock production, as a subsector of agriculture, supports some 50 percent of the population and creates 80 percent of the export earnings (World Bank, 1985). This form of agriculture is concentrated mainly in the central and northern regions and significant coastal land areas are given over to livestock grazing.

The significance of coastal areas to future agricultural development in Somalia is directly related to the role of coastal grazing and arable agriculture in meeting future demands for food and livestock products. The more arid rangelands of the interior are thought to have reached their carrying capacity and cannot be expected to absorb the projected population increase of the nomadic and semi-nomadic people. A critical national development issue centers on the absorption of the projected additional nomadic population into areas which can support permanent cultivation and their participation in non-agricultural activities. Therefore, the underdeveloped agricultural lands of the coastal plains will be called upon to absorb more population and to help meet the nation's domestic needs for food and other agricultural products as well as continuing to provide for major export earnings. The dry season grazing of coastal rangelands will also come under increasing pressure and will be called upon to support the more diversified livestock and cultivation systems inland.

To achieve these objectives there will have to be significant advances in land and water resource management and associated improvements in manpower skill development and the provision and maintenance of infrastructure. The major constraints to the expansion of the area under permanent cultivation and increased production are unstable rainfall and the lack of infrastrucutre. The degree to which potentially cultivable land can be successfuly developed, either through rainfed production or controlled irrigation, is not at all clear. The World Bank Agriculture Sector Review (1981) estimated that the expansion of irrigated farming would require a level of investment some 2 1/2 times that required to develop rainfed areas. However, the development of both irrigated and rainfed lands will depend upon improved standards of watershed management to reduce current problems of increased flooding and siltation of irrigation and drainage channels. The feasibility of extending the area under irrigation is not only affected by low standards of watershed protection, it is also influenced by low levels of water resource management and consequent inefficient use of existing water supplies.

It could be argued that no further extension of irrigated lands based on existing water supplies is practicable until existing irrigation and water managment practices are improved. However, discussion with the Ministry of Agriculture indicate that major emphasis will be placed upon the development and expansion of irrigated crop production. A German consultant is helping to prepare recommendations for improved water management and increased irrigation water use efficiency.

The Director of Planning and Administration at the Ministry placed emphasis upon current efforts to move away from their focus on crop production and to create integrated regional development where livestock, crops, services and infrastructure are considered jointly. Three pilot projects are planned for the Middle and Lower-Scebelle and the Gedo regions. The first pilot in the middle-Scebelle region has been initiated, however, institutional problems are being encountered. The main difficulty lies in forming adequate working arrangements with bodies as diverse as the Ministry of Interior, Health and Education and specialist agencies such as Water Resource Development. Although it is too early to evaluate the progress to date, these regional develpoment initiatives represent a level of development planning which has, until now, been lacking in Somalia.

2.3 Forestry

Forestry development is coordinated and administered through the National Range Agency's (NRA) Forestry Department. Local offices of the NRA implement regional and local programmes which deal mainly with nursery development for dune stabilization and fuelwood projects.

The forest resources of Somalia are mainly represented by savannah woodlands and more limited riverine forest. There are small and often widely dispersed areas of mangrove which occur in the southern portion of the Indian Ocean coast. The forest area is calculated to represent 60 percent of the total area of Somalia, this is misleading because much of the "forest" is made up of low density and often discontinuous tree cover. The total "forest" area is estimated 8,800,000 ha including:

- riverine forest	40,000 ha
- dense savannah	2,300,000 ha
- bush and scrub	6,197,000 ha

The area of true forest is difficult to calculate but remnants of the original juniper and evergreen woodlands are found in the northern mountains. Within the coastal lowlands there are remnants of the riverine forest along the Juba river and in the area of the proposed Bush-Bush park. The Tsetse fly infestation of areas such as Bush-Bush has discouraged land clearance and overgrazing and has acted to conserve the remaining forest resource.

Fuelwood production and browsing by livestock are the predominant uses of the forest resource. Fuelwood provides the bulk of household energy needs while browsing provides a high proportion of the livestock feeding requirements.

Within the immediate area of the coastline, wood is cut from trees on the sand dunes and from mangrove stands to serve a variety of purposes including building materials, fuelwood for domestic use and for fueling the simple limestone kilns found along the coast. No figures are available concerning the total demand placed upon coastal woodlands. However, the increase in national demand for fuelwood has stimulated a series of community action programmes including fuelwood projects, forest conservation and planting windbreaks to reduce soil erosion.

The dune fixation projects which have supported the development of tree nurseries and windbreak planting programmes are the most significant foresty development activities in the coastal zone. Their impact will be positive in respect to coastal and marine resource development.

The management of mangrove areas is at an early stage of development. The only information obtainable was drawn from the Rangeland Surveys recently completed by private consultants for the NRA. These surveys classed mangrove as providing "suitable grazing for camels" which pays little attention to their wider role in fisheries, coastal erosion control or as a source of forest products.

The NRA is interested in improving assessments of mangrove resources and provision of reference materials such as the recent UNESCO/IUCN/UNEP/EWC Mangrove Area Management Handbook would help the NRA to improve current approaches to mangrove development.

2.4 Industrial Development

There appears to be no overall policy of industrial location at the national or regional levels. A policy of locating new industrial development in a zone at the periphery of Mogadishu has been implemented in an attempt to provide sufficient land for expansion and to control the encroachment of other uses. This form of policy can be effective for industrial uses which need to be close to raw material importing points, labour and markets as in the case of the cigarette and match factory. However, the gravitation of industry to the capital city does accelerate the migration of people to the city and does not help to balance economic development opportunities in the centres.

For resource based industries processing indigenous materials such as minerals (the cement factories), agricultural products (bananas, sugar) or fishery products, the choice of locations is heavily influenced by resource locations.

2.4.1 Mining and Quarrying

The only significant mining and quarrying activity in the coastal area at this time is the extraction of limestone blocks and sand from quarries close to the shoreline near the main towns on the South eastern coast. No detailed information is available concerning the total area or volume of material that is being removed. The Harbour Master's Department within the Ministry of Marine Transport and Ports is responsible for controlling these quarrying activities within 400m of the high water mark.

Although these quarries constitute a very small percentage of the total coastal land area, their impact can be very significant. Some of the sites visited formed large open excavations of up to 10 m depth extending over an area of 20-30 hectares. Many of the sites extend from the main

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Annotated photographs of mining and other activities in coastal areas are presented in the Appendix.

coastal road South of Mogadishu to within a few meters of the sea and the level of excavation is below the high tide mark. In several cases the remaining unexcavated material separating the quarry from the sea has been breached and pools of stagnant sea water were found.

There appears to have been no effort to reinstate the land and many of the quarries are located at the foot of destabilized sand dunes. Reports on the problem of shifting sand dunes cite quarrying as a factor leading to the reactivation of formerly stabilized dune systems.

The Harbour Master's Department is attempting to institute tighter controls over quarrying operations and to seek reinstatement of the sites once operations have ceased.

Mineral sands: During the field visit to Berbera, black sands were observed on the intertidal beach and berm areas. These deposits were not mentioned in any materials available to the team. Samples were taken for analysis. If these prove to be mineral rich sands and the deposits prove to be economic at some future date, sand mining may be attempted. It would be prudent to establish sand mining regulations and reinstatement procedures to protect beach systems.

Salt production: Salt is produced at Gesira to the South of Mogadishu. A system of shallow ponds ('pans') are flooded with sea water and evaporation concentrates the salts. No figures on annual production were avaiable to the team. The area of the ponds is approximately 2 ha.

2.4.2 Manufacturing

The majority of Somalia's installed manufacturing plant is located within the coastal zone. Table 2 gives the name, location, productive capacity and actual production of all manufacturing enterprises in Somalia. Figure 3 indicates their location in relation to the coast. A major feature of the current level of manufacturing is the generally low production in comparison to the installed capacity. In several cases, production has, at best, been intermittent and others have ceased production. Due to constraints on production resulting from a shortage of spare parts, inadequate fuel supplies and dependence on imported raw materials, manufacturing output declined during 1984 and registered a negative rate of growth of some -19 percent. Manufacturing's share of GDP declined from 9.3 percent in 1970 to 6 percent in 1984. Employment in this sector totals 15,000 persons 80 percent of whom work in public enterprises.

The potential impact of the manufacturing activities has been assessed in the sectoral report on Land-Based Sources of Pollution. The main impacts relate to the uncontrolled discharge of wastes and are most serious in the cases of the tannery and abattoir at Mogadishu.

No major expansion of manufacturing is planned during the next five years. Instead, emphasis is being given to the rehabilitation of existing plant, improvements in the supply of spare parts and raw materials and improvements in technical and managerial skills. These will all help to boost production and there will be a consequent increase in waste discharges. The reduction in potential damage from pollution will be difficult given the existing problems of location, outdated machinery and lack of built-in means of processing wastes. The impact from improved production from existing plant is therefore likely to create a greater problem than the creation of new enterprises where environmental safeguards could be built into the basic design.

2.4.3 Construction

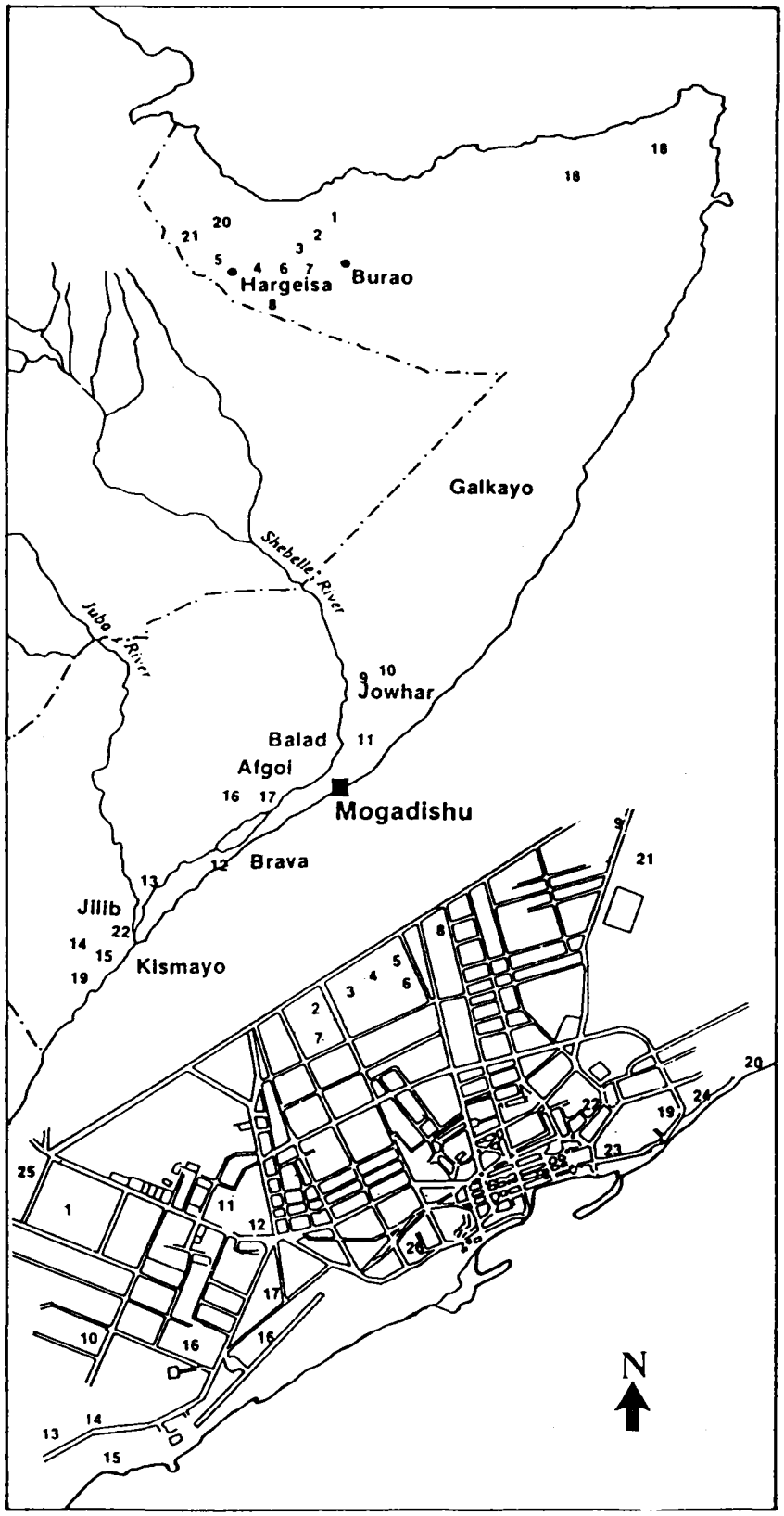
The construction industry experienced a high rate of growth from 1982 to 1983 but declined during 1984. This is related to the relatively stagnant economic climate, a decline in industrial output and the relatively few new projects implemented. Shortage of building materials is cited by the Ministry of National Planning (1985) as a factor constraining the growth of this sector.

Table 2: Industrial Facilities and Performance in Somalia 1984

INDUSTRY COMMENTS AND WASTE DISPOSAL	PRODUCTS	INSTALLED CAPACITY (year)	DOMESTIC NEEDS (year)	PRODUCTION Units	PRODUCTION Capacity (%)
Juba Sugar (Land disposal Without treatment)	Sugar Molasses	67,000 T	67,000 T	26,900 13,200	40
Jowhar Sugar (Land disposal)	Sugar	40,000		680	1.7
Mogadishu Oil (Land disposal)	Edible oil Crushing Refining	 140 T/d 1,000 T	45,000 T	0	0
Pasta Mogadishu (Insignificant waste)	Pasta Macaroni	13,200 T 3,100 T	 1,600	11,000 52	85
Sopral Meat	Canned	1,800 T		0	0
Kismayo Meat (No market)	Canned	5,000 T		125	2.5
ITOP Fruit (Lack of raw materials)	Canning			0	0
Mogadishu Milk (Land disposal)	Milk and cheese	6 million l	56 million l	0	0
Bottling, Mogadishu (Land disposal)	Coca Cola	million cases		455,000	46
Cigarette, Mogadishu (Minor pollution)		1000 T		270	18
Somaltex Balad (Land disposal)		22.5 million/yard	38 million/yard	5.2 M.Yard	23
Tannery, Mogadishu (Extreme pollution Land disposal without treatment)	Skins Hides Shoes		459,000 90,000 120,000	217,500 26,100 44,000	47 29 25
Tannery, Kismayo	Skins Hides		360,000 10,000	120,000	33
Packing, Jamama (Land disposal without treatment)		18 mil. pieces (card box)	3.8 mil. 16.8 million pieces (Polyethyl)	 4.2 mil.	20 25

Table 2 (continued)

INDUSTRY COMMENTS AND WASTE DISPOSAL	PRODUCTS	INSTALLED CAPACITY (year)	DOMESTIC NEEDS (year)	PRODUCTION Units	PRODUCTION Capacity (%)
Chemical, Mogadishu (Land disposal)	Detergent	65,000 T			15
	Soap	20,000 T		0	15
Pharmaceutical (Land disposal)	Antibiotics			0	0
Urea, Mogadishu (Sea disposal)		45,000 T	15,000 T	500 (1985)	9
Refining (Sea disposal)	Petroleum products	460,000 T	600,000 T	125,000 (1985)	31
Power plant (Sea disposal)		40 MW		?	
Cement, Berbera (Commence in 1987)		200,000 T	200,000 T	0	0
Asbestors, Berbera (Air pollution)		40 T		15	37.5
Gypsum, Berbera (Air pollution)		60,000 T		20,000	33
Foundry, Mogadishu (Minor pollution)		610 T		105	17
Al. Utensils, Mogadishu (No pollution)		120 T		9.6 (1985)	8



LOCATION OF INDUSTRIES IN SOMALIA

1. Cement project
2. Gypsum factory
3. Eternik (corrugated sheets)
4. Shoe and Pickling plant
5. Somali Bottling (Pepsi Cola)
6. Sunshine detergents
7. Powdered detergents
8. Pickling plant
9. SNAI-BIASA: liquor, cosmetics, plastics
10. Jowhar Sugar factory
11. Somali Textiles
12. Hides and shoe factory
13. Juba Sugar Project
14. Shoe and Tannery plant
15. Meat factory
16. Brick factory
17. ITOP: fruit and vegetable processing
18. Fish factory
19. Fish factory
20. Ayaan milk factory
21. National Building Components Co.
22. INCAS corrugated container plant

LOCATION OF INDUSTRIES IN MOGADISHU

1. Tannery, Shoe and Leather factory
2. Cigarette and Match factory
3. Foundry and Mechanical Workshop
4. Edible Oil factory
5. Flour Mills
6. Aluminium utensils factory
7. Allamagans furniture
8. IFCA insect sprays, toiletries
9. Basta spaghétti factory
10. Warshadda Masaamiirta (wire products)
11. Somali Prefab building materials
12. National Bottling (Coca Cola)
13. Oil Refinery
14. Urea Plant
15. Somali GRP fibreglass boats
16. Foam Industry
17. Bail Soap factory
18. Sharif Zein garments factory
19. Deeqa stationery manufacturer
20. Pepsi Cola
21. Haplas plastic materials
22. Alba soft drinks
23. Iglas pharmaceuticals
24. Shamow Bros aluminium
25. Warshadda Daawada
26. Multifabric Somali

Figure 3. Industrial map of Somalia

The extraction of limestone and sand from coastal quarries, such as those in Mogadishu, is directly related to the location and scale of construction activities. The impact upon coastal dune systems and beach profiles could be reduced through the development of more inland sources of aggregates and stone blocks. However, the distances involved may be considerable due to the extent of the coastal plain near major centres on the southern coast. At Berbera inland quarries provide the main source of building stone and limestone but the distances involved are some 15-20 km.

2.4.4 Energy and Power

Hydropower

A 5 MW generating station is powered by water stored by the Fanoile dam on the Juba river. A 100 MW station is planned for the proposed Bardere dam on the Juba. Electricity from these generating stations will mainly supply the cities of Mogadishu and Kismayo and their surrounding districts.

Diesel and steam generation

There is a series of diesel generating stations located along the coast and a new steam power station was completed at Gezira during 1984. Together, hydro-electric, diesel and steam generating plant represents a total potential supply of 60,000 KW with some 26,000 KW or 43 percent serving Mogadishu.

Government policy is to increase the total generating capacity with priority being given to the regional centres of Kismayo and Bardoa. Funds are being sought from the Finnish Government to support the improvement of electricity supplies in the regional centres.

A windmill development project was planned for 1985 based upon support from DANIDA, however, we were not able to obtain information on the progress of the project, its design capacity or location.

The major demand for electricity is associated with the concentration of settlements and industrial activity in the coastal zone. The remaining area of the country with its highly dispersed population commands a relatively small total electricity supply and only limited distribution with major inland settlements forming the focus of both supply and demand.

Influence on coastal and marine resources

The potential impact of the generating facilities is limited due to the small capacity of the plants and their dispersed locations. The potential thermal pollution from the coastal power stations is minimized by the strong currents close to the shoreline. The dam storage systems on the Juba pose more serious problems related to changes in stream flow and entrapment of sediments which can influence water salinity and nutrient exchange in the lower reaches of the river system. Due to the multiple purpose design of the dams (irrigation storage, hydro-power and flood control), the hydro-electric function plays a less significant role in changes in river flow conditions than the storage and periodic release of water associated with irrigation.

2.5 Transport

2.5.1 Marine Transport and Ports

Marine transport is vital to Somalia's economy. Virtually all exports are sent by sea. Coastal trade is important, however, road transport forms the major means of moving goods, fuel, etc. within the country. Coastal trading based on dhows and other vessels has declined. This may be due to the fears that coastal trading would become nationalized. The decline in coastal

shipping has increased the isolation of coastal fishing communities which depend heavily upon dhow traffic to bring in new boats, fishing gear and supplies. Coastal trading also provides the main means of moving dried and salted fish to market centres (FAO/World Bank - 1981).

Major exports are : livestock and bananas (which together account for some two-thirds of all exports), hides and skins, heavy fuel oil, meat, fish, myrrh and frankencense. Major imports are: foodstuffs, consumer goods, textiles, crude oil and refined petroleum products, vehicles, building materials, machinery and equipment.

Mogadishu is the major port handling over 50 percent of all traffic. Berbera is the only major port on the northern coast but Bosaso has customs services and serves as a major shipping point for livestock. Kismayo on the southern coast also ranks as major port performing important roles in the export of bananas, livestock and the development of fisheries. Merca is referred to as an active port in several references, however, when we visited the town the pier was derelict and we were told the trade in bananas has shifted to Mogadishu and Kismayo.

The development of port facilities generally creates significant impacts upon coastal areas. Apart from the effects of construction, there are related issues such as oil pollution from accidental spills or, as in the case of the ARIADNE, major accidents involving the sinking of ships and the release of the cargoes into the sea. These latter problems can normally be rectified, however the construction of a port introduces a major, permanent influence into highly dynamic coastal systems. Great care must be taken in both the design and construction of port facilities to avoid negative environment impacts where feasible. This requires high standards of coastal engineering and the incorporation of environmental factors into the evaluation of alternative port locations.

Port development in Somalia has been a mixture of extending old facilities and the creation of new port areas. For example, the modern port of Berbera was established relatively recently and has subsequently been extended. Mogadishu also has a new port replacing the old port which lies to the north.

While no criticism is being made of the facilities themselves, there does not appear to have been any detailed environmental assessments of port development options or any monitoring of the impact of new construction. Given the significance of marine and coastal resource systems to Somalia's development more attention must be paid to the impact of port construction and management. Examples of issues which are related to the development of Mogadishu are: (1) the extensive quarrying and sand mining required to construct the port took place in the adjacent beach/sand dune systems leaving a derelict quarry and adding to the problems of sand dune remobilization; (2) filling of the sand bypass system of the old port has created a problem of siltation rendering the old port of limited value and there is evidence of related beach starvation and erosion to the north of the old port along the Lido Beach.

There are proposals to build a deepwater port at Merca and, in the absence of comprehensive environmental assessments which examine alternative sites and potential impacts, there is a danger that avoidable environmental damage will be incurred.

Given the wide authority and powers over development along the coast exercised by the Ministry of Marine Transport and Ports, it is important that a nucleus of staff be trained in coastal management. Specific attention should be given to coastal dynamics, environmental assessment, coastal engineering and coastal area management and planning. Close coordination should be developed with the Ministry of Public Works which is in charge of major construction projects and with other Ministries which would be affected by port development activities.

2.5.2 Roads

Road transport forms the major mechanism of trade between the regions. Coastal roads, such as the one linking Mogadishu, Merca, Brava and Kismayo, are often constructed in environmentally sensitive areas and are called upon to bear heavy vehicle traffic in all forms of weather. These conditions require high standards of route location, construction and maintenance. If a road is put in the wrong place or inadequate foundations and drainage arrangements are made it may suffer continual damage. The coastal road to the South of Mogadishu has a history of sand encroachment due to the destabilization of sand dunes. The only road leading to Merca was earlier blocked by sands which stimulated the government's efforts to promote the dune fixation programme. In Brava the new access route is threatened by poor drainage arrangements which are causing erosion which will undermine the road's foundations. The main road leading to Kismayo also suffers from poor drainage and in adjacent sand dune areas massive erosion is evident.

2.5.3 Airports

Somalia's two international airports - Berbera and Mogadishu - are built in coastal locations. Other airports such as those at Bosaso and Kismayo are also located adjacent to the coast.

Airport construction in arid coastal regions of the tropics presents special problems due to the need to deal with extended dry periods, periods of intensive rain, strong winds of seasonally variable direction and the fragility of coastal landforms such as dunes. As in the case of ports and roads, environmental assessment procedures should be followed to examine alternative locations and very high standards of engineering, construction and subsequent maintenance are required.

2.6 Tourism

Tourism is virtually undeveloped in Somalia. The potential for future development is limited by the relative isolation of the country in respect to international air flights, poor infrastructure and a general lack of diversity in terms of major tourist attractions. The fine sand beaches do represent an attractive element for the tourist, however the distance from major European centres in relation to the accessibility of West Africa puts Somalia at a disadvantage. Game parks and marine reserves, including coral reefs, could also be considered a tourism resource, however neighbouring countries such as Kenya have a far better range of established parks which places Somalia in a less competitive position.

A development plan for tourism has recently been prepared with the assistance of a consultant working with the Ministry of Tourism. This plan places great emphasis upon linking marine resources such as coral reefs and the proposed Bush-Bush national park with tourism development.

New legislation has been passed[1/] (but not yet ratified) giving the Ministry of Tourism broad powers to create "Tourism Zones" in which strict controls over land use and development would be instituted. Controls would also apply to the siting of facilities, construction, water provision and sewerage services associated with hotel development.

The Tourism Development Plan and accompanying legislation represents a major step forward in the planning, development and management of tourism. It also represents an opportunity to establish multiple yet complementary forms of land and water resource use. By linking natural resource development and conservation options, such as the establishment of marine parks and game sanctuaries in association with tourism, it would be possible to increase political support for conservation measures and to derive income from tourism to improve foreign exchange earnings.

1/ Tourism Development Act of 1984

If the Plan is adopted and the legislation is ratified, the potential impact of tourism in the coastal zone could be focused to suitable locations and ameliorated through appropriate management measures. Controls over the development of tourist facilities would form the primary mechanism for reducing and ameliorating adverse impacts. Thought should also be given to management measures to strengthen the ability of fragile coastal ecosystems to withstand increased use. For example, access to beach areas would need to be controlled and boardwalks constructed to conserve the vegetation which helps bind the sand and prevents erosion. Such practices are common in tourism management plans. They will be particularly important in Somalia where grazing of livestock in beach and sand dune areas is common and the available vegetation is already under stress.

The creation of performance standards for project design and maintenance of facilities and their enforcement is critical to the successful implementation of any development. Appropriate standards and enforcement procedures plus well trained and motivated manpower will be required. Given the shortage of manpower, it will be important for the Ministry of Tourism to develop good working links with the Ministries of Public Works and Marine Transport and Ports to coordinate activities, ensure that manpower skills are made available and that facilities such as sewage are installed and maintained properly.

2.7 Urban and Rural Development

Planning for land and water resource development must take into account trends in population growth, migration and human settlement. Current estimates place the total population of Somalia at 5,384,202 persons (MNP, 1985). Annual natural growth is estimated at between 2.8 and 3 percent. Migration plays an important role in the distribution and growth of the population. Migration from northern Somalia and Ethiopia, combined with a high rate of natural increase have created a relatively high rate of population growth in southern Somalia. The growth rate in urban areas in southern Somalia is estimated at approximately 10 percent per year while the settled population in rural areas is growing at an estimated rate of between 5 and 8 percent (LRDC, 1984). Growth amongst nomadic populations is variously estimated at between 2 and 3 percent per year.

The trends in population growth and migration suggest that recent high rates of settlement of new agricultural lands and the expansion of urban and rural settlements will continue. With the limited capacity of rangelands in lower rainfall areas to absorb either increased nomadic populations or increased numbers of livestock, there will be increasing pressure on the less arid coastal grazing areas. There will also be a continuation in the long-standing trend in sedentarisation of the nomadic population into areas of mixed farming and livestock. Due to existing high rates of land uptake in areas of higher potential for permanent cultivation and the limitations upon the expansion of irrigated cultivation posed by limited water availability in the middle Scebelle, there is a high probability that future agricultural development and rural settlement will focus on the lower Scebelle, lower Juba and inter-riverine plain between these river systems. There are already plans for new refugee settlements in these lower coastal plain areas.

The sectoral report on Marine Pollution contains an estimate of the population in coastal districts. This reveals that some 30 percent of the total population lives in the coastal zone. If the districts in the northern, central and southern regions are compared, it is clear that more than 69 percent of the coastal population lives in southern Somalia. Of the southern coastal population 44 percent live in the coastal settlements of Kismayo, Brava, Merca and Mogadishu. The population of Mogadishu represents some 11 percent of the total coastal population.

2.8 The Economic and Social Significance of the Somali Coastal Zone

If the broad definition of the Somali Coastal Zone discussed earlier is used, a large percentage of the agricultural lands suitable for the development of permanent crops, important grazing lands, and fishery resources are located in coastal land and adjacent marine areas. Given the heavy dependence of the Somali economy on primary resource production to supply both domestic food and material requirements and exports, management of the coastal resource base will play a central role in national development in terms of meeting the basic needs of the expanding population and supplying raw materials for secondary economic development.

The coastal zone also contains the majority of all industrial activities which represents a major commitment of public investment, a concentration of the available technical and managerial skills, and a major source of domestic income and foreign exchange earnings. Future economic development will depend heavily upon expansion of the industrial base to transform primary resource production into secondary economic products for domestic consumption, for import substitution and the creation of an expanded export market. Access to ports and sea communications associated with the major urban and industrial areas will also play a major role in the development of trade.

The concentration of some 30 percent of the total population in coastal communities and rural districts provides both an extensive labour pool and a relatively concentrated domestic market. Both the inherent natural resources and the concentration of social and economic resources within the coastal zone reflects the existing and potential value of coastal areas in Somalia's development.

Given the high rates of natural population growth and inward migration to southern Somalia, and the concentration of industry, commerce and agricultural land with potential for further settlement, the coastal areas of southern Somalia will form the focus of future development. The management of both rural and urban development in the southern coastal zone will require a major new initiative if development of coastal and marine resources is to keep pace with population growth. The continuation of existing sectoral approaches will not provide an adequate response to this development challenge. A coastal area management and planning initiative should be considered as an appropriate mechanism for integrating and coordinating sectoral development policies and initiatives in relation to the ability of coastal and marine resources to support development.

While it will be extremely important to develop resources such as fish stocks and arable lands on a sustainable basis, it will be equally important to rectify existing problems which reduce the quality and productive capacity of natural resource systems such as pollution of groundwater supplies. The successful development of primary, secondary and tertiary resource opportunities will require increased standards of resource assessment, planning and allocation and day to day management. Given the complexity of the relationships between coastal and marine ecosystem and man's use of the coast, there will have to be concomitant advances in government administration, manpower training and legal arrangements. To these ends, the adoption of a working definition of the Somali Coastal Zone may prove a useful tool in defining appropriate bio-physical management units, resolving conflicts between sectors of the economy and the promotion of multiple-use of coastal and marine resource systems.

3. PROBLEMS AND ISSUES ASSOCIATED WITH THE MANAGEMENT OF COASTAL AND MARINE RESOURCE DEVELOPMENT

3.1 Major Development Problems

One of the fundamental issues associated with the development of marine and coastal resources in Somalia is the limited perception of major environmental problems. The terms of

reference for this mission reflect Somalia's perception that the major coastal and marine development problems are related to marine pollution. The field observations and discussions with agencies in Somalia revealed that there is little significant marine pollution. The major problems are land based and have only a limited effect on marine resources. However, their current impact upon coastal land and water resources is very significant and, if nothing is done to improve coastal areas management and planning, the development potential of coastal and marine resources may be severely reduced.

The development problems of primary significance are natural hazards, land based industrial and municipal pollution and the generally low standards of management and planning associated with the allocation and use of resources. These are dealt with in more detail below.

3.1.1 Natural Hazards in Somali Coastal Areas

Migration of sand dunes:

Remobilized coastal dunes and the formation of new dunes pose a threat to communications, settlements, arable lands and livestock grazing areas. There is an uninterrupted sand dune system extending some 1,800 km along the eastern coast from Eli in the North to the border with Kenya in the South. The distance at which these dunes are found from the sea ranges from a few meters to approximately 25 km. The majority of the dunes are stable, however, there are large areas of destabilized dunes in areas scattered along the coast. The exact location of these areas is not well documented.

A recent UNSO report (UNSO/DES/SOM/80/001, March 1984) states that there are 150,000 ha of formerly stable dunes which have been reactivated to the South of Mogadishu, while active dunes to the North of Mogadishu extend over an area of 315,000 ha. The report emphasizes that the size of the area is less disturbing than the accelerated rate at which active dunes appear.

The Government of Somalia is well aware of the hazards posed by mobile dunes and has given priority to restabilizing a 200 km stretch of dunes along the Shallambood-Mudun-Brava road. In this area, 80 percent of the estimated dune area (150,000 ha) is thought to be migrating at a very rapid rate. This area has suffered repeated encroachment of mobile dunes onto the main coastal road serving the south between Merca and Mogadishu. Apart from disrupting road communications and access to the port of Mogadishu for the export of crops, migrating dunes also threaten the irrigation areas which produce major export crops such as bananas.

UNEP and UNSO[1/] have sponsored missions to examine the problem and to provide advice on measures to restabilize mobile dunes. These reports cite major causes of dune reactivation including: overgrazing, trampling, quarrying and sand mining (construction sand), water erosion resulting from urban development, poor maintenance of road drainage systems, the incursion of marine sand and increasingly arid conditions in the area to the north of Mogadishu. It is believed that dune destabilization originated during the 1960's and has accelerated rapidly.

1/ Sand Dune Fixation Report in the Democratic Republic of Somalia: Mission Report by Olaolu Babalola, UNEP - NA 79-4413; Inventory of Sand movement in Somalia, UNSO/DES/SOM/80/001, March 1984.

The National Range Agency (NRA) has an "anti-desertification" division which is responsible for measures to combat the dune problem. A programme for reafforestation is being implemented in an attempt to restabilize dunes in specific areas. The first efforts at restabilization began in 1970 at the behest of President J.M. Barre based upon a self-help programme involving the Department of Forestry of NRA, the army and local labour. Since 1970 three donor assisted dune fixation projects have been implemented at:

(a) Brava and Merca - through the Danish International Development Agency;

(b) Shallambood (south of Mogadishu) - through the help of the Italian Government; and

(c) Adale (north of Mogadishu) with AGFUND support.

We are not in a position to say whether current efforts are sufficient to adequately address the hazards of dune reactivation. The UNSO consultants report (UNSO - 1984) is very thorough and provides detailed management recommendations for the different areas studied. These recommendations include a revision of socio-economic policy to reduce human and animal pressures on large, severely affected areas where a regional rather than a site specific approach is required. This implies prohibition of human access and livestock grazing in the South western sectors of active dunes to the north of Mogadishu. Whether this very strong recommendation is socially acceptable to the nomadic pastoralists is a very important question. Prohibition of access to land is counter to Somali culture and is cited as a major stumbling block to the implementation of plans for wildlife refugees and national parks. If such a prohibition was accepted by the Government it is not clear how they could actually implement restrictions given the shortage of trained manpower, problems of access and the costs involved in transport and enforcement. Unless grazing is restricted, it is difficult to see how the dune problem can be adequately addressed.

There are associated issues which are not well documented which we have observed and contribute to the management problem associated with dune mobilization. These include: the lack of real control over the extraction of limestone blocks and sand for construction from quarries adjacent to the shoreline; the lack of control over development in the fore-dunes in beach systems; the absence of coastal protection measures associated with dredging, the extraction of coral reef materials for building materials or for other purposes such as reef removal to increase flushing of wastes from the abattoir at Mogadishu; and the absence of environmental engineering standards pertaining to urban and industrial development and road construction and maintenance.

The environmental sensitivity of the dune systems and associated coastal ecosystems, including beaches and coral reefs, is only beginning to receive attention. Our Somali counterparts from the Ministry of Marine Transport and Ports and the Ministry of Livestock Forestry and Range are aware of many of the above issues. Measures to increase control over activities such as quarrying and to seek reinstatement of the ground following the cessation of operations are being initiated. Specific help has been requested from the team to provide management advice and reference material to help in the improvement of the management of coastal and marine resource use. Suggestions for further help are dealt with at the end of this report in the section on conclusions and recommendations.

Even though new initiatives are being taken to control development in environmentally sensitive areas, there is a general lack of knowledge about coastal and marine resources and management parameters. While every effort should be made to help in this area, it is equally important to give attention to the need to improve development planning at the regional and local level and to seek improvements in the coordination of resource development efforts. This idea is further developed in the section on land and water use planning and management.

Floods

Floods are a natural feature of river systems in areas where there are major fluctuations in rainfall. The area over which the flood waters spread is defined as the 'Flood Plain' which serves to absorb the energy of the flowing water and to trap sediments transported from upstream areas.

Flooding in the coastal plain is common to both the Juba and Scebelle river systems. The two rivers rise in Ethiopia and due to strained relations between the two countries, there is little prospect of developing complementary river basin management schemes for either river. At the present time, floods along the Scebelle in Ethiopia reduce potential peak flows in lower reaches of the river in Somalia. However, flood containment measures such as banks or dykes constructed along the river in Ethiopia could increase the flooding hazards in Somalia. In contrast, efforts to control erosion rates in the upper watershed in Ethiopia could help reduce siltation in the river system creating benefits in Somalia such as reduced flooding or siltation of irrigation channels.

While the upper reaches of the Juba or Scebelle systems cannot be considered as part of the Somali coastal zone, the management of activities in these river basins has a direct bearing upon coastal area management. The most serious floods along the Scebelle are found near Jowhar and below Afgoi both of which are located in the lower coastal plain.

Flood control measures, including embankments to raise the height of natural levees, have been constructed but suffer from poor maintenance and from farmers cutting breaches in the embankments to irrigate fields. A World Bank (1984) report which discusses flood control places great emphasis upon structural measures to defend villages from flooding. However, dykes, relief canals and off-stream reservoirs are capital intensive, require continuous maintenance and, as in the case of the embankments mentioned above, may impede the use of the river's waters for improving the yields of field crops. It may be sensible to seek non-structural watershed management solutions including, reafforestation, agro-forestry, improved water management and to let the flood plain continue to function as a natural flood control mechanism.

The use of the flood plain to serve its natural function is referred to in the World Bank (1984) report in terms of establishing "flood zones". However, the zones referred to are couched in terms of excluding other uses. While the team has not had the opportunity to make a detailed examination of the flooding problem, alternative solutions might be explored based upon non-structural approaches, by delimiting natural flood plains and discouraging settlements in these areas, and by devising agricultural systems which can accommodate periodic flooding. Steps would have to be taken to reduce the short-term risk to villages during the period in which watershed management measures would start to take affect. Improved land use planning would also help to steer future settlement development away from flood prone areas.

It should be remembered that structural measures may only serve to increase and accelerate the flow of water during peak periods and to concentrate the full force of those waters in the lowest reaches of the river system. Given the irregularity with which the Scebelle river reaches the sea, it would be extremely important to consider the impact upon the coastal areas where the Scebelle flows including the freshwater wetlands and the intermittent channels to the sea.

Flooding along the Juba system is most serious in the flood plain below Dujuma. This area is the focus of banana and sugar plantation development. The construction of a dam at Bardere is planned to provide increased irrigation water storage and would also serve to retain flood waters and to control their release. The World Bank (1984) report stresses the need for structural measures to control flooding in the lower flood plain. We have not been able to examine the project documents pertaining to the Bardere dam but, if strict control over land use and vegetation management in the watershed above the dam is not part of the scheme, there may well be problems of siltation, forshortening of the economic life of the project and longer-term increased flooding hazards.

Man's influence in increasing the incidence and severity of natural hazards

Both the remobilization of sand dunes and the incidence of flooding in coastal districts represent natural hazards whose incidence and scale of impact have been increased due to man's activities. The reduction of such hazards and the social and economic stress they generate requires both a sound understanding of the environmental systems and the management of diverse activities which have a collective impact upon those systems. This is a primary reason why environmental assessment and land and water resource management must play an increasing role in planning the development of Somalia's natural resources.

3.1.2 Land Based Pollution

Marine pollution derived from land-based sources is not a major problem due to the relatively minor and highly localized emission of industrial and domestic wastes reaching the sea. However, pollution of coastal land and water resources has reached an alarming level. The sectoral study of land-based sources of pollution and the marine and coastal area development study have identified and given priority to the following environmental problems:

(a) Discharge of toxic tannery wastes to the sea at Brava and Kismayo and on land at Mogadishu. The discharges at Mogadishu are located in an area where a shallow ground water aquifer supplies domestic drinking water;

(b) Discharge of sewage from hotels, commercial premises and government institutions directly to the sea at Mogadishu;

(c) Inadequate refuse managment in settlements, especially the capital city Mogadishu;

(d) Poorly developed and maintained water supply networks and low standards of water quality. In Kismayo people are receiving untreated, silt laden water from the Juba river even though a modern water treatment facility was provided by a donor assistance. The facility has not been maintained;

(e) Housing and sanitation problems are acute in many settlements;

(f) Environmental monitoring is virtually non-existent and critical enviromental health tests are not being carried out;

(g) Absence of adequate mechanisms for coordinating environmental management activities such as the control of municipal waste discharges and industrial emissions or maintenance of groundwater quality; and

(h) Public awareness of the danger to health due to deteriorating sanitation arrangements or water quality is low.

Each of these factors is discussed in more detail in the sector report on Land Based Sources of Pollution

3.2 Issues Related to Current Marine and Coastal Development Problems

The generally low level of perception of environmental problems and their impact upon social and economic development efforts is part of a chain of events which leads to the degradation of resources and the loss of development options. The mission was greatly encouraged by the concern shown by officials over the need to promote improved standards of environmental management and resource development. A fundamental difficulty facing the Somali Government is lack of

information concerning coastal and marine resources. The absence of basic management principles and guidelines relating opportunities and constraints posed by the environment to development planning policies and actions also poses a severe problem. Factors which contribute to the marine and coastal resource development problems in Somalia are dealt with below.

3.2.1 Environmental Assessment

The fishery surveys and stock assessments available for Somalia are inadequate for the development of sustainable fishery activities. The same conclusion can be applied to most coastal resource systems. For example, there are no comprehensive studies of coral reefs, the fish stocks they support or their ability to sustain tourism or the harvesting of semi-precious corals. Little is known of the areal extent and species composition of mangrove. No detailed beach surveys have been conducted to determine their international significance as nesting areas for endangered species of turtles or birds. There is a wide range of basic questions concerning the ability of Somalia's coastal and marine resources to respond to development initiatives. Nevertheless, sensitive and highly dynamic coastal ecosystems are being developed for uses such as mining which drastically alter their character. Major donor assisted projects are also being formulated based upon inadequate assessments of renewable resources. The fish processing plant in Kismayo is a case in point. In essence major sectoral development efforts are being implemented based upon little knowledge of the systems upon which they are dependent.

In addition, little is known of the linkages between coastal ecosystems. Obvious linkages such as flooding in the lower coastal plains of the Juba and Scebelle rivers resulting from upstream land use development are recognized, but improved land and water management of upland areas is not seen as a means of improving the economic viability of flood affected activities in the coastal zone. Management of the Juba river system was never discussed by any of the officials we met in terms of changes in hydrologic cycles, agricultural chemical wastes or sedimentation affecting coastal and marine resources such as the shrimp fishery in the Juba delta.

Based upon an improved understanding of coastal ecosystems and their linkages with inland and marine areas, the ability of coastal resource systems to support different forms and intensities of development needs to be defined. Specific topics which need to be addressed are:

(a) sustained fisheries development of inshore fish, shrimp and lobster stocks;

(b) the application of extended environmental assessment (ecological, economic and socio-cultural evaluations) of livestock grazing in coastal sand dune areas to determine acceptable means of regulating grazing pressure;

(c) limestone and sand mining in areas adjacent to the sea;

(d) conservation of coral reefs to prevent coastal erosion from wave activity and the subsequent destabilization of coastal sand dunes; and

(e) carrying capacity of coral reefs and beaches in terms of potential tourism development.

The assessment of coastal and marine resource systems also needs to be strengthened in terms of providing information on alternatives for development. Two types of alternatives need to be examined. The first relates to single purposes versus multiple-use options for the management of coastal and marine resources. For example, coral reefs can act as a buffer to coastal storms, supply limited amounts of limestone or semi-precious corals, provide nutrients and nursery and spawning areas for commercially valuable fish stocks and provide an attraction for tourists all at the same time if the uses of the reef are carefully managed.

We saw little evidence of comprehensive environmental evaluations or the determination of multiple-use development alternatives during our visit to Somalia or in project reports and published materials. The National Tsetse and Tryponosomiasis control project (LRDC/1985) does present an analysis of the agricultural resources of coastal areas and a good example of project planning where ecologic, economic and socio-cultural information is integrated. However, the exposition of single versus multiple-use options for coastal and marine resources will require more detailed information on a broader range of topics than is normally collected and analysed for a sectoral activity such as agriculture or fisheries. It requires information on: (1) the ability of individual resource systems to respond to alternative forms of development, (2) information on interactions between different forms of use, and (3) the form and level of management required to promote the desired development. However, the choice of alternatives is not promoted by current sectoral evaluations of the development potential of resources. For example a forestry department defines the ability of a forest to produce timber, however they are poorly equipped to conduct evaluations of agricultural potential of different forest sites. The current strong emphasis upon sectoral resource evaluations often leads to competition between agencies and the assessment of alternatives is often more a question of political power. This can lead to short term expediency where the best productive agricultural soils may be given over to banana plantations instead of mixed cropping systems producing both export crops and import substitution crops.

People naturally guard their sectoral activity and give as little away to other uses as is possible. The result is both poor resource assessment for sustained development and inadequate information for the evaluation of development alternatives.

We therefore suggest that a new approach be taken to the collection and evaluation of information based upon natural resource systems, their functions and interlinkages. Instead of forestry surveys of species composition and standing stock, or the range survey of mangrove for camel fodder, more balanced and objective studies need to be conducted which do not predetermine the form or limit the scope of assessments of alternatives. We further suggest that the assessments be coordinated by a centralized body - such as the Ministry of National Planning and their proposed inter-agency "Environmental Coordination Committee". This would help promote a clearer understanding of the major resource systems, their ability to support development and limits to development which are related to physical factors such as soils, public investment in roads and other infrastructure, manpower skills and problems associated with current development (misallocation of resources, pollution, erosion, water shortages, etc.).

The second form of alternative which needs to be addressed is the evaluation of alternative locations for projects and activities. For example limestone and sand materials quarried for construction purposes may be found in different locations. The benefits and disbenefits to the Somali economy of quarrying these materials in beach areas versus less fragile inland environments needs to be evaluated so that options can be presented to decision makers such as the staff of the Harbour Master's Department. The same concept can be applied to other activities such as tourist hotels.

From our own work in Somalia we would suggest the following forms of information are required to promote improved evaluations of development alternatives:

(a) Assessments of the compatibility of different forms of resource use and determination of multiple-use opportunities which maximize the development potential of natural resource systems. An example would be the use of mangrove for coastal erosion control; fisheries conservation; limited fuelwood and charcoal or other minor forest product production; woodchip production; control of salt water intrusion into ground water supplies, etc.

(b) Assessment of the environmental, social and economic impact of different forms and intensities of development. This would help to define the costs or benefits which would result from management controls over specific activities. For example, would the enforcement of standards of agricultural waste discharges into rivers result in significant reductions in damage to river fisheries, irrigation, water supplies, etc.

(c) What improvements could be made to existing development to improve production and reduce land requirements. This is particularly significant to issues such as livestock grazing, quarrying and urban and industrial development. Such analyses help to reduce resource competition, improve the cost effectiveness of public investment in infrastructure and help to promote more effective resource management to meet national targets of resource production; and

(d) What land/water uses require coastal locations and which are not compatible with other coastal uses. These uses will require exclusive use of specific coastal areas and the trade-off associated with alternative locations should be explored.

This list can be extended, however, we suggest the theme we have indicated of improving the use of resources by looking for multiple-use opportunities and alternative strategies for improving existing resource use is a key point which should be built into the Action Plan.

3.2.2 Land and Water Resource Planning and Management - Institutions and Sectoral Responsibilities

The National Development Plans prepared by the Ministry of National Planning (MNP) in association with the Ministry of Finance (MOF) set forth priorities for development programmes and sanction projects proposed by sectoral agencies and regional authorities. There are no comprehensive national, regional or local plans for the development or allocation of marine or coastal land and water resources. Policy decisions concerning the allocation of physical resources and scarce development funds are, therefore, based upon the success of competing sectoral claims.

While programme and project funding is controlled by the MNP and MOF, responsibility for the allocation of land or water lies with a series of sectoral agencies including the Ministries of: Agriculture; Livestock, Forestry and Range; Marine Transport and Ports; Fisheries; Mineral and Water Resources; and Commerce and Industry.

Inter-sectoral conflicts

The competing, and at times conflicting, interests of these agencies can lead to disputes over the control and use of land and associated resources. Within coastal areas the problems are acute due to both the concentration of population and secondary economic activities and the lack of control over primary activities such as livestock grazing and sand mining. In the case of sand dune reclamation, dune stabilization efforts by the National Range Agency (NRA) are being frustrated by the absence of controls over livestock grazing which is the responsibiity of the Ministry of Livestock, Forestry and Range the parent Ministry of the NRA. Apart from the lack of coordination between the arms of this ministry, activities controlled by other ministries are compounding the difficulties of restabilizing dunes including sand mining (Ministry of Marine Transport and Ports), coastal settlements (Ministry of Fisheries) and coastal road construction (Ministry of Public Works). There are further conflicts between agencies which make the resolution of sand dune problems more difficult including the dispute over who should control sand mining in coastal areas between the Ministries of Minerals and Water Resources and Marine Transport and Ports.

The co-ordination and integration of development is, in theory, carried out by regional councils presided over by district commissioners and regional governors. The administrative structure of the regions and districts includes representatives of all major national ministries and agencies including: MOA, MCFR, NRA and WDA. In practice, the absence of adequate resource and environmental assessments, lack of manpower skilled in regional development planning and the heavy dependence on foreign assistance leads to a piecemeal project by project approach to development planning.

Legislation

There is no legislation which makes provision for the creation of regional or district land or water use plans. The planning and management of urban areas, was earlier dealt with under the Town Planning Ordinance of June 1, 1947 which was laid down during the period of British control of the northern regions and was most likely based upon the then new planning arrangements in Britain. We have not been able to examine this ordinance however the UNEP Regional Seas Report No. 49 (1984) cites sections 10 and 13 of the Ordinance. This section deals with the development of a town planning scheme with the general objective of securing proper sanitary conditions, amenities and other infrastructure in connection with the laying out and use of land within townships. Section 13 specifies the factors which must be taken into consideration in the creation of a town planning scheme. These include:

(a) the alignment, adoption, naming, construction, grade, level and width of streets, roads, sanitary lanes and other ways, together with the spaces therein to be utilized for carriageways, tramways, ways for fast traffic vehicles, footways, boulevards, trees, and planted or ornamental plots and for stands for traffic vehicles and for sites for services of public utility and the relation of buildings abutting thereon to the said streets, roads or other ways;

(b) the alteration, re-alignment, renaming, diversion, closing or suppressing of existing streets and sanitary lanes;

(c) the erection, character, occupation and use of buildings and other structures, the building line, the height, elevation and construction thereof, the space about the same, the percentage of any plot which may be covered by new buildings or on which old buildings may be reconstructed, the class of buildings to be erected in specified areas, and the adoption of zones within which to regulate the density of buildings for the purpose of securing the amenity of proper hygienic conditions;

(d) the provision, adoption, maintenance, alteration or conversion of open spaces, public and private, and of parks, parkways and public and private pleasure or recreation grounds, outspans and commonways;

(e) the preservation of objects of historical or archaeological interest or of natural beauty and the provision of access thereto;

(f) the lines of water-mains and pipes and provision of means for drainage, sewerage and sewage disposal;

(g) the prohibition, removal, demolition or alteration of any obstructive work;

(h) the payment of compensation in respect of property injuriously affected by the town planning scheme.

This Town Planning Ordinance provides a useful framework for dealing with many of the existing problems of settlement development. From our visit to Berbera it appears that this Ordinance is not utilized. Its creation under the former protectorate arrangements also suggest that it may not have been adopted in the central and southern regions. In Mogadischu, town planning regulations exist but they pertain mainly to building design. Other functions, such as services and infrastructure development, are divided amongst agencies such as Public Works or the Municipal Water Authorities. No overall planning system dealing with land use allocation and the coordination of supporting infrastructure exists.

The absence of an effective town planning system has led to problems such as the absence of adequate sanitation and the encroachment of housing into industrial sites which presents problems for the expansion of industry and health hazards to the local population.

The Coastal Development Project established under law no. 36 (6 April 1977) provides the Ministry of Fisheries with additional powers to plan and coordinate nomad resettlement activities initiated under powers set forth in law no. 14 of 1976. This project can determine resettlement sites, construct schools, housing, hospitals and fishing harbours and manufacture fishing equipment and boats.

The new Tourism Development Act, 1984 makes provision for broad controls over land and water use activities in special zones defined as having tourism potential. This law also makes provision for controlling the design, construction and maintenance of facilities, services and related infrastructure.

While the objectives of these laws are laudable, they set a precedent for zoning areas and land and water resources primarily for sectoral development. Coordination and development powers relate to specific activities and not the resolution of competing or conflicting demands for resource allocation or problems associated with rights of access to resources such as exercised by nomadic pastoralists grazing fragile dune systems. Strong tribal loyalties and traditional claims of rights of access to "common" land make it very difficult to institute effective controls over land or water use. It is questionable whether the post-revolution legislation placing the ownership of all land in the public domain (law 73 of 1975) will facilitate the rational allocation and management of resources. A case in point is the resettlement of nomads in sites which were chosen to avoid conflicts with established residents. Many of these sites have been shown to have soils unsuited to agriculture and represented areas rejected by local people (LRDC, 1984).

The sectoral report on marine environmental legislation deals in much greater detail with legislation pertaining to marine and coastal resources.

Manpower

As is the case of many developing nations, there is a shortage of administrative and technical skills in Somalia. This inevitably leads to heavy work loads for those who are capable of undertaking major responsibilities with little opportunity for them to delegate work to staff with adequate supporting skills.

The majority of people we met in responsible positions were either trained in military establishments or received higher degrees from universities abroad. The National University of Somalia has only a limited number of fully functioning faculties which have the capacity to train administrators and specialists with skills related to coastal and marine resource development. Most of the training opportunities which exist are related to highly specialized scientific areas such as geology, biology or chemistry. There are no faculties or departments teaching land use planning, resource management, environmental conservation or resource economics. The nearest course to any of these topics is a basic economic geography course taught in the social science faculty and a course in water resources offered by the civil engineering department.

The Range School set up under the auspices of the National Range Agency with help from G.T.Z. offers basic training in forestry and wildlife management. However, with only two lecturers, the throughput of the school is limited as is the scope of the instruction which can be offered. To date the three year full-time course and short courses have focused on foresty with little emphasis being given to wildlife management. Topics such as watershed management do not comprise a major part of the curriculum.

In time, the University will expand and new courses can be introduced related to the major manpower skills required. However, for the forseeable future, training at centres outside Somalia or special training projects or workshops held in-country will have to be called upon to provide the bulk of the manpower training related to coastal and marine resource management. Great emphasis should be placed upon developing technical and administrative skills as well as more advanced, interdisciplinary training in coastal area management and planning.

3.2.3 Degradation of the Resource Base

There are few evident problems of damage to marine resources. Overfishing or the destruction of coastal ecosystems such as coral reefs which are prevalent in other developing nations do not present serious problems in Somalia at this point in time.

Degradation of coastal groundwater supplies, inappropriate development of sand dunes, overgrazing, and dereliction associated with coastal mining do create serious management problems. Most of the damage which has been caused could have been avoided without impeding the process of development.

3.2.4 Underutilization of Resources

As in the case of fisheries, the full development potential of many marine and coastal resources has not been realized. Other resource opportunities have not yet been exploited. The underutilization of sustainable resource development opportunities may represent a more serious challenge than those associated with contingency planning for a possible oil spill. However, apart from fisheries, oil and gas exploration and tourism, little attention has been given to exploring the use of coastal and marine resources to help diversify the economic base of Somalia.

3.2.5 Basic Economic Implications of Coastal Resource Development Opportunities and Environmental Problems.

Overexploitation, underutilization, intersectoral conflicts, pollution or resource degradation all represent forms of inefficient economic development. For a nation such as Somalia which is highly dependent upon the ability of its natural resource base to sustain economic activities and which has scarce capital and skilled manpower resources, efficient economic investment and the maximization of sustainable resource production are complementary objectives. Realization of these objectives requires the investment of funds and manpower to develop information required to define resource development opportunities and constraints. Investment is also required to correct problems which reduce the productive capacity of the resource base.

Balanced assessments of coastal resource systems are not a characteristic of current development plans. Instead, single purpose land or water uses dominate coastal development initiatives. This strong emphasis upon maximizing specific single purpose resource developments effectively states that all other uses are of insignificant value. However, the sum of the benefits from multiple-use forms of development often exceeds the benefits from either preservation or conversion and destruction of the resource systems. Except for activities such as ports or power stations which cannot be developed without radical alterations to coastal areas, the greatest economic returns from coastal resource development will lie in skillfully managed, multiple-use activities based on the conservation of natural coastal resource systems.

The basic challenge in coastal area management and planning is the establishment of a balance between the maximization of sustainable resource production and the conservation of development options until such time as they are no longer needed to fulfill the needs of the Somali people. Therefore, there is a need to focus upon the assessment of how existing development can be made more productive, and to study the relative advantages of this option versus the intensification of activities which are detrimental to coastal and marine resource systems.

In practice, economic and ecological considerations cannot be separated in the evaluation of management alternatives for coastal and marine resource systems. Two critical factors which require careful consideration are: (1) many of the goods and services produced by these resource systems are not easily expressed in monetary terms, and (2) many of these goods and services are utilized at a distance from the system which produces them and become economic externalities.

Figure 4 below illustrates these two points using the example of a mangrove ecosystem. It is therefore very important to include the full range of environmental goods and services, whether they occur on-site or off-site of the resource system, in the economic assessment[1/] of development options. Ecological information defining the boundaries of resource systems, the functions they perform and the goods and services they generate provides a means of constructing an analytical framework for accurately representing the economic benefits and disbenefits of alternative management options.

In the absence of a well developed framework for resource assessment, allocation and management in Somalia, benefits could be realized now from more comprehensive project evaluations using economic-ecological assessment to determine the relative merits of proposed activities and alternatives for their location. This, however, will require technical assistance and training of new staff and the exposure of managers to the benefits which can be derived from better economic/environmental assessment, project evaluations and, ultimately, improved resource planning and management frameworks and procedures.

Methodologies for the economic analysis of natural systems have been developed[2/] and can be built into development planning methodologies.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Main Findings and Conclusions

The coastal zone of southern Somalia will form the focus of future development activities. In the northern and central regions, coastal and marine resources will also play a major role in the diversification of the economic base and in the production of food, raw materials and other essential goods and services. However, the scale and rate of coastal development in these regions will, for the forseeable future, be of a more modest scale than in southern Somalia.

At this time there is no significant marine pollution or other issues affecting marine resources in Somalia. However, a series of problems exist which will have to be overcome in order to allow coastal land and water resources to fulfill their potential for sustainable development. These include:

(a) environmental damage and hazards to human health resulting from the discharge of untreated industrial and domestic wastes;

1/ Stress is placed upon broadly based economic assessments which represent the full range of costs and benefits to society rather than financial assessments which are normally applied by a private investor unconcerned with economic effects external to his profit and loss accounts.

2/ For example see Hufschmidt, M.M., D.E. James, A.D. Meister, B.T. Bower, and J.A. Dixon, 1983. Environment, Natural Systems and Development: An Economic Valuation Guide. Baltimore: The Johns Hopkins University Press; or Burbridge, P.R. and J.A. Dixon 1984, Economic Considerations in mangrove management, in Hamilton, L.S. and S.C. Snedaker (eds) Handbook for Mangrove Area Management, East-West Centre, Hawaii/IUCN/UNESCO/UNEP.

Valuation of Goods and Services		Location of Goods and Services: On-site	Location of Goods and Services: Off-site
	Marketed	**1** Usually included in an economic analysis (e.g., poles, charcoal, woodchips, mangrove crabs)	**2** May be included (e.g., fish or shellfish caught in adjacent waters)
	Nonmarketed	**3** Seldom included (e.g., medicinal uses of mangrove, domestic fuelwood, food in times of famine, nursery area for juvenile fish, feeding ground for estuarine fish and shrimp, viewing and studying wildlife)	**4** Usually ignored (e.g., nutrient flows to estuaries, buffer to storm damage)

Figure 4. Relation between location and type of mangrove goods and services, and traditional economic analysis

(b) low standards of design in projects located within fragile coastal environments - an example being inadequate drainage arrangements for roads built in sand dune areas which have led to massive erosion and destabilization of dunes;

(c) inadequate environmental assessments which do not provide information on appropriate locations and mixes of development - the new abattoir constructed adjacent to the municipal dump and in close proximity to the Lido beach in Mogadishu is a prime example;

(d) lack of emphasis given to multiple-use opportunities provided by most coastal and marine resource systems; this is linked to;

(e) inter-sectoral conflicts where agencies plan the development of land and water resources based upon single purpose, exclusive use - for example, mining and quarrying close to the active wave zone precludes other uses and is leading to severe erosion, destruction of beaches and sand dune destabilization. This seriously threatens the development of agriculture, tourism, land and sea transport and urban development;

(f) the need to improve technical and administrative skills of people responsible for managing coastal land and water systems; and

(g) the need to enhance public awareness of the significance of marine and coastal resources in supporting national economic and social development objectives.

Due to the concentration of population, settlements and industrial development in southern Somalia, the incidence and severity of coastal land and water management problems is higher than in other coastal areas. The scope and severity of problems will most likely increase as a result of the concentration of future development in this region. Priority should, therefore, be given to rectifying existing problems such as municipal and industrial waste management, and to the improvement of coastal land and water resources planning and management in southern Somalia.

The two most pressing management issues are:

(1) Pollution of coastal groundwater supplies resulting from tannery wastes and sewage. This is primarily an urban problem related to inadequate settlement planning and development standards and controls. In time, land based pollution and poor land and water use practices will create a significant, cumulative impact on coastal and related marine resource systems near major settlements; and

(2) The increase in the incidence and severity of natural hazards through inappropriate development and/or inadequate controls over resource uses. The single most important hazard is the destabilization of coastal sand dunes (see photographs - Appendix).

4.2 Recommendations

Somalia has the opportunity to rectify existing environmental management problems and issues and can avoid unnecessary damage to its coastal and marine resources base. Due to the concentration of problems in a limited series of onshore locations and the absence of serious marine resource problems, emphasis should be placed upon coastal area management and planning.

The formal demarcation of a rigid coastal zone is not advocated for Somalia. However, the coastal zone concept can serve as a mechanism for defining appropriate management boundaries for dealing with problems, such as sand dunes re-stabilization, which require the coordination and integration of different sectoral activities. Within the broad concept of a coastal zone, principles and guidelines for Coastal Area Management and Planning can be used to: (1) improve institutional arrangements for coordinating and integrating development; (2) utilize scarce technical and administrative manpower more effectively; and (3) specify actions to reduce environmental problems and promote improved resource production.

4.3 Suggestions for Promoting Coastal Area Management and Planning in Somalia

4.3.1 Basic Concepts and Principles of Coastal Area Management and Planning.

Coastal area management and planning (CAMP) is a means of developing and controlling the use of coastal resources to meet nationally defined needs, goals and objectives. A fundamental concept of CAMP is that renewable resources development options should be maintained and that development should result in uses which are both sustainable and which can, where feasible, form part of multiple use strategies.

A series of basic principles which apply to the management of coastal environments and the resources they support are:

The coastal area is unique and has special needs for management and planning

Traditional land-based or marine-based forms of management and planning must be modified to be effective for the transition area between land and sea.

Water is the major integrating force in coastal resource systems

Every aspect of a CAMP programme relates to water in some way, requiring unusual and complex institutional arrangements.

Coastal area land and water uses must be jointly planned and managed

The CAMP process recognizes coastal lands, waters, and intertidal areas as an interacting and indivisible unit that lies between the dry land and the open seas.

Sustainable development of coastal resources is a major purpose of CAMP

An important premise is that renewable resources should be managed to provide optimum socio-economic benefits on a perpetually sustainable basis.

Multiple use of renewable coastal resources is emphasized by CAMP

Single, exclusive, use of particular coastal resource units is discouraged by CAMP in favour of multiplicity of uses whereby conservation and development become compatible goals.

The focus of CAMP is on common property resources

While planning and management strategies may of necessity include control on use of private activities and properties, the main purpose of CAMP is usually the caretaking of common property resources.

Integrated, multiple-sector, involvement is essential to CAMP

A major purpose of CAMP is to coordinate the initiatives of the various coastal economic sectors toward long-term optimal socio-economic outcomes, including resolution of use conflicts and beneficial tradeoffs.

All levels of government must be involved in the CAMP process

Coastal areas and coastal resource systems are governmentally complex because of the degree of shared jurisdiction and the amount of common property resources involved; therefore, CAMP activities need to involve all levels from national to village governments.

CAMP boundaries are issue based and adaptive

There is no single description of "coastal area" or "coastal zone" for the CAMP progress; boundaries are delineated on the basis of the problems CAMP attempts to solve and must be adaptive to evolution of the process.

CAMP is structured for incremental implementation

While CAMP must be organized in a nationwide, comprehensive, format, it can then be implemented on either a region by region basis or a resource by resource basis.

CAMP emphasizes the nature-synchronous approach to development.

The most cost effective approach to coastal development is to respect the strength of natural forces operating at the coast and to design projects to utilize or adapt to these forces, i.e., to "design with nature".

CAMP emphasizes the importance of environmental assessment.

This entails strategic investigations at the initial stages of planning and focuses on the abilities of environmental systems to support different types and levels of development and to respond to alternative forms of management.

Special forms of economic and social evaluation are required by CAMP.

The complexities of coastal renewable resources development requires that special methods be devised and used in CAMP; this applies to the full range of economico-political systems, from laissez-faire to centrally planned.

The CAMP process incorporates current methods of Environmental Impact Assessment.

The E.I.A. process is important to prediction of the full range of effects of regional development programmes and specific development projects[1/].

4.3.2 Institutional Arrangements

There is no need to create a new institution to deal with coastal and marine resource development. The primary need is to improve the coordination and integration of development efforts by the sectoral agencies. Efforts in this direction have been made by the Somali government in their establishment of an inter-ministerial environmental coordination committee. The committee has not come into operation because of the pressures upon ministers and senior officials to deal with the day to day operation of their individual ministries.

We suggest that this initiative can function and serve as a vehicle for improved coastal land and water management. What is needed is the creation of a coastal zone sub-committee made up of representatives of all ministries and agencies with responsibility for coastal land and water and marine resources supported by a permanent secretariat charged with the responsibility of providing advice on technical and policy issues. The secretariat would monitor development

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1/ These principles are based upon the work of Clark (1985) and the Manual for Coastal Development and Planning and Management in Thailand (TISTR, 1985).

initiatives by individual agencies and would collate information which would be used to brief permanent secretaries and ministers concerned with implementing national development policies and the allocation of resources. Once briefed on matters which are of common concern to their own and other ministries, the coastal zone representatives can use the Environmental Coordination Committee to improve policies, resolve conflicts and to coordinate and integrate their individual development initiatives.

The permanent secretariat would be staffed by people of high technical or administrative calibre seconded by ministries or agencies. The secretariat would be established as an autonomous body under the Ministry of National Planning and would have access to all information pertinent to the management and planning of coastal and marine resources.

The two key ministries with responsibilities for managing coastal activities are Marine Transport and Ports and Livestock, Forestry and Range. Other ministries and agencies represented should include: Agriculture, Commerce and Trade, Minerals and Water Resources, Finance, Fisheries and the Water Development and the Coastal Development Agency.

4.3.3 Manpower Development

Due to the shortage of skilled manpower it is unrealistic to expect senior officials seconded to the permanent secretariat to be released for full-time training in coastal management at institutions outside Somalia. In the short-term, it will be necessary to provide technical assistance and to establish training courses for a nucleus of professional staff in Somalia. Models for such activities have been established by the United States National Park Service, UNESCO and IUCN[1/] and a full range of teaching materials and manuals are available to strengthen professional skills.

For the longer term, less senior staff should be given leave to go abroad to receive training in coastal management related fields including:

Coastal resource management
Resource assessment and environmental evaluation
Coastal geomorphology
Coastal engineering
Environmental engineering
Urban and regional planning
Marine biology
Environmental conservation

1/ The National Park Service, with support from the USAID Expanded Information Base Project, has produced a series of case studies in Coastal Areas Management and Planning (CAMP), a manual on the management of coastal resource systems and set up a programme to train people from developing countries in CAMP. UNESCO promoted and helped to fund a two month interdisciplinary training programme for professional managers from major agencies involved in coastal resource management and development planning in Thailand.

IUCN is also promoting the training of professional and scientific staff from developing countries in topics related to coastal area management and planning.

Funds will have to be made available from donors to support both forms of training. A contractual arrangement might be considered whereby people sponsored for training abroad would undertake to return to Somalia and to work with the coastal management secretariat for a minimum of five years.

4.3.4 Specific Actions to (a) Reduce Existing Problems and (b) Promote Improved Coastal Resource Assessment, Planning and Management.

The reduction of existing problems. In association with the recommendations of the expert on land based sources of pollution we recommend that the following actions be undertaken to reduce hazards to human health and to promote improved coastal settlement planning:

(a) Revise and update the 1947 Town Planning Ordinance and use it as the basis for planning and managing coastal settlements. Priority should be given to the preparation of a "Master Plan" for Mogadishu. The 1947 Town Planning ordinance contains provisions for dealing with existing problems including the location of land uses and the provision of services and infrastructure. Therefore, the precedent for integrated settlement planning exists within Somalia. What is urgently required is technical assistance to help the municipal authorities to formulate and implement the concepts, methodologies, procedures and standards associated with the principles set forward in the Town Planning Ordinance.

(b) Request assistance from UNHABITAT to formulate a proposal for technical assistance to improve existing legislation, to establish a planning framework, train manpower and to prepare plans for major coastal settlements. The proposal should include elements which could be funded by separate aid agencies as part of an overall technical assistance strategy with clearly defined objectives and goals.

(c) Use the proposal to solicit assistance from specific agencies with skills, for example, in resource assessment, land use planning and town planning (Overseas Development) Administration - British Government; USAID; UNDP.

(f) Industrial location (UNDP, UNIDO).

(g) Housing (UNCHS, HABITAT).

(h) Health and Public Welfare (WHO).

These actions will help to improve the planning and management of coastal settlements and to reduce environmental problems and threats to human health. This will take time and a realistic estimate of the period required to establish a fully operational planning system is between 10 and 15 years.

Urgent attention should also be given to a series of actions to bring about rapid improvements in environmental conditions in coastal settlements. These include:

(a) ensure the provision of safe drinking water by rehabilitating the water treatment plant at Kismayo and by carrying out more comprehensive water quality tests of public water supplies including toxic wastes such as chromium from tanneries, agricultural chemicals and pathogens;

(b) prohibit the connection of private sewage facilities to the storm water drainage system in Mogadishu.

(c) improve solid waste disposal practices;

(d) improve primary health care and promote a public health education programme;

(e) prohibit further settlement in flood prone areas until improved watershed management measures can be implemented;

(f) institute more rigorous controls over grazing, sand mining and quarrying in beach areas and adjacent sand dune systems; and

(g) require new development proposals to include both assessments of alternative locations and environmental impacts and to identify measures to ameliorate potential impacts.

The promotion of improved resource assessment, planning and management:

(a) Key manpower training - Dr. Mohamed Abdirahman Haji (Director of Environmental Studies, National Tsetse Fly and Trypanosomiasis Control Project, MLFR) and Dr. Ali H. Munye (Director of the Marine Department, MMTP) were two key counterparts to this mission and could play a major role in helping to promote CAMP in Somalia. It is recommended that they be given the opportunity to attend one of the CAMP workshops sponsored by the US National Park Service, UNESCO or the proposed IUCN training programme. Funding to be requested directly from the representatives of these agencies in Somalia.

(b) Reference Material - request UNEP, Nairobi, to collect and make available to the MMTP (Dr. Ali Munye), MLFR (Dr. Mohamed Abdirahman Haji), and the MNP at least 3 sets of CAMP reference materials including; the training materials prepared by the US National Park Service/USAID Expanded Information Base Project, UNESCO, IUCN and the UNEP Regional Seas Project; the Coral Reef and Mangrove Area Management Handbooks; and manuals such as the Coastal Mapping Handbook prepared by the US Geological Survey.

(c) Technical Assistance and Financial Support - request technical assistance from IUCN in cooperation with other agencies such as UNDP, UNESCO or ODA to help in the preparation of:

- an inventory of coastal ecosystems including their functions and the linkages between different ecosystems;

- an inventory of uses;

- an assessment of specific management problems in coastal areas;

- management guidelines for the development and management of land and water uses associated with renewable resource production of these coastal ecosystems;

- maps and written materials to be collated with other pertinent materials to form a coastal resource data atlas;

- assessment of priority areas for immediate CAMP action;

- a monitoring programme to provide information on land and water use trends, to assess the effectiveness of management measures and to provide an early warning system of emerging problems;

- a livestock grazing management plan for environmentally sensitive areas such as beaches and dunes;

- guidelines for beach sand mining and quarrying of fossil reef limestone materials in the area between the high water mark and the coastal dune systems; and

- guidelines for coastal engineering activities including port and harbour construction, dredging and dredge spoil dumping sites, airport location and construction, highway location, construction and drainage, and hotel and related facility development adjacent to beach and dune areas.

Priority should be given to the southern Somali coastal zone. Within this area a series of studies have been undertaken which provide valuable source materials such as aerial photographs, satellite images, maps, field notes and photographs, assessments of soil and water resources and land capability analyses for specific uses such as livestock grazing and rainfed agriculture. The collation of these diverse materials should form the first step in assessing the extent and quality of information available and the forms of information required for the preparation of coastal management quidelines.

Technical assistance will be required to help bring this about and the following specialized skills would be of particular help:

- coastal geomorphologist to work with an engineer with coastal experience in establishing guidelines and performance standards for developing and managing the littoral environment and landward areas including beaches and dunes;

- marine biologist;

- coastal resource management specialist; and

- a range biologist (livestock grazing).

These specialists would work together with back-up support from the ministries of LFR and MTP and a small team of counterparts. Once the information base and guidelines have been prepared, it will be possible to develop further steps in the CAMP process including:

- assessment of the basic potential for the intensification or expansion of existing activities or the development of new activities;

- assessment of the multiple use potential of different coastal resource systems; and

- the definition of areas for future development and the specification of appropriate land and water use management practices and development controls.

5. IMPROVING FORECASTING PROCEDURES AND TECHNIQUES FOR FUTURE LAND REQUIREMENTS IN COASTAL AREAS

In association with the improvement of coastal resource information, work should begin now on improving forecasts of land requirements for activities that are directly dependent upon the functions of coastal resource systems. This would require participation by all major agencies operating in the coastal zone. The Ministry of National Planning should be encouraged to undertake this work with the help of a coastal area management and planning specialist. The specialist would help to identify key people in the various ministries and agencies who would be delegated to work with the MNP in the preparation of forecasts. These key people would then be candidates for appointment to the permanent secretariat recommended above. A direct request to an agency such as UNDP or UNEP would be an appropriate means of obtaining the required technical assistance. Emphasis should be given to identifying and quantifying:

(a) the area required;

(b) specific resource conditions (soils, slope, elevation, water quality and quantity) necessary to support individual land uses;

(c) compatible forms and intensities of land use;

(d) multiple use possibilities and appropriate management arrangements (seasonal use, spatial or temporal segregation, intercropping, intensities of use/extraction, etc.);

(e) non-compatible uses; and

(f) alternative resource systems that could be utilized for non-compatible uses and the resulting costs or benefits.

6. THE FORMULATION AND IMPLEMENTATION OF COASTAL AREA MANAGEMENT AND PLANNING POLICIES

Once many of the short-term activities have been started, attention should be given to the formulation of a longer term planning framework for coastal areas. The primary task would be to improve the formulation and implementaiton of national land use policies, procedures, and controls to protect coastal land and water resources. Ideally, this should be an integral part of a national coastal resource management (CRM) policy, where strict controls are exercised over the conversion of good quality agricultural lands, watershed protection zones, livestock grazing and other important land uses. If manpower and other constraints are viewed realistically, the full development of national CRM policies, land use plans, and effective development controls will take ten to fifteen years.

Due to the great importance of coastal resource systems, priority should be given to developing improved land use policies and development controls for:

(a) mangroves;

(b) coral reefs;

(c) sand dunes;

(d) riverine and estuarine areas;

(e) watershed protection;

(f) marine/coastal conservation areas;

(g) coastal agriculture and, where possible, high quality agricultural lands either already developed or with potential for intensification, diversification and agricultural settlement;

(h) conserving coastal forested lands (production, protection and nature conservation);

(i) seagrass; and

(j) beaches of importance to birds, turtles, tourism, and recreation.

7. ADAPTIVE MANAGEMENT AND PLANNING

The adaptive management of resources is a pragmatic approach to adopt when dealing with tropical ecosystems, where both information and development experience are limited. By focusing the available manpower skills on adapting plans to suit longer term management objectives, it is possible to rectify mistakes and to incorporate new data and experience into successive planning efforts. This approach offers the best chance of accelerating development and creating a management framework for promoting sustainable forms of use. This approach would harmonize with the Government of Somalia's policy to encourage private resource development initiatives while promoting improvements in environmental management. If the recommended technical assistance is made available within the next 6-9 months, work can begin on initiating the adaptive management approach within one year.

8. SUMMARY OF MAJOR RECOMMENDATIONS

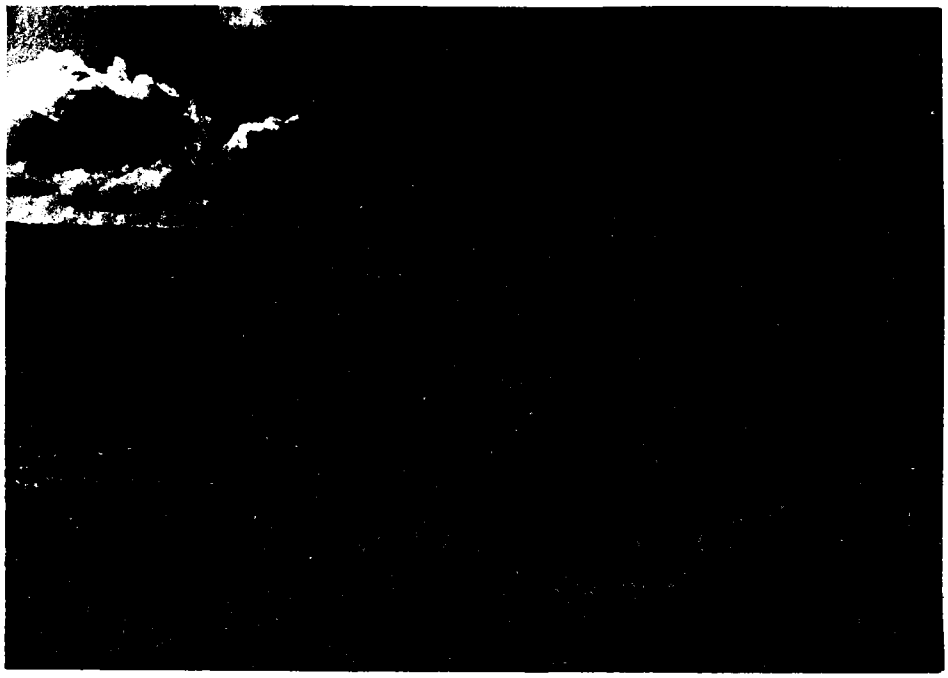
The coastal zone of Somalia includes a diverse range of marine and terrestrial ecosystems. The resources provided by these ecosystems play a major role in the Somali economy. The coastal zone contains some 30 percent of the total population and the majority of the nation's industrial development. Existing trends in population growth, migration, agricultural development and other activities suggest that the coastal zone of southern Somalia will form the focus for future development.

The major challenge facing Somalia in the development of its marine and coastal resources lies in rectifying acute problems associated with pollution from municipal and industrial wastes which pose a very serious threat to human health. These problems have come about as a result of rapid urban growth, poor standards of settlement planning and largely uncontrolled discharges of industrial wastes.

There are also severe problems associated with the destabilization of coastal sand dunes which threatens good agricultural land, roads and even settlements. Fortunately these problems and land-based sources of pollution do not, at the present time, have any serious effect upon marine resources. However, they are posing a threat and will, if unaddressed lead to the longer term degradation of coastal marine resources.

In the absence of any significant marine pollution, we recommend that priority be given to finding solutions to municipal and industrial sources of land-based pollution and improved coastal land and water resource management. By strengthening the coastal area management and planning capacity of the Somali Government, current problems which hinder sustainable development will be properly addressed and future problems can be avoided which would otherwise reduce the capacity of marine resources to help meet the development needs of the Somali people.

Sand dune restabilization



Destabilized dunes

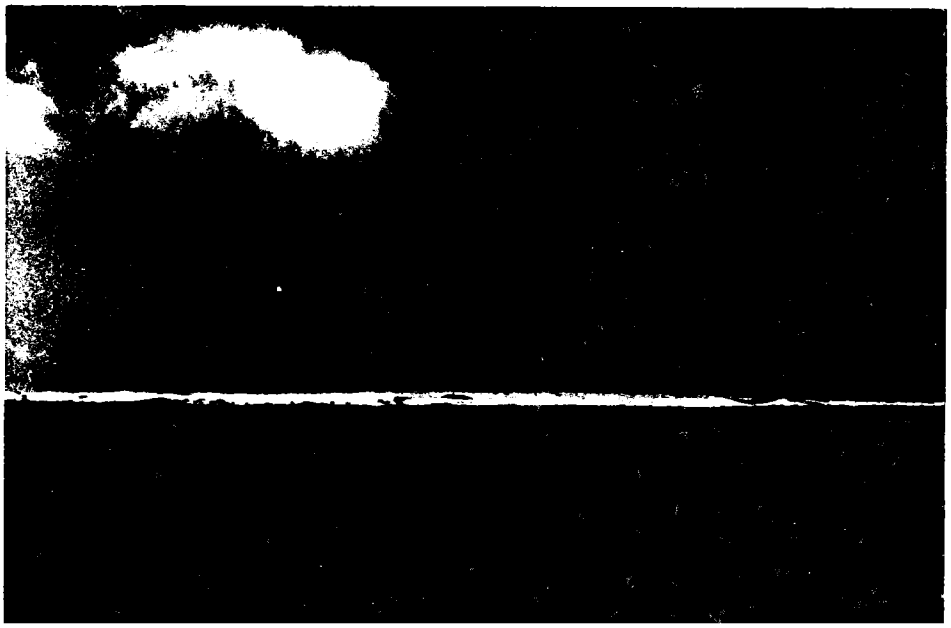
Grazing area

Lime kilns: limestone is quarried near the shoreline, wood is brought from sand dune areas

Area mined and grazed

Restabilization project area

Wind breaks of dry vegetation are created to protect seedlings planted to help stabilize sand



Example of some of the 5,000 km^3 of destabilized sand dunes. This site is South of BRAVA and the dunes are moving inland. The main road is threatened and grazing and permanent cultivation areas may be lost

APPENDIX

Sand mining and limestone quarrying

Sand extraction in the inter-tidal zone destabilizes beach form and longshore drift of sand

Note coastal wells inland of beach, grazing on windward face of sand dune and sparse vegetation

Heavy equipment used in sand and limestone operations - located less than 50 m from beach

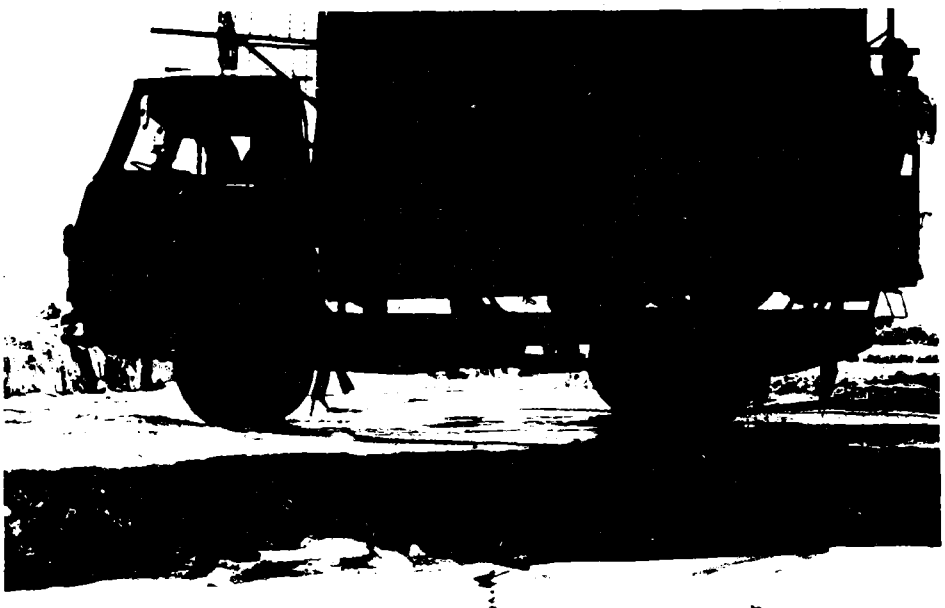
Note destabilized sand dune in background

Coastal well providing fresh water for livestock

Shallow well 4 m deep utilizing limestone underlying sand as the aquifer

APPENDIX

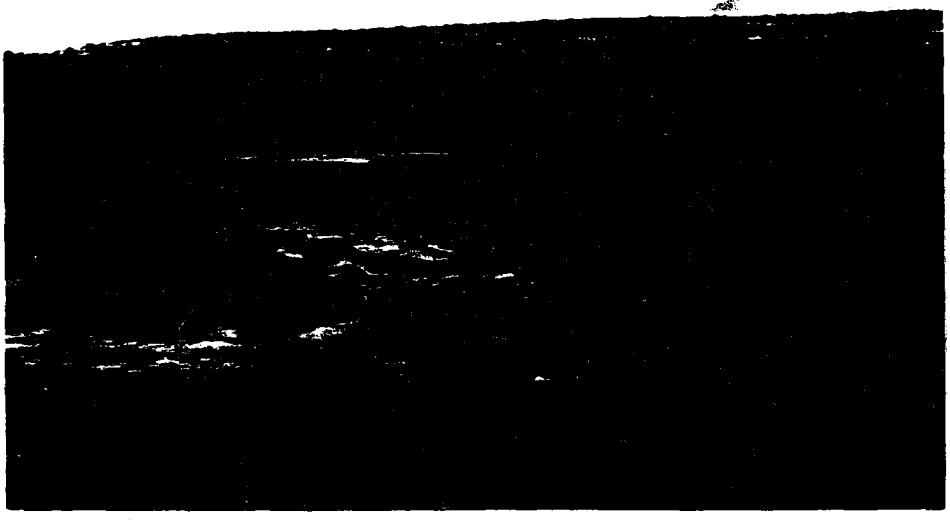
Road construction in sand dune areas



Access road to MERCA

Poor construction in relation to heavy axel loads of vehicles

No drainage provision has been made to carry water under the road from springs located at the base of sand dunes or to carry storm water draining off the surface of the dunes



Destabilized sand dunes

Road

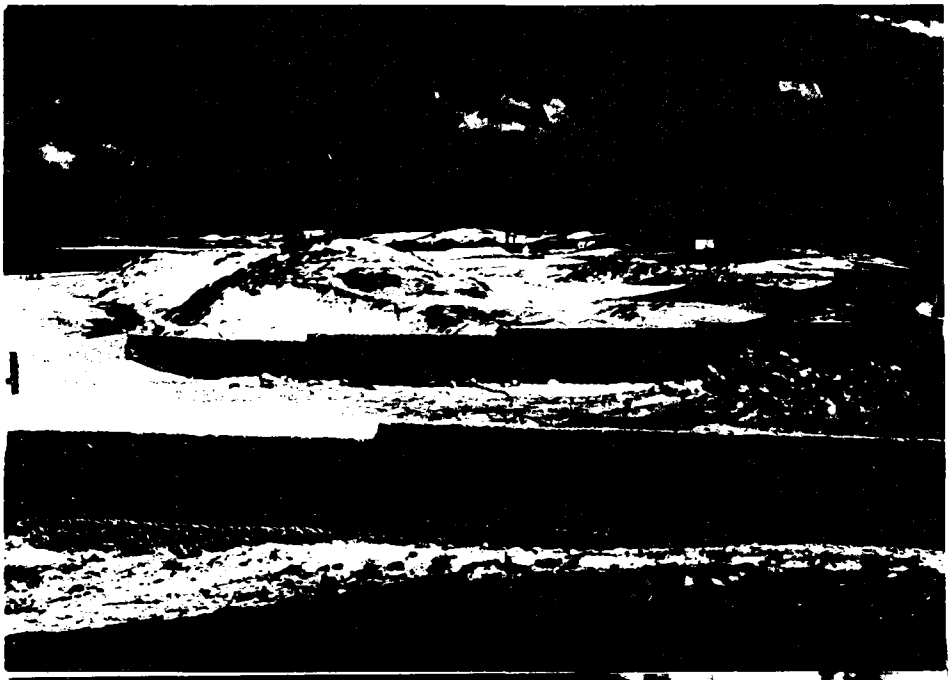
Width of erosion gully indicates periodic high rates of surface water run-off

MERCA - Advanced gully erosion behind the town. The gully concentrates storm water run-off into the centre of the town

Note severe erosion of the sand dune, sparse vegetation, burial

APPENDIX

Tourism - poor siting of hotel foundations - Gesira



Haphazard siting of prospective hotels within the frontal dune system. These marine sand dunes are extremely sensitive to damage to vegetation or changes in the profile of the dune surface

Area behind hotel foundations. Grazing of goats, sheep and camels reduces vegetation cover. Poor siting of foundations removes remaining vegetation and allows sand to shift. The marine (light coloured) sand is migrating inland and, in some areas, represents a major hazard to roads, agriculture and settlements

Example of linkage between pressures for development in the near-shore area, road construction, industrial siting and grazing is increasing the danger to sand dune destabilization

APPENDIX

Tourism - poor siting and management facilities

Hotel is located 40 m from beach

Fine sand beach at MERCA

Parking area at hotel - a hard, semi-porous surface of crushed limestone has been laid down without any provision for dealing with increased surface water run-off. This is leading to gully erosion and disturbance to the beach

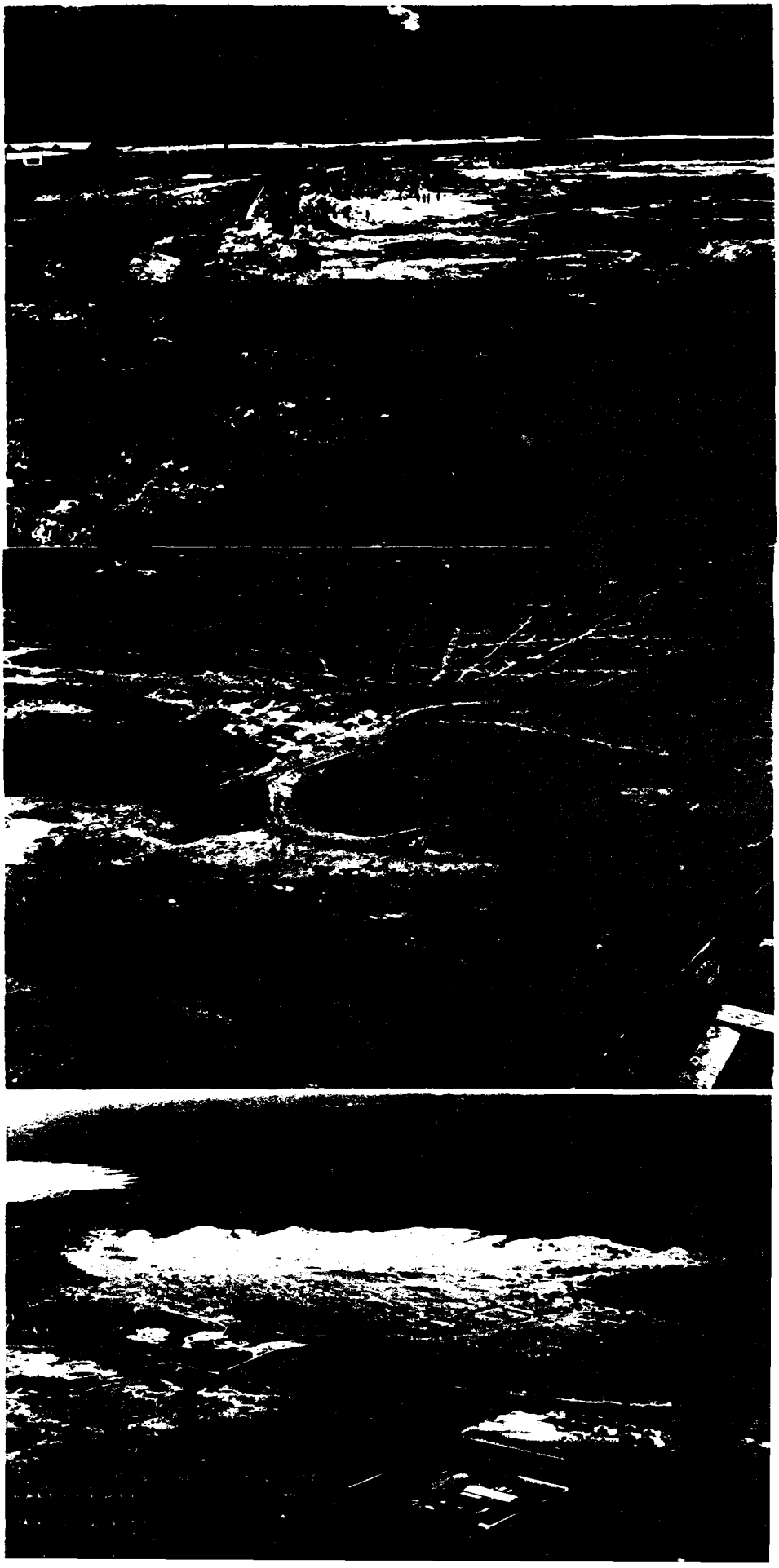
Coral reef protecting the beach from storm damage

Beach vegetation binds sand particles but is easily damaged by trampling

erosion gully resulting from inadequate drainage arrangements at the parking lot

APPENDIX

Beach mining at Mogadishu



Mining operations using fossil coral reef limestone.
Note close proximity to shoreline, depth of excavation (10 m approximately) and extensive area of operations

Mixed grazing and temporary settlement

Main road

Mining site

Stagnant brackish water pools

Adjacent development

Mixed agriculture

eroded sand dunes

Grazing area

New housing

Factory producing GRP fishing boats

Steam generating station for

APPENDIX

Coastal resettlement project

Project located in an area of severe sand dune destabilization

GRP boats poorly maintained

Fish receiving station built right on active face of beach. Seasonal fluctuations in beach profile are undermining the foundations of the building and the concrete ramps

Destabilized old sand dune

Goats grazing beach vegetation

Marine sand moving inland

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ANNEX VII

SECTORAL REPORT

ON

MARINE ENVIRONMENTAL LEGISLATION

BY

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CONTENTS

1. NATIONAL ORGANIZATION

This part summarizes the general structure of the Somali Government and outlines the major components of the Government with brief comments on the functions and responsibilities of ministries, autonomous agencies and local governments which are involved or which would be involved in the future protection and management of the marine and coastal environment.

1.1 The Structure of the Government

The new Somali constitution was adopted by referendum on 25 August 1979. The constitution defines the Somali Democratic Republic as a Socialist State and establishes the Somali Revolutionary Socialist Party as the only Legal Political Party. The President of the Republic is also head of the party, consistent with the contitutional principle of "the unitary system of political leadership of the party and state".

1.1.1 The President

The President is elected by the People's Assembly on nomination of the Somali Revolutionary Party, is the head of the State, Chairman of the Council of Ministers, Chairman of the National Defense Council, Commander-in-Chief of the Armed Forces, Secretary-General of the Somali Revolutionary Socialist Party, and Chairman of its Political Bureau. The President is empowered to:

Apprehend and dismiss ministers;

Convene and dissolve the People's Assembly;

Promulgate laws;

Issue Presidential Decrees, which are the prescribed form for delegated legislation for decree-laws subject to parliamentary approval and for determining the structure of the Council of Ministers.

Four Vice-Presidents who are mainly important Ministers sit as members of these various councils and together with the President preside over the Office of the President.

The components of the Office of the President are as follows:

Ministry of Presidency
National Purchasing Committee
State Attorney General
Magistrate of Accounts
Directorate of Administration
National Security Court
Economic Committee
Secretariat of Council of Ministers.

These offices provide legal advice, study and make recommendations on political issues, and maintain organizational and fiscal contact over the rest of the Government.

1.1.2 The People's Assembly

The People's Assembly is charged with the responsibility to debate and act upon all prepared laws and budgets. This legislative power may be delegated for limited periods. Because the assembly is restricted to brief semi-annual sessions, the major share of its responsibility is delegated to its standing committees on political affairs, social affairs, legal affairs, economic measures, defense and national security.

1.1.3 The Council of Ministers

The Council of Ministers is the chief executive organ of the Government and is responsible for determining government policies and overseeing government operations. The Council of Ministers, chaired by the President, is composed of approximately 48 ministers and vice-ministers appointed by the President to direct the 24 ministries and the autonomous agencies attached to them.

The Council meets frequently to consider and vote on measures presented to it including policy statements and draft legislation. The Council of Ministers also has the power to issue decrees. A 1970 law provides that regulations are to be issued by the President of the Supreme Revolutionary Council generally on the proposal of the Minister concerned.

1.1.4 Interministerial Committees

A large number of interministerial committees have been established by Presidential Decree. Some are temporary while others are permanent. They are supplemented by numerous ad hoc committees assembled to examine or cope with a specific problem.

1.1.5 The Administrative Units

Policies are implemented and laws executed by the 24 ministries which, with the Office of the President, comprise the Central Government. In addition, over 60 "autonomous agencies" operate as parastatal or relatively independent public enterprises under the auspices of specific ministries.

Ministries are responsible for studying problems in a particular functional area, preparing plans, developing draft laws and decrees, carrying out or supervising approved and funded projects, and enforcing the laws and decrees promulgated by higher authorities. Legislation specifies the area of responsibility of each ministry.

The internal structure of the ministries follows a common pattern. At the top are the minister and usually a vice-minister, both of whom are appointed directly by the President; just under is a permanent secretary and immediately below are director-general and directors.

Ministries are subdivided into departments, and the departments are divided into services and sections. Many of the services and sections in some ministries are not enough staffed or not yet staffed. Some of the departments have such small number of staff that there is no supervisory level below that of the department head. Eight ministries have over 50 percent of their employees in regional, district, or other field offices. These are the Ministry of Education, the Ministry of Health, the Ministry of Justice and Religious Affairs, the Ministry of Livestock, Range and Forestry, the Ministry of Interior, the Ministry of Marine Transport and Ports, the Ministry of Telecommunications and the Ministry of Public Works. Lines of jurisdiction between many of the ministries are unclear, and there is some obvious duplication of effort. A number of ministries make decisions upon a common sector or serve a common clientele. For example, four ministries have a significant responsibility for water resource development, five are concerned with protected areas and eight with major aspects of marine pollution.

In each ministry, the key managerial position is that of the Permanent Secretary who is appointed by the President, and is a career civil servant of long experience and respected expertise in the subject area for which the ministry is responsible.

Permanent secretaries operate at the locus of responsibility for both day-to-day decision making, and for longer terms planning activities. All departments report directly to the Permanent Secretary.

In addition to his normal responsibilities which include oversight of the preparation and presentation of the ministry's proposed budget, permanent secretaries also often play a lead role in dealing with political authorities and foreign donor organizations.

1.1.6 Autonomous Agencies

A large number of administrative units, known as autonomous agencies have been created by legislation or decree and attached to one or another of the ministries. These agencies report generally to the minister or vice-minister, the administrative head of each agency is known as its "General Manager". The autonomous agencies can be classified within four categories:

One group consists of certain non-revenue producing service delivery agencies (such as the National University of Somalia). A second group is known as "Joint Projects" or "Joint Ventures" because they operate subject to agreements between the Government and a donor financing organization or private company. Representatives of the donor or private company normally share in the management of the agency to the extent provided for in the project agreement (Somali Shipping and Lines Agency is an example); a third category consists of manufacturing and processing establishment. A fourth category consists of financial institutions and trading companies. The two last categories were expected to be self-sustaining from the revenues derived from the sales of products or services.

1.1.7 Local Government

The Ministry of Interior supervises all local governments except the municipality of Mogadishu, which is directly under the Office of the President. The country is divided into 16 regions that are in turn subdivided into 84 districts. The municipality of Mogadishu has the functions of both a regional and a district government.

Regional governments are headed by a Governor appointed by the President. The Governor is simultaneously chairman of the Regional Development Council and head of the Regional Party Committee. As regional executive he is responsible for the Ministry of Interior on administrative matters.

The Regional Development Council consists of the Governor (Chairman), the Governor's assistants, regional representatives of all ministries, local commanders of the armed forces, head of social organizations, district commissioners, chairmen of the district People's Assemblies, and district executive officers.

The Council meets quarterly, it must approve district tax levies and expenditures and prepare a budget for approval by the Ministry of Interior and the Ministry of Finance. Its own funds come from central government subventions and contributions from the districts within the region.

Regional governments monitor, through the Governor and his assistants, the implementation of all development projects, both those financed locally and those funded by transfers from the central government.

In each district there is a People's Assembly, members are elected by the people after nomination by the Party. There is an executive officer appointed by the Ministry of Interior. His role is that of advisor to the assembly and as supervisor of the local administration.

1.2 Existing Institutional Framework Relating to Protection and Management of Marine and Coastal Environment

There are various ministries and autonomous agencies which are involved or should be involved in sectorial aspects of marine environment protection and marine resources and coastal area management. These ministeries and agencies are described below.

1.2.1 Office of the President

Through the National Economic Commission, the Office of the President keeps an eye on the economic and administrative aspects of agriculture, industry, livestock, marine resources and rural development and monitors all plans and activities relating to these sectors as established by the Ministry of Planning. The President, on 10 November 1985, has issued a special instruction in order to promote reforestation action and people's mobilization and participation.

The State Attorney deals with international agreements. In particular, in co-operation with the Ministry of Foreign Affairs and the ministry concerned, he introduces to the Council of Ministers proposals for international convention ratification.

1.2.2 Ministry of Marine Transport and Ports

The Ministry of Marine Transport and Ports was established by law No. 12 of 3 February, 1977, with the main objective of developing maritime transport and improving port facilities. It is involved in controlling those activities which cause environmental degradation of the coastal areas, ports and marine environment in general including safety of navigation, pollution prevention and pollution control. The ministry and the maritime administration are responsible for the implementation of the maritime code and other legislative texts. They have jurisdiction on the maritime demesne. This ministry has 5 departments and five regional harbourmasters located in Berbera, Bosaso, Mogadishu, Merca and Kismayo. More recently, the legal department was created. Two autonomous agencies function under the Ministry of Marine Transport and Ports.

The Somali Ports Authority was established in 1962 and was reorganized by law in 1973 (Law No. 1 of 7 January 1973). This agency is responsible for the operation and management of all the ports in the country and the provision of port services, including those relating to the monitoring of wastes discharges and pollution. The port authority has port regulations (decree No. 67 of 15 April 1978) for the implementation of its functions.

The Somali Shipping Agency

In 1978, by virtue of law No. 27 of 1 June 1978, two agencies were unified into one agency for shipping activities and maritime transport. The main objectives of this agency are:

- to perform all activities concerning services to ships anchoring at the Somali ports;
- to repair, purchase, sell or hire ships or spare parts;
- to perform any auxiliary activity connected with the shipping trade;

The Ministry of Marine Transport and Ports leads the Somali participation in the Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African region, and the ministry examines and prepares the ratification of the East African Convention and Protocols by Somalia.

The Ministry of Marine Transport and Ports chairs the National Committee on Marine Affairs which was established for the Law of the Sea negotiations and to participate in meetings of Indian Ocean Coastal states. The main objectives of this committe are:

- to examine the follow up and the implementation of the Law of the Sea Convention;
- to co-operate with the other Indian Ocean coastal states in the field of marine affairs.

This committee is composed of representatives of ministries of:

- Marine Transport and Ports
- Minerals and Water Resources
- Fisheries
- Foreign Affairs
- Defense
- Education

1.2.3 Ministry of Fisheries

The Ministry of Fisheries was established in 1977 by law No. 17 of 3 February 1977 for the development and management of fishery resources.

Its functions include amongst others:

- to obtain benefits from marine resources;
- to develop a programme to make coastal settlements self-supporting;
- to organize and operate all maritime schools;
- to organize fishing support, industries such as boat-yards to make new types of vessels;
- to construct technical infrastructure such as ports and cold storage;
- to prevent pollution through international law of the sea;
- to formulate laws regulating fishing in Somali waters and to organize fishing rights.

The Ministry of Fisheries is composed of 6 departments (production, planning, research, marketing, personnel and administration). Seven autonomous agencies function under this ministry:

1. Coastal Development Project
2. Somali Marine Product
3. North East Coast Fishing Enterprise
4. North West Fishery Development Project
5. Somali GRP - (Boat factory)
6. Somali Fish Company
7. Malhir Coast Fishing Company

This Ministry leads the Somali participation in the Action Plan for the Conservation of the Marine Environment and Coastal Areas in the Red Sea and Gulf of Aden.

1.2.4 Ministry of Minerals and Water Resources

The Ministry of Minerals and Water Resources was created in 1969 by law No. 8 of 24 May 1969. This ministry has two main responsibilities:

(a) The development of mineral resources including mining and geological survey. This ministry is responsible for the implementation of the mining code and in particular to issue all exploration or exploitation permits.

(b) The development of water resources within the country - the ministry is responsible for implementation of the water law No. 77 of 18 November 1972. Under the supervision of the Minister, function autonomous agencies.

The Water Development Agency was created in 1971 by law No. 28 of 20 February 1971. for the purpose of the development of water resources within the Somali territory the agency shall promote:

- The research of the necessary water resources;
- The construction of acquaducts, water networks;
- The collection and the evaluation of all data relating to water resources and the potential thereof in the territory of Somalia;
- The preparation, programming and execution of projects relating to water resources, in order to coordinate the use of water within the territory of Somalia;
- The stipulation of contracts, conventions and agreements necessary for the same;
- The provision of spare-parts necessary for water plants of the various local governments;
- The training of the subordinate technical and clerical personnel, in order to ensure maximum efficiency of all services.

The Mogadishu Water Agency was established in 1978 (law No. 18 of 6 April 1978) for the following objectives or responsibilities:

1. Investigation, production and distribution of clean and potable water sufficient for Benadir region;
2. Provision of enough potable water for Mogadishu city (Benadir Region);
3. Laying main pipes for water supply and construction of public fountains for Mogadishu city;
4. Laying distribution pipes for house connections, public places and get accordingly the charges;
5. Collection of data on ground water and surface water in the region and use them for the Agency's activities;
6. Carrying out scientific studies for the optimum utilization of available water;

7. Acquiring technical "know how" for the implementation of water projects in the region in accordance with the principle of planning, investigation costing, construction, operation, maintenance and laboratory analysis;

8. Purchasing materials and equipments for the Agency's services;

9. Improving the working knowledge of the staff of the Agency in all departments.

10. Assigning tasks for organising, implementation and operation of the Agency in general and in particular to the establishment of the project "Mogadishu Sewerage".

The Agency has the following rights:

(a) Public or private right of way or public utility assessment;

(b) to use any road in any place for laying water pipes;

(c) to fix water tariff, house connection charges and power to enforce its own service connection regulations and charges for water consumption;

(d) If necessary the Agency shall construct water works on Scebelle River or drill wells in neighbouring regions in order to supply water to Mogadishu city;

(e) The Agency shall have the power to sign agreements for the services it requires which might contain provision for tax exemption and duty free clauses, after consultation and approval from the Minister of Finance.

Similar autonomous water agencies were established in 1978 for Kismayo and Hargeisa region with similar objectives with a view to provide enough drinking water for the respective regions.

Note that the urban sanitation is the responsibility of the local councils technically supported by the Ministry of Health.

1.2.5 Ministry of Interior

This Ministry operates resettlement schemes with the provision of water supplies; as such, it is involved, particularly in rural areas, in the monitoring of activities which have negative environmental consequences (irrigation practices, cutting of trees, watering of animals, etc.).

1.2.6 Ministry of Livestock, Forestry and Range

This Ministry, created by Law No. 8 of 24 June, 1969, is responsible for the control of animal husbandry, veterinary services, range, forestry and national parks. It operates through two important agencies.

The National Range Agency

Established by Law No. 23 of August 1976, this autonomous agency has the objective of ensuring the most rational management of livestock, grazing and forest resources, including the prevention of overgrazing through the control of watering points, monitoring of deforestation leading to desertification, and preparation of plans, action programmes and mobilization of rural people for ensuring reforestation and sand dunes fixation, in order to combat desertification.

At the moment the first priority of the agency is the reforestation and anti-desertification.

The National Parks Agency

The National Parks Agency was created in 1971 by law No. 34 of 1 March 1971 with the main objective to establish and maintain national parks and reserves.

1.2.7 Ministry of Commerce and Industry

The ministry drew up a commerce and industry policy including implementation of factories and creation of industrial zone. But each industrial sector and each manufacturer has his own regulation (i.e. Tanneries, Fertilizer Factory). Twenty four autonomous industrial agencies function under the supervision of the ministry.

The National Petroleum Agency is one of them. The National Petroleum Agency controls the import, export, refining and distribution of oil.

1.2.8 Ministry of Agriculture

This ministry was established by Law No. 14 of 3 June 1962 as amended in 1969. It is responsible, among others, for the development of irrigation, land settlement, reclamation and improvement, plant and animal protection, locust control and fertilizers registration. Its involvement in issues connected with land and water degradation or pollution is important.

The ministry has several autonomous agencies or projects under its supervision, among which are the following:

The Agricultural Development Corporation

Established by Law in 1970 for the purpose of promoting agricultural production through the provision of seeds, fertilizers, pesticides, water pumps, farm machinery and other inputs.

Agriculture Development Project

This project was established by Law No. 5 of 19 February 1979, for the development of agriculture in the North-western region. One of its main functions is to prevent desertification of the agricultural lands and the development of irrigation.

1.2.9 Ministry of Tourism

While this ministry, created by Law No. 32 of 8 July, 1970, is not directly involved in the management of natural resources, it has a deep interest in all activities tending to improve or conserve such natural resources as flora, fauna, water, coastal areas and beaches. The development of tourism, requires preserving the environment. The direct responsibilities of this ministry are:

to manage hotels, restaurants and public recreation centres;

to provide services and promote tourism;

The development of tourism act of 1984 created the Somali National Tourist Agency within the framework of the Ministry of Tourism.

Somali National Tourist Agency

- To carry out the Ministry of Tourism's policy to develop a comprehensive and modern tourism industry.

- To execute, realize, manage and commercialize all and any structure and infra-structure necessary for the development of the national tourism industry.

- To orientate the development of tourist activities by all necessary means.

- To promote the maintenance of the beauty of tourist resorts and the preservation of the cultural and wildlife heritage.

- In order to achieve the aims of its policy, the Agency shall entertain high level links with the National Range Agency and in particular with the National Transport Authority i.e. the Minister of Transport for the commercialization of tourism.

1.2.10 Ministry of Planning

The Ministry of Planning and Coordination was originally established in 1966 by virtue of Law No. 10 of 1 January, 1966. This ministry prepares plans, supervises implementation of development works, evaluates external and internal financial resources and publishes data on national plans and economic trends. It may have an important role to play in coastal areas management.

There is a plan to create a National Environmental Coordination Committee chaired by the Minister of National Planning and composed of representatives of all ministries concerned - but no legislative texts have been adopted.

1.2.11 Ministry of Health

This ministry is directly involved in monitoring all those activities which cause pollution, particularly with regard to its consequence for human health. It has a special unit for the control of environmental sanitation and pollution questions, but its capabilities seem to be limited.

1.2.12 Training Institutions

Except in the case of the National Range School, there are no training institutions yet, dealing with environmental management and pollution control administration as such. The following institutes in the country are concerned with training in maritime affairs, fisheries, agriculture and technical training:

National Fisheries and Maritime Institute in Mogadishu

Mogadishu Technical Institute

The National Fisheries and Maritime Institute is devoted to maritime training. It is a four year degree course offering courses in mechanic, and navigation. More recently prevention of the pollution by ships have been introduced in the courses.

1.2.13 Other Ministries

There are two other ministries which have an important role in protection and management of marine and coastal environment.

The Ministry of Justice and Religious Affairs

This ministry is directly involved with the study and drafting or amendment of any required legislation.

The National Commission for Legislation

The National Commission for Legislation chaired by the Director of the legislative department examines all draft laws before the submission to the Council of Ministers and finally to the People's Assembly. The President signs and promulgates the laws.

The National Commission is composed of:

- The Vice President of the Supreme Court
- A Judge of the Supreme Court
- A Legal Advisor of the Ministry of Justice
- The Deputy Attorney General
- The Director of Judiciary and Professional Affairs

There are two possibilities to elaborate a draft law. First, the technical ministry prepares a draft and submits it to the Ministry of Justice which transmit this draft to the National Commission for Legislation. Second, the technical ministry request the ministry of justice to prepare a draft in co-operation with technical ministries concerned then the draft will be transmitted to the National Commission for Legislation.

The Ministry of Justice through one of its legal advisors (who provide advice to the Ministry of Marine Transport and Ports) was directly involved with the elaboration and negotiation of the two regional action plans (Red Sea and Gulf of Aden, and the Eastern African), and this ministry will continue to be involved with the follow up and the implementation at the national level of the Convention and Protocols (legal aspect).

For those reasons and because there is no Ministry of Environment, the Ministry of Justice has a very important role in these fields and it is one of the key ministries. The Ministry of Justice is in a good position to assist technical ministries to prepare draft specific environmental laws and regulations or to elaborate such draft laws. Also, on the occasion of examination of non-specific environmental draft laws or regulations, and if it is necessary, the Ministry of Justice may recommend that the environmental aspect is taken into account and it may propose specific provisions in this view.

Also because it knows very well the Somali legal system, the national organisation and the regional conventions, it may progressively well adapt the required laws and regulations to Somali institutions and capabilities.

The Ministry of Foreign Affairs

The Ministry of Foreign Affairs is involved with the study and acceptance of the international environmental agreements, but it is not known what are the exact responsibilities of this ministry.

The Ministry of Defense (the Navy)

Our information relating to the responsibilities and capabilities of the Navy in relation to the protection, management and development of the environment is incomplete.

2. SURVEY AND ANALYSES OF EXISTING LEGISLATION RELEVANT TO THE PROTECTION AND MANAGEMENT OF MARINE AND COASTAL ENVIRONMENT

A description of the legal documentation made available to the consultant is given below.

2.1. Legal Status of the Maritime Spaces under the Somali Jurisdiction and of the Maritime Demesne

2.1.1 The Constitution of Somalia

(New Somali constitution, decree of the President of the Somali Republic No. 46 of September 1979).

According to Art. 5, "Territorial sovereignty shall extend over the land, the sea, the water column the sea-bed and sub-soil, continental shelf, the island and air space"; Art. 42 states that the land, natural marine and land-based resources shall be State property and that the State shall issue legislation to exploit these resources.

These basic provisions provide the legal ground for the Government to control activities which might endanger the marine and coastal environment and resources.

2.1.2 The Territorial Sea and the Exclusive Economic Zone

Law on the Somali territorial sea and ports: Law No. 37 of 10/9/1972

The Somali territorial sea includes the portion of the sea to the extent of 200 nautical miles from the continental and insular coasts; the Somali territorial sea is under the sovereignty of the Somali Democratic Republic.

The normal baseline for measuring the breadth of the territorial sea is the low water line along the coast. In localities where the coastline is deeply indented or if there is a fringe of islands along the coast in its immediate vicinity, the method of straight baseline joining appropriate points may be employed. Waters on the landward side of the baseline of the territorial sea form part of the internal waters of the State.

Where an island is situated within the 200 mile limit, the belt of waters around it constitutes territorial waters. This belt shall be 200 miles wide and shall be measured from the low water mark following the sinuosities of the island. A group of islands forming part of an archipelago is considered a unit and its territorial waters shall be measured from the centre of the archipelago.

The internal maritime waters include all navigable waters in Somali rivers open for maritime vessels and maritime ports. The internal Somali waters are subject to the sovereignty of the Republic.

Passage in the territorial sea and internal waters is not allowed to vessels having the nationality of a State not recognized by the Somali Democratic Republic.

Fishing in the territorial sea and regular transportation of persons and goods between Somali ports are reserved for vessels flying the Somali flag and other authorized vessels.

Any infringement of the above provision shall be punished with a fine of from So Shs. 5,000 to 100,000 and in case of repetition of the infringement by the vessel or the operator, the punishment may be doubled and the captain shall be liable to offences prescribed by the Somali penal laws and the vessel may be confiscated.

There is no basic provisions in the law of the Somali territorial sea and ports relating to:

- The protection and preservation of the marine environment;
- The exploration and exploitation of the resources of the continental shelf or the sea-bed of the territorial sea;
- The marine scientific research.

There is evident similarity between the Law of the Sea Convention and Somali provision governing navigation in the territorial sea, with the major difference that the Law of the Sea provisions apply only to a 12 miles territorial sea, and more liberal navigation rights are recognized in a 200 mile Exclusive Economic Zone.

The penalty for disobedience is a fine of 1,000 to 100,000 shillings and would presumably apply both to permitted ships that violate the conditions of innocent passage and to ships to which passage is forbidden.

Somalia has signed the United Nations Convention on the Law of the Sea but has not ratified it yet.

The Government of Somalia should take advantage to amend the law on the Somali territorial sea or to adopt new legislation in conformity with the Convention on the Law of the Sea.

The Government of Somalia should elaborate a new law on the territorial sea (12 miles), a law on the exclusive economic zone, and a law on the continental shelf. In those laws, Somalia should introduce basic provisions relating to the marine environment, the exploration and exploitation of the marine resources and the marine scientific research.

2.1.3 The Maritime Demesne

The regulations relating to the maritime demesne are contained in the existing Maritime Code (legislative decree No. 1 of 21 February 1959 amended by decree law No. 7 of 1 November 1966, converted and amended by law No. 3 of 7 January 1976).

> Article 11: The maritime demesne includes beaches, shores, ports, bays inlets, mouths of rivers flowing into the sea, basins of salt or brackish water which directly communicate with the sea. Buildings and other works belonging to the administration, existing within the limits of the maritime demesne and of the territorial sea, are considered as pertinencies of the same demesne. The maritime administration regulates the use of the maritime demesne and exercises policies on the same.
>
> Article 12: The shore shall include that portion of the coastline extending as far as the highest water mark at high tide. The extension of the shore shall be determined by the maritime offices on the basis of ascertainments carried out locally and of the testimony of other persons who are familiar with the place. The beach shall include the land next to the shore, which can be destined for the public use of the sea. Where the extension of the beach is not determined by the subsequent articles, it shall extend as far as the nearest land publicly or privately owned
>
> Article 13: The delimitation of specific zones of the maritime demesne with respect to public or private property, referred to in article 12, is affected by the head of the maritime zone.

It seems that the actual practice is to include up to 400 metres the land next to the shore in the maritime demesne.

Other provisions relating to the maritime demesne are:

Article 15: The exclusion from the maritime demesne of zones which cannot be used for public sea uses are provided for by a decree of the Minister.

Article 16: Unauthorized occupation of and innovation on properties of the maritime demesne, their pertinencies and the territorial sea are prohibited.

Article 17: The maritime administration, consistent with the needs connected with public use, can grant the occupation and use of the maritime demesne or zones of the territorial sea for a definite period of time.

Article 24: Concessions for the installation and management of factories and coastal storage of flammable products located within the limits of the territorial sea granted by the Ministry of Marine Transport and Ports.

Article 28: Activities carried out by anyone in ports or generally within the limits of the maritime demesne, are subject to the supervision of the maritime authority.

There are no provisions in the maritime code concerning the coastal area management. Taking into account that the Ministry of Marine Transport and Port is preparing a new maritime code we would suggest that a separate law, relating to the maritime demesne be completed by provisions concerning the coastal area management, should be elaborated.

2.2 Legislation Relevant to Marine Pollution

2.2.1 Pollution by Ships

The existing regulations relating to the pollution by ships are very limited and concern the pollution in ports or within the vicinity of the ports. Those regulations are contained in the existing Maritime Code and in the port regulations (Presidential decree No. 67 of 15 April 1978), and the Somali is only party to two International Conventions relating to marine pollution of which IMO is depository. But, Somalia became a member of IMO on 4 April 1978 by depositing an instrument of acceptance of the IMCO Convention of 1948. Many amendments have been made to the latter Convention (which also changed the name of the organization which would be known as the International Maritime Organisation IMO). It would be desirable for the Somali Government to ratify these amendments which raise no particular technical problem.

(a) Operational Discharges by Ships

Port Regulations
Presidential Decree No. 67 of 15.4.1978

Section 17 - Ships in Ports or at anchorage or within the vicinity of the ports are not under any circumstances allowed to discharge oil and other substances causing pollution or waste into the sea.

Section 21 - Ships in the port are not permitted to throw or discharge refuse, waste, garbage or other disposable matter into the port waters or overboard.

Section 22 - Normally each port provides a garbage service at cost. The use of that service is compulsory, where garbage is not run by the port the service shall be undertaken by agents or contractors duly authorised by the Port Manager.

Section 77 - Prescribes fine of Shs. So. 200 to Shs. So. 5,000 for any violation of the provisions of the regulations. The fine shall be imposed by the Port Manager.

The Somali Government has no specific regulation which applies out of the ports or the vicinity of the ports.

The Oilpol 1954 Convention was the first international instrument relating to operational discharges by ships. The matter is now dealt with by the Convention MARPOL 1973/1978.

The purpose of this convention is to control operational spills, of oil, noxious substances, sewage water or garbage.

The Convention applies to all ships flying the flag of a Party to the Convention, and to all substances considered as harmful.

One of the effects of these general provisions is to reinforce the rights and the possibilities of effective surveillance of the coastal State and Port State which is Party to the Convention. The Somali Government should have advantage to be party to this Convention.

(b) Accidental Discharges by Ships

(i) The Prevention of Maritime Accidents

The main legal instrument for the prevention of accidents and by the way to prevent discharge into the sea of oil or other harzardous substances are the IMO Conventions on maritime safety:

- the International Convention for the Safety of Life at Sea SOLAS 1974 amended in 1978, 1981 and 1983;

- the International Convention on Load Lines (LL 1966);

- the International Regulations for Preventing Collisions at Sea (COLREG 1972)

The Somali Government has already ratified: the International Convention for the Safety of Life at Sea 1960; SOLAS 1960 but not the SOLAS 1974; the International Convention on Load Lines 1966 (LL 1966)

The Somali Government should have advantage to ratify COLREG 1972 and SOLAS 1974 with its 1978 Protocol as amended. COLREG 1972 is a code of good conduct at sea which could be ratified without problems and should be introduced into the national legislation - SOLAS 1974 - the main objective of the SOLAS convention is to specify minimum standards for the construction, equipment and operations of ships, compatible with their safety.

Flag States are responsible for ensuring that ships under their flag comply with its requirements, and a number of certificates are prescribed in the Convention for this purpose.

Certificates in accordance with the Convention shall be accepted by other Contracting Governments under the control provision of the Conventions (regulations 1/19). However, duly authorized offices of such Governments may intervene and ensure that a ship flying the flag of another State shall not sail if there are clean grounds for believing that the ship does not comply with the requirements of the Convention and cannot proceed to sea without endangering the passengers or crew.

Moreover, in the interest of the safe handling of dangerous good, the Somali harbour regulations should take full account of the provision of Resolutions A 435 (XI) on the safe transport, handling and storage of dangerous goods in port areas, incorporating key provisions of the International Maritime Dangerous Goods Code (IMDG Code).

(ii) Prevention and control of pollution after maritime accident

Somali legislation to prevent and control marine accidental pollution is limited.

Port regulations - 15/4/1978

Section 30 - In the event of a vessel being grounded or stranded the master or the person in charge shall take immediate steps and reasonable precautions to prevent pollution.

Maritime Code Legislative decree No.1 21.2.1959, amended by decree law No. 7 of 1.11.1966, converted and amended by law No. 3 of 7.1.1967.

Article 26: In case of submersion of goods or other materials in ports, the persons concerned must provide for their immediate removal. Should they fail to fulfil this obligation, causing danger or hindrance to navigation, the authority will order that removal to be carried out.

If the Somali Government adopts a new law concerning the territorial sea with a limit of 12 nautical miles it would be interesting for Somalia to ratify the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, (Brussels, 1969) and its 1973 Protocol relating to intervention on the high seas in cases of pollution by substances other than oil.

Besides, Somalia should adopt regulations for the intervention in case of emergency in the territorial sea and maritime demesne.

(iii) Contingency plan to combat accidental pollution

The Somali Government has not yet a national organisation and a national contingency plan for dealing with a major pollution of the sea by oil or other hazardous substances.

On the occasion of the Ariadne accident the Somali authorities have established a contingency plan. However, it is necessary that the Somali Government adopt an appropriate national organisation and a national contingency plan with a view to take immediate and preliminary action in case of emergency.

That means for Somalia to be prepared as a first step to request and organize international assistance and to cooperate in the framework of the regional agreements concerning co-operation in combating marine pollution in case of emergency. (Protocols to the Red Sea and the Gulf of Aden Convention and East African Convention). Then the Somalia Government has to ratify soon the two Regional Seas Conventions and their Protocols.

(iv) The liability and compensation for pollution damage

Except for few provisions in the maritime code concerning the liability of the master of the ship relating to shipping activities, Somalia has no specific law in this matter, and it seems that it would be the common law on the liability which would be applied.

It is in the interest of Somalia to ratify the relative conventions and to adopt appropriate national law in this field. Those conventions are:

- International Convention on Civil Liability for Oil Pollution Damage, 1969 - (entry into force 19 June 1975);

- Protocol of 1984 to amend the International Convention on Civil Liability for Oil Pollution Damage, 1969 - (not yet in force);

- International Convention on the Establishment of International Fund for Compensation for Oil Pollution Damage 1971 (entry into force 16 October 1978);

- Protocol of 1984 to amend the International Convention for the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971 (not yet in force);

- International Convention Relating to the Limitation of the Liability for Maritime Claims adopted in London in 1976 (will become in force 1 December 1986).

The existing Somali legislation relating to pollution by ships is out of date, incomplete and inadequate. The existing maritime code deals mainly in great details with the questions of private law and state ownership.

Regional advisers from IMO have pointed out that the present maritime code needs to be brought up-to-date and they have proposed a comprehensive programme of legal work. Taking into account proposals made in those reports the Ministry of Marine Transport and Ports have prepared a draft of new maritime code. This new code would be adopted and published soon.

As already pointed out there is a great lack of specific regulation in the maritime sphere, where an enormous volume of work on drafting and adopting remain to be done, in particular for the implementation of the appropriate conventions. This work would be greatly facilitated by the availability of a large number of practical codes published by IMO and designed to assist governments in applying the most important provisions of international convention in a uniform manner.

In addition, many studies and guidelines produced by IMO committees might provide foundation for the task of drafting national technical rules. The drafting of regulation and the implementation of those regulations need a large and qualified staff. It seems that at the present time the Ministry of Marine Transport and Ports have limited capacity. For the drafting, the Government of Somalia should request the assistance of an expert from IMO.

2.2.2 Pollution Resulting from Exploration/Exploitation of Sea-bed Minerals

Exploration and exploitation of sea-bed mineral resources are submitted to the mining code implemented under the responsibility of the Ministry of Minerals and Water Resources.

Mining Code

Article 2: The entire ownership and control of all minerals are vested in the State:

- in any land in the Republic;

- under territorial sea as determined by the maritime legislation in force;

- on or under the sea-bed beyond territorial limits to a point where the sea is 200 m in depth and beyond to such depths of the superjacent waters as admit of the exploitation of minerals.

Article 53: No person shall explore, prospect or mine any mineral or oil except in accordance with a permit or lease granted under the provisions of the Mining Code.

Article 54: Subject to the provisions of the Mining Code and Regulations, the Minister may with he approval of the Council of Ministers, in the prescribed manner, grant: (a) An oil exploration permit to explore for mineral oil in any lands and under any waters in or adjacent to the Republic as may be specified in the permit; (b) Oil prospecting permit to prospect or drill for, extract and remove for the purpose of test and research, mineral oil from any lands and waters in or adjacent to the Republic as may be specified in the permit; (c) An oil mining lease to explore and prospect for, mine, remove process for sale, and dispose of mineral oil from any lands and waters in or adjacent to the Republic as may be specified in the lease. Such a grant may be subject to such terms and conditions as the Minister may with the approval of the Council of Ministers determine.

Article 96: No person shall in the course of prospecting or mining operations permit any noxious or poisonous matter to pollute water in use by the public, nor shall he discharge sand, a slime or other tailings in a manner as to interfere with any such use.

Article 101: Any person who prospects or mines on any area referred to as prohibited, shall be guilty of an offence and shall be liable on conviction to a fine not exceeeding So.Shs. 100,000 or to imprisonment for a term not exceeding twelve months, or to both such fine and imprisonment.

Under the circumstances, this law empowers the Minister to introduce in the mining permits or concessions any provision which might be required in order to prevent and control marine environment pollution due to mining activities.

In this way, the Ministry of Mineral and Water Resources with the assistance of a legal advisor, has established under the legal framework of the mining code a draft concession agreement which will be proposed by the Government (Minister) to the oil companies. This concession agreement provides provisions which commit the oil companies to take measures to prevent and control marine environment pollution due to their mining activities.

For this purpose the guidelines established by UNEP on legal aspects concerning the environment related to offshore mining and drilling carried out within the limits of national jurisdiction may be used.

In a case of emergency the Ministry of Mineral and Water Resources will be involved and will have to assume the relation with the operator and the oil companies. Probably this Ministry in cooperation with the Ministry of Marine Transport and Ports would have to coordinate the other ministries concerned.

2.2.3 Marine Pollution by Dumping of Wastes and other Matter

It seems that a specific legislation on this subject does not exist.

It would be useful for the Somalia Government (probably the Ministry of Marine Transport and Ports and the Ministry of Justice) to study the Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (London 29 December 1972 entry into force 20 August 1975), and to examine the opportunity to ratify this convention and to establish a national regulation in this field.

The London Dumping Convention (LDC 1972) regulates the deliberate disposal at sea of wastes from vessels, aircraft or other man made structures at sea, excluding operational discharges. It defines three categories of wastes:

- wastes, the dumping of which is probibited;

- wastes, the dumping of which requires a prior special permit,

- all other wastes, the dumping of which requires a prior general permit.

2.2.4 Marine Pollution from Land-Based Sources.

Pollution from land-based sources means pollution of maritime area by direct or indirect discharges (through the river) on sea of industrial and domestic wastes and of pesticides which come to the sea through the river.

Laws and regulations to prevent, reduce and control pollution of the marine environment from land-based sources do not exist in Somalia.

The Government of Somalia has a great interest to adopt laws, regulations, measures, standards, criteria and procedures to minimize, to the fullest extent possible, the release of toxic, harmful or noxious substances, especially those which are persistent into the marine environment. Those laws and regulations would take into account the characteristics of Somalia, the capability of the administration to develop and implement such laws and regulations, the need for economic development for this purpose and the economic capacity.

The UNEP guidelines on marine pollution from land-based sources may be used.

The prevention and control of land based pollution by industrial wastes would be integrated in the future law relating to the industrial development which are prepared by a legal advisor of UNIDO for the Ministry of Commerce and Industry. Such provision in this law will provide the legal basis for comprehensive regulation.

A specific law covering the prevention and control of land based pollution by domestic and municipal wastes does not exist in Somalia.

The Ministry of Interior in close cooperation with the Ministry of Mineral and Water Resources would prepare through interministerial consultation a general law under which progressive and comprehensive measures, regulations standards and procedures, would be adopted. The local authorities (municipalities, districts) would be in charge to implement these regulations.

A specific regulation for the use of pesticides in a view to avoid pollution of the marine environment does not exist in Somalia. Nevertheless the law concerning the Pesticides (Law No. 49 of 13.7.1971) may provide the legal basis under which a comprehensive regulation on the use of pesticides could be established.

Pesticides Law No. 49 of 13.7.1971 S.3/7

Article 2: This law applies to the registration of:

(a) active ingredients and pesticide formulations

(b) adjuvants sold to a grower or other used for addition at the point of use to the spray tank or other container of pesticide formulations.

It defines "pesticides" as any product proposed or used for controlling a pest and includes active ingredients, adjuvants and pesticide formulations.

Article 4: No person or corporate body shall distribute, sell, offer for sale or deliver within or import into the country pesticides unless it has been registered under this law.

2.3. Legislation Relevant to Coastal Areas Management and Development

Coastal areas management and development require a holistic integrated approach which means interministerial activities and the need for interministerial co-ordination.

Laws and regulations relating to coastal area management and development do not exist as such in Somalia. At this stage the first steps should be to:

- identify the ministries and agencies concerned and the ministry which may lead and coordinate those activities;
- create an interministerial co-ordination body mechanism;
- formulate a conceptual approach
- prepare a regional pilot project to improve the conceptual approaches, and to mobilize national agencies and regional and local governments.

Such an approach would be better than developing a long list of new laws and regulations.

Comprehensive regulations and procedures would come later and would be complemented by a national and regional planning framework.

2.4. Legislation Relevant to Marine Living Resources

2.4.1 Fisheries Legislation

Basic marine fisheries legislation was contained in the maritime code of 1959, which entrusted fisheries regulation and management to the maritime authority, but now falls under the responsibility of the Ministry of Fisheries which was established in 1977.

The provisions of the maritime code (currently under revision) relating to fisheries activities were inadequate (1959),and the functions of the Ministry of Fisheries include amongst others the responsibility to formulate laws regulating fishing in Somalia waters and to organise fishing rights. So the Ministry of Fisheries, on the basis of a draft prepared by an FAO expert, has drawn up a national fisheries regulation.

The fisheries law No. 13 of 30 November 1985 has been promulgated and entered into force. This law covers every aspect of the fisheries including administration management, planning, licensing and enforcement.

The law is still in the Somali language version; its translation is expected in the near future.

2.4.2 Endangered Species

Specific laws and regulations relating to the protection of marine endangered species do not exist in Somalia. Somalia has signed the Eastern African Convention and its Protocols and could ratify soon those instruments.

Under the Protocol Concerning Protected Areas Wild Fauna and Flora in the Eastern African region, the contracting parties shall take all appropriate measures to ensure the protection of wild fauna species listed in annexes of the Protocol.

The Ministry of Fisheries may progressively prepare an appropriate regulation, for the implementation of this Protocol.

Moreover, the Somali Government may ratify the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES Washington 3 March 1973 entered into force 1 July 1975). The objectives of this convention are to protect certain endangered species from overexploitation via a system of import export permits. The Somali Government may also ratify. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn 1979) which also contains provisions relating to endangered marine species.

2.5. Protected Areas and Reserves

Specific regulations relating to marine and coastal protected areas do not exist in Somalia.

Nevertheless, the law on Range Development and Management of 4 February 1979, the law on Fauna (Hunting) and Forest Conservation of 25 January 1969, the decree on protection of wild game and the law on the national parks agency of 1 March 1971 establish the responsibility of the Ministry of Livestock, Forestry and Range to create and maintain national park and game reserves and to prevent the destruction of the game resources.

The Ministry of Livestock, Forestry and Range should have the responsibility for marine and coastal protected areas. It would be the Ministry in charge of the implementation of the Protocol Concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region.

The Ministry of Livestock, Forestry and Range in co-operation with the Ministry of Fisheries, the Ministry of Marine Transport and Ports the Ministry of Tourism and the University would develop a national policy concerning marine and coastal protected areas and reserves and would prepare a legal framework for the creation and maintenance of such protected areas.

The Ministry will operate, with the support of the other ministries concerned, through the National Parks Agency which is responsible for establishing national parks and reserved areas.

Moreoever, the Somali Government might ratify the Convention on Wetlands of International Importance Especially as Waterfowl Habitat - (RAMSAR 2.2.1971 entry into force 21.12.1975).

The objectives of this Convention are to stem the progressive encroachment on, and loss of, wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific and recreational value.

2.6. Ratification and Implementation of the Regional Seas Conventions and Protocols (Red Sea and Gulf of Aden and East African Region)

Somalia should ratify soon those Conventions and Protocols. It would be useful that only one Ministry assumes the lead role and be the UNEP focal point.

The Ministry of Marine Transport and Ports seems to be in the best position to assume the lead and to be the UNEP focal point.

The Ministry of Marine Transport and Ports will assume responsibility for the interministerial co-ordination of the participation of Ministries or Agencies concerned by the regional co-operation in this field.

The existing Somalia legislation governing the protection, and development of the marine environment and coastal areas is relatively limited, non-appropriate and incomplete.

Except for the protection of marine environment related to offshore mining and fisheries, there is a great lack of specific regulations in the field of marine pollution and coastal areas management, where an enormous volume of work on drafting and adopting has to be done.

It seems that the Somalia Administration, without supplementing financial and human resources, is unable to do all this work and to implement and enforce a complete legal system. Therefore, it is necessary to establish priorities taking into account the existing or future capabilities of the Somali admininstration in terms of budget and human resources.

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

In general the domaine of responsibilities in the fields of marine pollution and coastal area management are not clearly defined and established. There is a possibility of overlapping. There is no marine environment policy as such and no Ministry of Environment. Often, Ministries and Agencies carry out their activities independently and without previous consultation with other agencies concerned.

Marine environment and coastal area management are a field where many ministries and agencies operate or would operate, therefore this field need an interministerial coordination machinery. Coordination and liaison between ministries and agencies would have to be strengthened and institutionalized.

Two Ministries seem to be in a position to assume a lead role in this field, these are: The Ministry of Marine Transport and Port and the Ministry of Justice and Religious Affairs, although the Ministry of Livestock, Forestry and Range would have an important role to play, but mainly in the specific field of protected areas and reserves.

Except for the off-shore oil exploration and exploitation and for fisheries, there is a lack of specific regulations. An enormous amount of work should be done for drafting and adopting. As regards the International Conventions and Regional Agreements, Somalia has signed a very limited number of them and has ratified an even smaller number. International Conventions provide basic standards, and it is in the interest of Somalia to ratify such Conventions.

Needs are very important in terms of action to be taken but the capabilities and resources are limited. For this reason, it is necessary to make choice and fix priorities.

3.2 Recommendations

3.2.1 National Organization

(a) Each ministry or agency should consider the environmental aspect in its field of responsibility. And the responsibilities of ministries and agencies sector by sector should be clearly established by laws. Special units within ministries concerned could be created. Budget consideration will have to be taken into account when legislation defining ministerial responsibilities and necessary resources should be provided.

(b) An interministerial co-ordination machinery should be created. This machinery should have two components: (i) An Interministerial Commission at the technical level and (ii) an Interministerial Committee at the political level.

(i) Interministerial Commission

The Interministerial Commission chaired by the Permanent Secretary of the Ministry of Marine Transport and Ports, would be composed of representatives of all ministries and agencies concerned. The Permanent Secretary would be assisted by a permanent staff. (Permanent Secretariat).

The purpose of the Interministerial Commission would be to:

- propose to the Interministerial Committee objectives for a national policy relating to marine environment and coastal area management;
- establish the framework of a national action plan and propose actions for the implementation;
- study and examine draft laws and regulations (laws, decrees, directives);
- control the implementation by ministries of the decisions taken by the Interministerial Committee;
- coordinate the participation to the regional action plans of the ministeries and agencies concerned and coordinate the implementation of those action plans.

(ii) The Interministerial Committee

The Interministerial Committee chaired by the President would be composed of all Ministers concerned. This committee meets twice per year, more if necessary.

The purpose of the Interministerial Committee would be to:

- Adopt the objectives and actions proposed by the Interministerial Commission and the necessary resources in terms of budget and personnel.

(c) A national organisation and national Contingency Plan dealing with a major pollution of the sea by oil or other hazardous substances should be established.

3.2.2 Ratification of International Conventions

It is in the interest of Somalia to ratify or accede to a number of international conventions.

Firstly, the Government of Somalia should ratify the Regional Seas Conventions:

- The Convention for the Conservation of the Red Sea and Gulf of Aden Environment and the Protocol Concerning Regional Cooperation in Combating Pollution by Oil and other Harmful Substances in Cases of Emergency.
- The Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region and related Protocols.

Secondly, the Government of Somalia should ratify the International Conventions relating to marine pollution of which IMO is depositary:

MARPOL 1973/78
COLREG 1972
SOLAS 1974
CLC 1969 and Protocol 1984
FUND 1971 and Protocol 1984
Conventions relating to intervention on the high seas
in cases of pollution - (Convention 1969 and Protocol 1973)
London Dumping Convention, 1972

Finally, Somalia should ratify:

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)

The Convention on the Conservation of Migratory Species of Wild Animals (Bonn 1974)

The Convention on Wetlands of International Importance Especially as Water Fowl Habitat. (Ramsar 1971).

3.2.3 Legislation to be enacted on a priority basis

Proceeding step by step in due time taking into account the available resources:

(a) Marine pollution by land-based sources
Establish laws and regulations to prevent, reduce and control marine pollution from land-based sources, and provide skilled personnel to monitor and enforce this legislation - the UNEP guidelines on marine pollution from land-based sources may be used. The assistance of an expert should be requested.

(b) Marine pollution by ships

With the assistance of a legal expert of IMO, the Government of Somalia should progressively establish appropriate regulations in the maritime sphere.

(c) Protected areas

With the assistance of an expert of IUCN, the Government of Somalia should progressively establish an appropriate law and regulations concerning protected areas and conservation of endangered wild species.

(d) Status of the maritime spaces under the Somali jurisdiction

Somalia should elaborate a new law on the territorial sea, a law on the exclusive economic zone, and a law on the continental shelf - in those laws, Somalia should introduce basic provisions relating to the marine environment, the exploration and exploitation of the marine resources and the marine scientific research.

The maritime demesne would be subjected to a separate law complemented by provisions concerning the coastal area management.

3.2.4 Coastal areas development and management

Prepare and implement a regional pilot project to improve the conceptual approaches on coastal areas development and management.

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