



UNITED NATIONS ENVIRONMENT PROGRAMME

*Survey of the status of oil pollution control
in the South American sub-region
of the Wider Caribbean region*

UNEP Regional Seas Reports and Studies No. 111

Prepared in co-operation with



IMO

PREFACE

The Regional Seas Programme was initiated by UNEP in 1974. Since then the Governing Council of UNEP has repeatedly endorsed a regional approach to the control of marine pollution and the management of marine and coastal resources and has requested the development of regional action plans.

In 1974, at the request of several Caribbean Governments and by Decision 8 (II) of the Second Session of the Governing Council of UNEP and the development of an Action Plan for the Wider Caribbean region was initiated. Seven years later twenty-two States and territories adopted the Action Plan for the protection and development of the marine and coastal resources of the Wider Caribbean in Montego Bay, Jamaica in April 1981.

Two years after the adoption of the Action Plan for the Caribbean Environment Programme, two major legal instruments were also adopted by several countries of the region: The Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region and a Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region. These regional agreements entered into force in 1986 and have been ratified by fifteen countries of the region.

Whilst the Protocol provides a region-wide legal framework for co-operation in combating oil spills, it was recognized that in view of the Protocol's geographic coverage it was necessary to develop more detailed and operational contingency plans among groups of States which were likely to be involved in a joint response to or share specific similar risks in combating potential oil spills. This need to underpin the Protocol with appropriate bilateral or multilateral sub-regional arrangements was recognized in Article 8 of the Protocol.

In 1983 the Third Meeting of the Monitoring Committee on the Action Plan for the Caribbean Environment Programme reviewed and approved the project "Development of sub-regional Contingency Plans for the Islands of the Wider Caribbean" to be implemented by IMO with funding from the Caribbean Trust Fund. This project was later expanded to include the South American sub-region (Colombia, Venezuela, Guyana, Suriname and French Guyana, as well as the contiguous island countries of Trinidad and Tobago and the Netherlands Antilles) and to explore the feasibility of sub-regional arrangements for co-operation and mutual assistance in the event of a major oil spill.

Consequently, as part of this project, an expert mission was carried out in 1985 to evaluate the status of the existing national measures and capabilities to combat and control oil spills in the South American sub-region. This survey should be seen in the context of a comprehensive effort to assist governments in the development of national oil spill contingency planning and to encourage, where appropriate, the development of regional and sub-regional co-operation.

This survey was widely disseminated and as a result produced three proposed programmes, supported by a series of individual projects, that could significantly improve the present state of knowledge or state of readiness for oil spill control and response. The proposed programmes have short and long-term components, as a tiered approach was recommended. Such an approach would enable the implementation of programmes to assist countries with poorly developed response capabilities, while at the same time conducting more advanced projects for better equipped countries. As a contribution towards this end, a follow-up project has already commenced with funds from the Caribbean Trust Fund with IMO as the implementing agency. The main objective of this project is to strengthen the capabilities of the Wider Caribbean States and territories in combating oil pollution by providing training in the organization of a national and regional response to a major oil spill, with a view to providing a framework for possible options for the development of sub-regional arrangements for co-operation in combating marine pollution.

The assistance of the IMO consultants and of the Wider Caribbean countries which participated in the preparation of this survey is greatly acknowledged.

TABLE OF CONTENTS

	<u>Page</u>
EXECUTIVE SUMMARY	1
1. INTRODUCTION	3
1.1 Objectives	3
1.2 Composition and itinerary of IMO/UNEP expert mission	3
1.3 Report format	5
2. SOUTH AMERICAN SUB-REGION	6
2.1 Geography: Coastal and marine environment	6
2.2 Petroleum related activities	7
2.3 Spill risks and potential spill effects	7
2.4 International conventions and regional agreements	10
2.5 Summary and recommendations	12
3. COLOMBIA	14
3.1 Geography: Coastal and marine environment	14
3.2 Petroleum related activities	14
3.3 Spill risks and potential spill effects	14
3.4 National organization	16
3.5 International conventions and regional agreements	19
3.6 Summary and recommendations	19
4. FRENCH GUYANA	21
4.1 Geography: Coastal and marine environment	21
4.2 Petroleum related activities	21
4.3 Spill risks and potential spill effects	21
4.4 National organization	23
4.5 International conventions and regional agreements	26
4.6 Summary and recommendations	26
5. GUYANA	28
5.1 Geography: Coastal and marine environment	28
5.2 Petroleum related activities	28
5.3 Spill risks and potential spill effects	28
5.4 National organization	30
5.5 International conventions and regional agreements	31
5.6 Summary and recommendations	31
6. NETHERLANDS ANTILLES	33
6.1 Geography: Coastal and marine environment	33
6.2 Petroleum related activities	33
6.3 Spill risks and potential spill effects	33
6.4 National organization	33
6.5 International conventions and regional agreements	36
6.6 Summary and recommendations	36

	<u>Page</u>
7. SURINAME	38
7.1 Geography: Coastal and marine environment	38
7.2 Petroleum related activities	38
7.3 Spill risks and potential spill effects	38
7.4 National organization	40
7.5 International conventions and regional agreements	41
7.6 Summary and recommendations	41
8. TRINIDAD AND TOBAGO	42
8.1 Geography: Coastal and marine environment	42
8.2 Petroleum related activities	42
8.3 Spill risks and potential spill effects	42
8.4 National organization	44
8.5 International conventions and regional agreements	46
8.6 Summary and recommendations	46
9. VENEZUELA	47
9.1 Geography: Coastal and marine environment	47
9.2 Petroleum related activities	47
9.3 Spill risks and potential spill effects	49
9.4 National organization	49
9.5 International conventions and regional agreements	51
9.6 Summary and recommendations	52
10. SUMMARY REVIEW AND CONCLUSIONS	53
10.1 Regional	53
10.2 Sub-Regional	53
10.3 National	54
11. RECOMMENDATIONS	56
11.1 Regional	56
11.2 Sub-Regional	56
11.3 National	58
11.4 Recommended projects and activities	60
12. REFERENCES	70
12.1 Citations	70
12.2 IMO/OAS/UNEP publications and reports	71
12.3 Recommended spill-related publications	73

EXECUTIVE SUMMARY

This mission was initiated by IMO/UNEP at the request of the Third Meeting of the Monitoring Committee of the Action Plan for the Caribbean Environment Programme, held in November, 1983. The primary purpose of the mission was to undertake a survey of the status of oil pollution control and combating resources in the South American sub-region of the Wider Caribbean. Visits to Colombia, French Antilles-Guyane, Guyana, Netherlands Antilles, Suriname, Trinidad/Tobago and Venezuela by the IMO/UNEP Expert Consultants involved meetings with relevant government and industry agencies to discuss legal, financial, environmental and operational aspects of oil spill risks and responses. National legislation, existing or draft oil spill contingency plans and bi- or multi-lateral agreements were reviewed to evaluate the state of organizational preparedness of each country in the sub-region.

On the basis of these visits and of an evaluation of available documentation the mission has prepared this review and series of recommendations. The primary conclusions of the survey are that the Wider Caribbean region is a major marine transportation crossroads for oil and other cargoes, that the risk of a marine accident and of a major oil spill is high, and that the preparedness and response capability of individual countries is extremely variable. The present organization and resources in Colombia, French Guyana, Netherlands Antilles, Venezuela and Trinidad/Tobago are adequate for all but major oil spills. By contrast, Guyana and Suriname are ill-equipped and not organized to deal with anything larger than a spill of a few barrels of oil. The level of co-operation between neighbouring states is low and few relevant international conventions and regional agreements have been signed by the countries in the sub-region, with the exception of France (French Department of Guyane) and the Netherlands (Netherlands Antilles).

The evolution of the Action Plan for the Caribbean Environment Programme depends upon the development of long-term programmes designed to be of collective and individual benefit to member states. This survey of the status of oil pollution control and of the response capability to combat marine oil spills in the sub-region of South America and the contiguous islands has produced three proposed programmes, supported by a series of individual projects that could significantly improve the present state of knowledge or state of readiness for oil spill control and response. The proposed programmes have short- and long-term components as a staged approach is recommended. Such an approach would enable the implementation of programmes to assist countries with poorly developed response capabilities whilst at the same time conducting more advanced projects for the better developed countries. The primary recommendations developed as a result of this mission are to: (1) immediately encourage the unprepared countries to have at least a minimum level response capability; and (2) encourage co-operation between neighbouring countries through joint sub-regional contingency planning.

There exists a strong requirement for a programme that would encourage all states within the Wider Caribbean region to co-operate and communicate with each other. In addition, within the sub-region of South America, direct and immediate benefits could result from a co-operative programme that is based on geographically cohesive groups of states. On the basis of this study the three long-term programmes that are recommended to meet the primary needs are:

- (a) A Marine Pollution Response Manual for the Wider Caribbean Region;
- (b) An Oil Spill Contingency Plan for the Atlantic Coast of the South American Sub-Region;
and
- (c) An Oil Spill Contingency Plan for the Caribbean Coast of the South American Sub-Region.

The manual could be developed over a period of years and be the result of a series of incremental projects, some of which are more urgent than others. One section of the manual would be a Regional Oil Spill Contingency Plan; this plan being the apex of a series of hierarchical sub-regional and national oil spill contingency plans. The two proposed sub-regional and national oil spill contingency plans could be initiated quickly and a provisional framework for

notification between responsible agencies could be established almost immediately. The geographical areas of the proposed plans reflect areas of common risk and of common operational practicality. It is recommended that similar overlapping sub-regional plans are appropriate for the entire Wider Caribbean area. Local oil spill contingency plans are critical for small or localized operations, but broader involvement between neighbour states also requires effective pre-planning. The mission recommends that a series of sub-regional oil spill contingency plans for the Wider Caribbean region are more realistic and practical than a single regional plan of co-operation.

Many of the recommendations at the national level can be undertaken without external assistance. For example, the establishment, where necessary, of an interministerial group as a national contact point for marine pollution. However, the co-operative projects outlined in this report and the preparation of: (1) an updated marine pollution risk analysis; (2) a notification and resource information base; (3) a shoreline response manual; and (4) a river-estuary response manual would enhance the operational capabilities of all states in the region.

The mission particularly noted the generally low level of knowledge and experience for shoreline response, shoreline clean-up and the disposal of oily wastes. The emphasis in most states is on marine, rather than near-shore or onshore response. Each state could benefit from a national shoreline oil-spill clean-up workshop because usually the most severe impacts and the highest operational costs occur when oil reaches the shoreline.

1. INTRODUCTION

1.1 Objectives

The primary objective of this project was to conduct an up-to-date survey of the status of oil pollution control and available resources to combat marine oil spills in the sub-region of South America and the contiguous islands of the Wider Caribbean region. The sub-region, as defined by UNEP's Regional Seas Programme, is comprised of: Colombia, French Guyana, Guyana, Netherlands Antilles (Aruba, Bonaire and Curaçao), Suriname, Trinidad and Tobago and Venezuela (Fig. 1). The project was undertaken by IMO pursuant to the request of the Third Meeting of the Monitoring Committee of the Action Plan for the Caribbean Environment Programme held in Havana, 8-10 November, 1983.

The terms of reference that were defined in order to achieve the objective of the project are summarized as follows:

- (a) A general description of the risks of major oil spillages on marine and coastal environments in the sub-region and, where possible, identification of particularly vulnerable coastal zones;
- (b) A description and appraisal of existing and/or proposed plans and preparations in each country to respond to a coastal or marine oil spill (including copies of plans where available);
- (c) A description of any bi- or multi-lateral oil spill response agreements or contingency plans adopted by governments of participating countries (if possible, including copies of plans);
- (d) An indication of the interest in the development of a sub-regional oil spill contingency plan or other operational arrangements for the South America and contiguous islands sub-region;
- (e) An evaluation of the historical and potential involvement of national agencies and foreign countries or companies in the response to oil spills;
- (f) An appraisal and inventory, where available, of specific oil spill response resources in each country;
- (g) An inventory of the primary and supporting national agencies designated as responsible for oil spill prevention and combating; and
- (h) An overview of existing legislation relating to oil spill control.

The mission is considered to have been successful, thanks to the support of the national and international authorities in the states visited, as contacts and discussions were held with responsible government organizations and operational groups within each country. Upon completion of the mission a series of recommendations were developed that relate to both national and sub-regional levels of oil spill response. These recommendations are designed to improve the existing state of knowledge or state of readiness within or between countries of the sub-region.

1.2 Composition and itinerary of IMO/UNEP expert mission

Following the request of the Third Meeting of the Monitoring Committee, IMO defined the Terms of Reference for this Study and organized the mission in conjunction with the UNDP offices in each of the sub-region states. The mission was carried out by IMO/UNEP consultants, Dr. E. H. Owens, M. J.-C. Sainlos and Sr. L. T. Giuliani. The mission visited each of the countries of the sub-region.

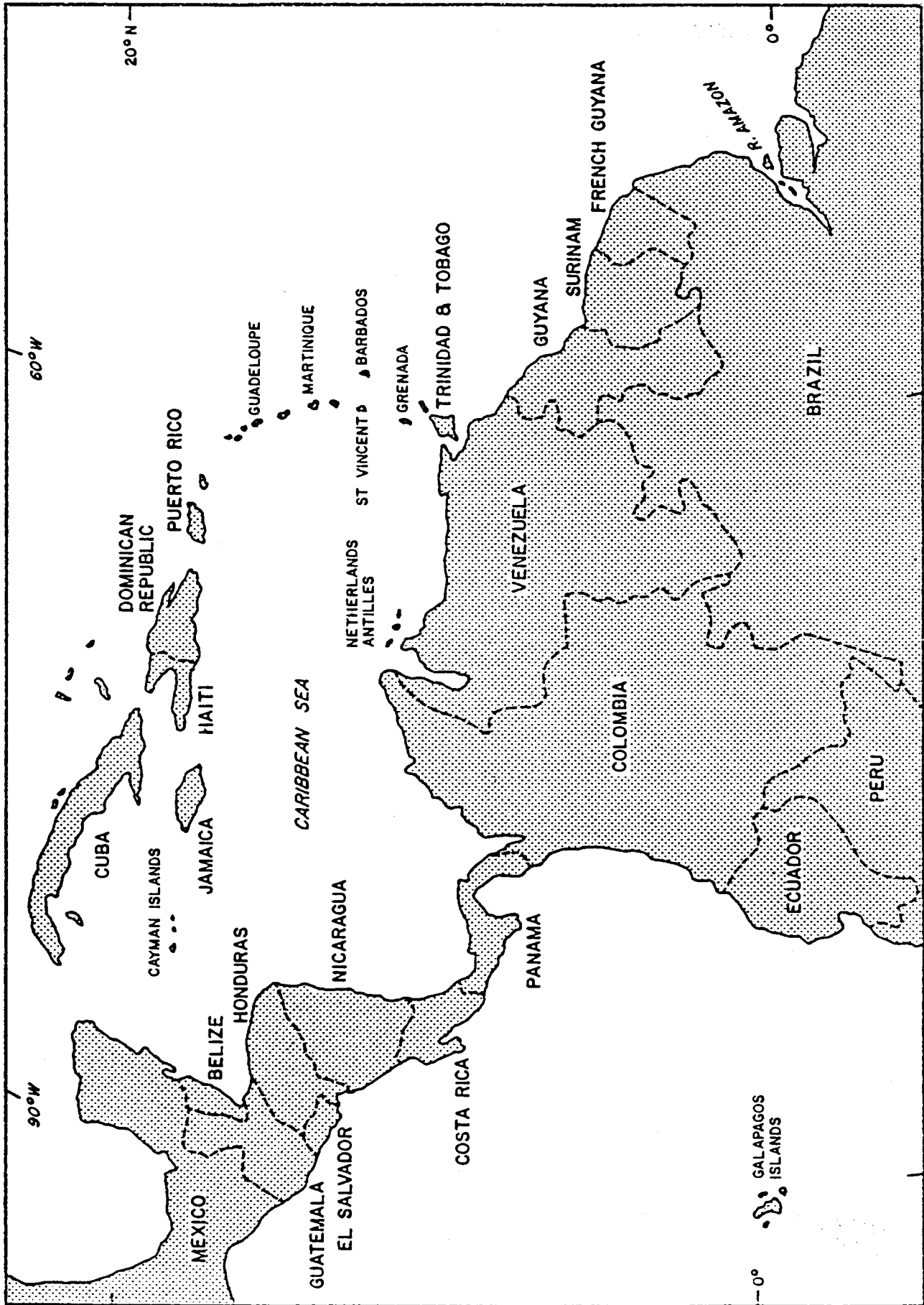


Fig. 1 Map of South American sub-region of the Wider Caribbean region

The itinerary of the mission was as follows:

15-17 May 1985	VENEZUELA	Caracas
20 May 1985	VENEZUELA	Lake Maracaibo
21-24 May 1985	COLOMBIA	Bogotá
10 July 1985	NETHERLANDS ANTILLES	Curaçao
11-12 July 1985	MARTINIQUE	Fort de France
13 July 1985	FRENCH GUYANA*	Cayenne
14-15 July 1985	SURINAME	Paramaribo
16-17 July 1985	GUYANA	Georgetown
18-19 July 1985	TRINIDAD/TOBAGO	Port of Spain

Considerable assistance was provided throughout the mission by UNDP and by the national governments of each of the countries in the sub-region.

1.3 Report format

A considerable body of data and information was gained during the course of this project. This report provides a summary of relevant information that relates to each national country and to the sub-region. This information has been presented in a systematic fashion in order to make it possible to compare and contrast the status of spill response preparedness in each of the countries.

The chosen format is to present an initial overview of the sub-region (Section 2) which is followed by a section on each country that describes: (1) the coastal and marine environments; (2) the petroleum related activities; and (3) the spill risks and spill effects associated with these activities. For each country (4) the national organization is described in terms of the internal legislation, the responsible authorities, and existing response resources and training programmes. The status and nature of (5) international conventions and regional agreements are defined. Finally, for each country (6) a summary of the status of oil response in each country, in the opinion of the expert mission, is provided along with a series of recommendations that relate to national activities.

The main information points are reviewed and discussed at the national, sub-regional and regional levels (Section 10). The recommendations presented for each country at national level are supplemented by recommendations at the sub-regional and regional levels (Section 11) to provide a comprehensive development programme. This proposed programme (Section 11.4) is the culmination of the mission and provides a rational approach which is designed to assist individual states as well as to encourage multi-lateral co-operation.

In addition to the references and reports cited in the text (Section 12.1), a list of relevant IMO, OAS and UNEP publications and reports are given in Section 12.2. A reference list of recommended reports and publications, prepared in response to several requests made during the visits of the mission for such information, is given in Section 12.3.

A list of agencies and individuals contacted by the mission is presented in Appendix A. Supporting documents, such as contingency plans, legislation and oil spill response equipment lists, for each of the countries of the sub-region are given in Appendices B through H.

* See Note on page 21

2. SOUTH AMERICAN SUB-REGION

2.1 Geography: Coastal and marine environment

The sub-region contains a heterogeneous range of island and continental states. The contrasting physical environments include extensive low-lying deltaic or estuarine systems and high cliffed rock coast. Wave-energy levels on the exposed Atlantic Ocean shores of Trinidad and Tobago are several orders of magnitude greater than in Lake Maracaibo or on the Caribbean coast of Colombia. Similarly, ecological variability ranges from highly productive mangrove, salt marsh or coral reef environments to less sensitive sand beaches and bedrock coasts. This great variety in shoreline character reflects two primary transitions:

- (1) from the Atlantic Ocean open ocean swell wave environment to the Caribbean marginal sea, protected wave environment; and
- (2) from the lowland coastal plain of eastern South America to the upland and mountain region of northern South America (the islands of Netherlands Antilles and Trinidad/Tobago are offshore extensions of continental upland bedrock features).

Homogeneous features of the sub-region include: (a) warm tropical sea temperatures; (b) the relatively low tidal range (generally less than 2m); (c) the influence of the north-east Trade Winds; and (d) the influence of tropical cyclones. Mangroves and tropical salt marsh environments are common throughout the sub-region and each is ecologically constant despite the variations in physical and oceanographic conditions.

The total coastline length of the sub-region is about 6,000 km, of which half is within Venezuela alone. Detailed descriptions of the shoreline character of each country are given in Bird and Schwartz (1985) and these are summarized in the following sections. Other coastal information is provided by McGill (1958), Dolan *et al.* (1972), Chapman (1977) and Davies (1980).

The Atlantic coast of Venezuela, Guyana, Suriname and French Guyana is a lowland plain with a shallow near-shore environment that is characterized by mudbanks and by the Guyana Current, both of which (a) migrate towards the northwest and (b) are associated with the Amazonian river system. The river water is carried from the mouth of the Amazon to the northwest by the effects of the Equatorial Counter Current, which in turn is partially driven by the South-East Trades. This water forms a coastal boundary current that is muddy and of low salinity in comparison to the adjacent ocean water of the Atlantic. The muddy sediments carried to the coast by the Amazon, and to a lesser degree by other rivers, are transported alongshore by wave and current action in the form of large mud banks. These banks can be up to several kilometers wide, tens of kilometers long and migrate at rates of 1 to 2 km/year. The shoreline is slowly advancing seaward as more sediment accumulates in the shallow near-shore waters. The character of the coast is dominated by mud and sand sediments, with extensive mangrove and salt marsh environments. A few rock outcrops, in French Guyana, interrupt the otherwise low nature of the shore-zone. The relatively straight shoreline is broken by a series of large and small tidal estuaries that have become focal sites for the predominantly coastal population. The Orinoco forms part of this entire system despite its own unique character as a major river delta.

The Caribbean Coast, from Trinidad to the isthmus of Panama, is relatively straight and the shoreline form is controlled by the regional geology. The northern Andes system splits into two arms: one forming the western margin of Lake Maracaibo and ending in the Guajira Peninsula of Colombia; the other turning northeast then east to provide the eastern borders of Lake Maracaibo and the northern margin of the Orinoco drainage basin. This latter arm (the Cordillera de la Costa) gives the northern Venezuela coast its broken, upland character. The east-west trend of the geology is best exemplified by the Peninsula de Araya-Peninsula de Paria upland which continues east to form the northern coast of Trinidad. The offshore islands of the Netherlands Antilles and Venezuela (Islas Las Aves to Los Testigos), Isla Margarita, Trinidad and Tobago are

all associated with this upland system and have become isolated from the continental mainland by erosion over geological time. The general continuity of the upland region is interrupted by lowlands near Puerto la Cruz, Lake Maracaibo, Barranquilla, Coveñas and Golfo de Uraba where river systems have eroded wide valleys through the mountains. Mangroves and salt marshes are common in lowland areas but the general coastal character of the Caribbean coast is dominated by bedrock outcrops and coarse-sediment beaches.

2.2 Petroleum related activities

The South America sub-region has been deeply involved in the production, refining, trans-shipment and marine transport of oil for many decades. Venezuela has been a major producer and exporter of oil and island ports have been focal points for the trans-shipment and/or refining of oil from Africa and the Middle East en route to North America. In this decade the patterns of oil movement and the quantities that are in transit have changed significantly. These changes are due in part to political and economic factors and in part to logistics. The construction of 'offshore oil ports' in Louisiana and Texas in recent years has meant that VLCC tankers must no longer discharge at an intermediary port but can discharge directly onto the mainland of the USA. Production volumes have changed in Africa, the Middle East, Mexico and Venezuela with resulting alterations to tanker traffic movements.

There exists a strong contrast between those countries of the sub-region that are involved with the petroleum industry to a high degree (Colombia, Netherlands Antilles, Trinidad-Tobago, Venezuela) and those which are merely consumer states (French Guyana, Guyana, Suriname). The latter group are involved with the industry in a relatively small way as purchasers and transporters of oil products for domestic uses.

The Wider Caribbean region is a crossroads in terms of the world's oil trade (Figure 2). Each year in the order of 2,250 m barrels of crude oil pass by sea through the region from production areas in Africa (north and west), Alaska, the Middle East, Mexico and Venezuela (Reinburg, 1984). At any one time about 100 oil tankers are in transit through the region. To this major oil shipping activity must be added cargo vessels, cruise ships and the considerable local traffic that distributes refined products to coastal towns and islands. Much of this traffic uses the many narrow straits or channels that characterize this island area.

In character, the tanker cargoes in transit include a wide range of both crude oils and products. The vessels themselves range in size from VLCC's to coastal tankers or river barges, and in performance from well-equipped and maintained company or national tankers to less sophisticated ships that may have had a long sea life.

A detailed summary of oil movements on the seas of the Wider Caribbean region is provided by Reinburg (1984). That report contains information on the volume of crude and refined oils shipped over Caribbean sea routes and on the frequency of transits through the straits in the region. The report is based upon 1982 data and, although recent, is therefore already out-of-date as a result of changing economic and transportation factors.

In order to be prepared for spills that might be expected as a result of this marine oil traffic a number of oil companies that operate in the Caribbean area formed the Clean Caribbean Co-operative (CCC). CCC has contract equipment that is dedicated to spill response and which can be dispatched by air from the contractor's stockpiles. Equipment is leased by the contractor to CCC members who are then responsible for the management and cost of the clean-up operations. Equipment held by the contractor can be released to non-members if authorization is given by the CCC and providing that certain requirements are met. The equipment stock piles maintained by the contractor include boats, skimmers, booms, separators, pumps, dispersants and a communications system and command centre. The contractor can also provide equipment operators, cleaners and operations supervisors.

2.3 Spill risks and potential spill effects

Marine or coastal oil spills result from natural seeps, offshore exploration/production, operational discharges or spills, and transportation discharges or spills. On a global basis the significance of each of these sources can be seen in the context of the estimated input of hydrocarbons to the marine environment (Table 2.1). These estimates indicate that tanker operations, bilge and fuel oil discharges, and tanker accidents account for 95% of the input of petroleum hydrocarbons from transportation activities. Tanker accidents (collisions, groundings, explosions, etc.) account for about one quarter of the spilled oil but the amounts are concentrated in time and space so that the impacts are generally more severe than those from the discharge of tank or ballast washings on the open sea.

The primary risks of spills in this sub-region are related to:

- (1) tanker accidents
- (2) terminal operation discharges
- (3) tank/ballast washing
- (4) pipeline ruptures (Lake Maracaibo and Trinidad only)

TABLE 2.1

Input of Petroleum Hydrocarbons into the Marine Environment (mta)
(from National Research Council, 1985)

SOURCE	PROBABLE RANGE	BEST ESTIMATE
Natural sources:		
Marine seeps	0.02 - 2.0	0.2
Sediment erosion	0.005 - 0.5	0.05
(Total: Natural sources)	(0.025) - (2.5)	(0.25)
Offshore production	0.04 - 0.06	0.05
Transportation:		
Tanker operations	0.4 - 1.5	0.7
Dry-docking	0.02 - 0.05	0.03
Marine terminals	0.01 - 0.03	0.02
Bilge and fuel oils	0.2 - 0.6	0.3
Tanker accidents	0.3 - 0.4	0.4
Non-tanker accidents	0.02 - 0.04	0.02
(Total: Transportation)	(0.95) - (2.62)	(1.47)

A number of major spills have occurred over the past decade in the sub-region as a result of tanker accidents, most notably:

Forth Field (1975: 112,500 bbl)
CYS Dignity (1978: 112,550 bbl)
Aegean Captain/Atlantic Empress (1979: est. 3.4 million bbl)

In addition, offshore blowouts have occurred in Trinidad waters and natural seeps occur in the seas off Colombia, Trinidad and Venezuela.

Small operational spills at terminals are, in most cases, provided for locally in terms of notification and response plans. These procedures are usually developed and updated by the relevant petroleum company. Of greater importance are accidental tanker spills on the open sea or in estuaries as these may require a large integrated response involving national and possibly international agencies. This type of incident has a low frequency but a high impact. By contrast, small terminal spills do occur at a high frequency but these usually have a very low impact as they involve small amounts of oil over small geographic areas, and are often contained or removed by on-site resources.

The primary impacts that are of concern at the regional level relate to environmental damage that in turn affects man's activities and ecological systems. For example, a spill that impacts a mangrove environment can affect larval shrimp which in turn can affect the size of catches for artisanal or commercial fisheries. Some impacts are purely biological, such as would occur to migratory bird populations or to turtle eggs in a beach. Other impacts are directly on man's activities and can include the fouling of fishing nets or the contamination of urban river water supplies.

It is not practical nor particularly useful to define primary risk areas at the regional level but this can be undertaken at the more detailed local level. In the sub-region as a whole all coastal mangrove or salt-marsh environments and estuarine or river systems would be adversely impacted by oil spills. The degree of impact would be a function of the oil type and volume, plus a range of other factors. However, one would expect these environments and systems to be worst cases, and sand beaches or rock coasts to be areas of least concern in the sub-region. Although tourist beaches may be oiled, the impact of the oil is likely to be short-lived as clean-up can usually be effective and efficient. By contrast the destruction of a year class of certain marine species could have a profound and long-term impact on artisanal and commercial fisheries.

Little data exists on fish stocks or breeding grounds at the regional level. It is believed that there is important upstream recruitment in the Antilles from the coastal waters of northeast South America. The larval stage of some marine species extends in range from Brazil to the southeast USA in association with the oceanic currents. Locally, fish and shrimp species are recruited from estuarine and mangrove larval areas. From a wildlife perspective many migratory coastal bird species winter in the marshes and mangroves for up to eight months each year, so that risk to these birds is related to the timing of a spill incident and to the feeding habits of individual species.

Although these risks or impacts can be identified at a general level, to date few surveys or studies have been conducted at the regional scale or at the national scale as part of spill response preparations.

2.4 International conventions and regional agreements

(a) Regional agreements

The 'Wider Caribbean Region' of UNEP's Regional Seas Programme includes about 40 separate entities, some of which are independent states, whereas others are part of or are associated with France, the Netherlands, the UK or the United States. Although the majority of the countries are islands or shared island states, the region includes 13 mainland countries of Central and South

America, from Mexico in the northwest to French Guyana in the southeast. An Action Plan for the Caribbean Environment Programme was initiated by UNEP in 1980 and subsequently adopted in Jamaica in April, 1981. The Action Plan is coordinated by UNEP and a Monitoring Committee supervises the funding of projects within the Plan.

To develop a legal foundation for activities in the Wider Caribbean region, a series of meetings produced the Convention for the Protection and Development of the Marine Environment (Cartagena Convention) which was adopted by the nations of the Wider Caribbean region on 24 March, 1983. The Protocol associated with the Convention deals specifically with cooperation on oil spills in the region.

For the implementation of the Cartagena Protocol, the size of the Wider Caribbean region led to the evolution of three sub-regional divisions:

- (1) Island States and Territories
- (2) Central America, Panama and Mexico, and
- (3) South America and contiguous islands

The latter sub-region specifically is comprised of:

Colombia, French Guyana, Guyana, Netherlands Antilles (Aruba: Bonaire and Curaçao), Suriname, Trinidad and Tobago, Venezuela.

Signatories from this sub-region to the Convention and Protocol are:

Colombia, France (French Guyana), Venezuela.

Efforts to develop a Regional Oil Spill Contingency Plan led to a meeting in Saint Lucia (May, 1984) which developed a 'Sub-Regional Oil Pollution Contingency Plan for the Island States and Territories of the Wider Caribbean Region'. Due to the geographic overlap between the sub-regions, France (French Department of Martinique and Guadeloupe) and Trinidad/Tobago were involved in the Saint Lucia meeting.

At the present time no sub-regional agreements have been developed for the South America sub-region of the Wider Caribbean region.

(b) International conventions

The International Maritime Organization (IMO) is the UN agency responsible for maritime activities. This responsibility includes environmental affairs and in this role a number of conventions have been developed by IMO that relate directly to marine pollution. The most relevant of these are:

- (i) The International Convention relating to Intervention on the High Seas in cases of Oil Pollution Casualties, 1969 (INTERVENTION). This Convention specifies the legal rights of a nation to prevent, mitigate or eliminate the threat of oil pollution on the high seas to its territorial seas or coastlines. This Convention is supported by the Protocol of 1973 that extends its application to other harmful substances.
- (ii) The International Convention on Civil Liability for Oil Pollution Damage, 1969 (CLC) defines the liability for costs and damages that relate to tanker spills.
- (iii) The International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971 (FUND) relates to emergency funding to respond to large tanker spills.

- (iv) Two Protocols to CLC and FUND were adopted in 1976 and 1984 to increase the level of compensation for Oil Pollution Damage.
- (v) The International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL) and its Protocol (1978) provide comprehensive regulations on marine pollution from vessels. These define conditions under which oil or other harmful substances may be discharged by ships at sea. MARPOL supercedes an earlier convention (OILPOL).

All countries of the South America sub-region are members of IMO, but only:

- Colombia, France (French Guyana) and the Netherlands (Netherlands Antilles) have ratified MARPOL (73/78);
- France (French Guyana), Netherlands (Netherlands Antilles) and Suriname have ratified INTERVENTION;
- France (French Guyana) and Netherlands (Netherlands Antilles) have ratified CLC and FUND: but in the latter case apparently these conventions do not apply to the Netherlands Antilles (see Appendix E - item 3).

2.5 Summary and recommendations

(a) Summary

The sub-region is heterogeneous in terms of: (i) the physical character of the coastal and marine environments; (ii) the importance of oil production; (iii) the volumes of coastal and marine oil transportation; (iv) the potential effects of marine oil spills; and (v) the level of involvement with neighbouring states and with international agencies and their conventions. It is therefore difficult to generalize on environmental, operational and legal matters. Venezuela, for example, has a long history in the petroleum industry and participates in a wide range of international activities, but has not ratified MARPOL 73/78. By contrast, French Guyana is a relatively small participant in the petroleum industry as a consumer, yet is involved in international activities and, as a Department of France, has ratified and implements all of the relevant Conventions and Protocols.

The overall knowledge base for assessing environment risk is poor due to: (a) changes in petroleum production, refining and transportation patterns over the last three to four years; and (b) a lack of knowledge or of documentation on coastal and marine ecosystems. Although the risks of a large marine spill are high, the potential nature and contemporary sources of major oil spills have not been identified. This information is necessary for an impact assessment to be conducted.

At the level of international co-operation, although all countries of the sub-region are members of IMO few relevant IMO conventions have been ratified and only two of the seven states have ratified the Cartagena Convention and Protocol. Overall, co-operational interaction at the international level is poorly developed in the area of oil spills in the marine environment.

(b) Recommendations

At this sub-regional level it is evident that there exist a number of opportunities to develop programmes that would be of direct benefit to all, or to a majority of, states. The general basis for such programmes or studies is initially outlined below and described in more detail in Section 11.4.

- (1) An updated review of petroleum activities would provide a revised Risk Analysis for transport-related oil spills throughout the area. A recent survey (based on 1982 data) is already out of date.
- (2) A regional review of environmental sensitivity, involving a collation of existing data and an identification of, for example, primary breeding areas of commercial and other marine species, would be a basic step towards defining which areas and resources are at risk from oil spills. This problem is poorly understood and documented at present. One objective of this study may be the identification of areas that require special protection or countermeasures.
- (3) Individual states are encouraged to participate in IMO and UNEP activities that relate to marine pollution.

3. COLOMBIA

3.1 Geography - Coastal and marine environment

The Caribbean coastline of Colombia is approximately 1,000 km in length. Although located in a relatively sheltered part of the Caribbean Sea the coast lies in a region that is affected by tropical cyclones. The tidal range is generally less than 2 m at spring-tides.

The most northerly section of coast, the Guajira Peninsula, is an upland region that represents the most northerly extent of the Andean Mountain system. The north-east tip of this peninsula is characterised by an active coral reef environment. The north-west coast of the peninsula is one of sandy beaches and dunes and extends as far as the upland headland of the Cabo San Juan de Guía. This headland is characterized by crystalline rock outcrops that form a cliff coast broken by pocket beaches.

At Barranquilla, the extensive delta of the Rio Magdalena has grown seawards into the Caribbean Sea. This broad arcuate delta has several active distributaries and the entire delta system encompasses the area from Cartagena to the Cienaga Grande de Santa Marta. The latter is almost completely closed by a barrier spit that has grown from the main distributary mouth of the delta eastwards to join with the headland. The enclosed bay is characterized by extensive mangrove systems and by wide mudflats.

South of Cartagena the shoreline is generally low with numerous small rivers and extensive mangrove environments. Mudflats characterize the shorezone in many areas and a few sections are fronted by active coral reefs. In the extreme south-west the Golfo de Uraba is an extensive embayment that is characterized by the bird-foot delta of the Rio Atrato. This sheltered, low-energy environment is characterized once again by beach ridges and mangrove forests.

3.2 Petroleum related activities

Oil production in Colombia is about 150,000 bbl/day, all from onshore fields. Empresa Colombiana de Petroleos (ECOPETROL) is the national oil company and is responsible for 80% of the production. In addition, ECOPETROL is responsible for the oil terminal operations at Cartagena. Colombia has a total refining capacity in the order of 213,000 bbl/day, of which 70,000 bbl/day are handled by the Cartagena refinery. At the present time all marine imports and exports of oil are handled through the terminal at Cartagena. The tanker traffic through Cartagena is about 14 vessels each month, including local coastal tankers. A second terminal for oil handling is planned for early 1986 at Coveñas, to the south of Cartagena, where a 300,000 dwt tanker will be anchored 9 km offshore for use as an intermediate storage and loading facility.

The majority of the proven hydrocarbon reserves are onshore, although small offshore gas fields have been found adjacent to Cartagena and at Chuchupa and Bellend off Guajira. Gas is pipelined from these fields onshore to Rio Hacha. Total gas production in this area is in the order of 180 Mcfd.

Colombia is practically self-sufficient so that there is very little international trade. Production now is already higher than consumption and from next year (1986) Colombia will be an oil exporting country. This is largely a result of the recent discoveries of lighter crudes (+30° API) in the Arauca area about 100 km south of the traditional oil production area around Barrancabermeja, near the Venezuelan border. Oil movement from this development is planned through a 200,000 bbl/day capacity pipeline to the Cartagena-Coveñas facilities.

3.3 Spill risks and potential spill effects

The primary vulnerable areas are:

- (a) Bahia de Cartagena - a semi-enclosed embayment characterized by mangroves and important spawning environments

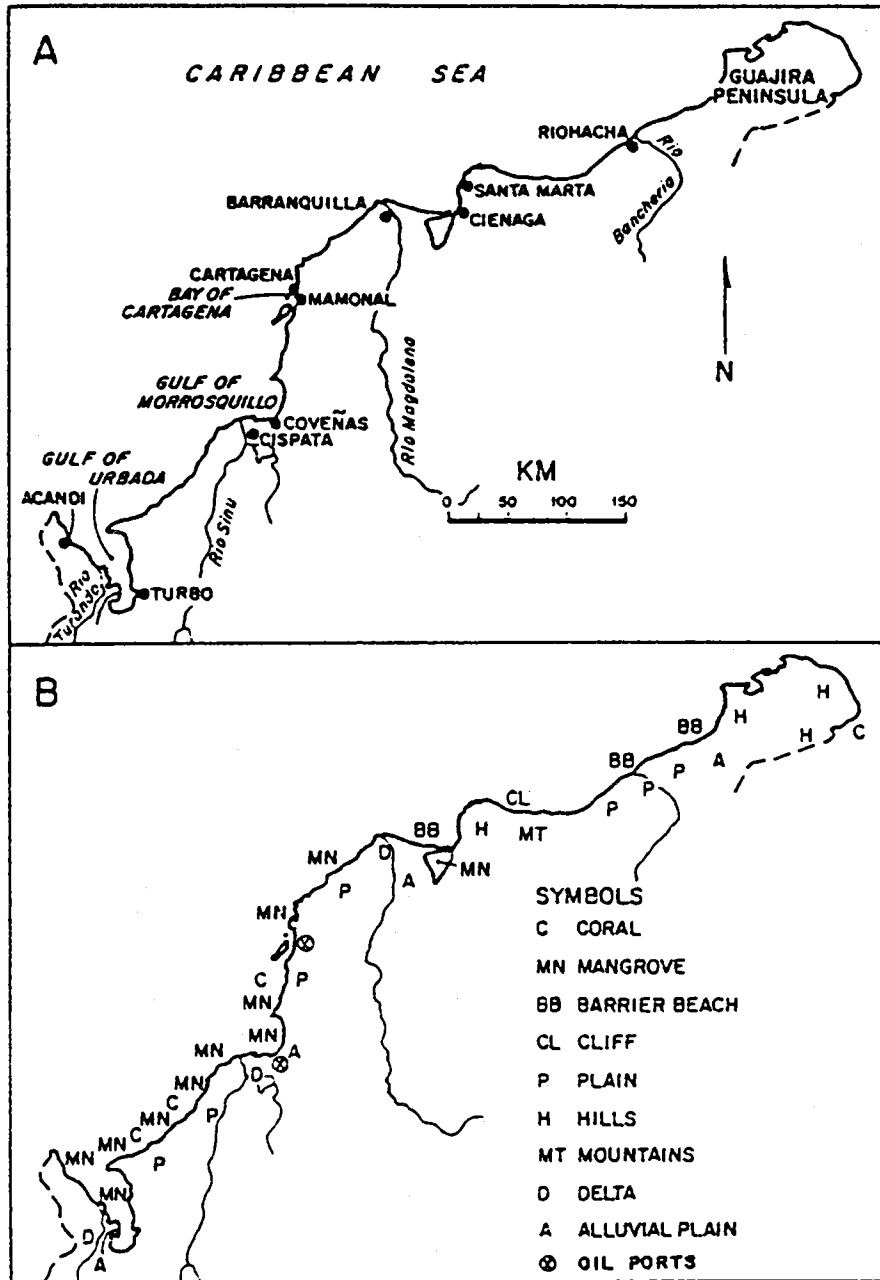


Fig. 3 Caribbean Coast of Colombia:

A. Geographic Map

B. Geomorphic Map

(b) Santa Marta - an area of importance for tourism

(c) Coveñas - an area shortly to be developed for oil terminal facilities

These areas have been identified as having a potential spill risk as well as having a sensitivity in the event of oil reaching the coastal environments.

In terms of marine traffic, the Cartagena area has the highest density of shipping with up to three tankers each month carrying crude oil and eight each month carrying fuel oil, as well as four per month that distribute product locally along the coast.

Cartagena is the most sensitive and highest risk coastal area in Colombia due to the combination of traffic to and from the terminal with the tourist and fishing (shrimp) industries that are important economic features of this coastal bay.

3.4 National organization

Colombia is well endowed with legal powers for the protection of the environment. An appropriate administrative structure exists and is in operation, so that any new agreements which may be related to oil spill mitigation or to the enforcement of existing legislation can be implemented effectively.

(a) National legislation

In 1973 the Colombian Congress adopted an important law on the prevention and control of pollution in the environment and on the conservation of renewable natural resources (Law No. 23 of 19 December 1973). On the basis of this law, there exists a broad and complete legal framework.

Decree 2811 of 8 December, 1974 initially publishes the national code for renewable natural resources and for the protection of the environment. The application of this code extends to the marine areas that are under national law (territorial waters, economic zone and continental shelf) as well as to the biological resources from these areas. This code provides a complete definition of pollution.

Decree 1741 of 4 August, 1978 is the application of Law No. 23 (1973) and Decree No. 2811 (1974) which creates a specially protected area in Bahia de Cartagena. This decree also establishes a co-ordinating committee composed of concerned administrations and organizations, in particular, DIMAR, INDERENA, HIMAT and the Commander of the Atlantic Naval Force.

Article 8 of Law No. 10 of 4 August, 1978 on territorial waters, the economic zone and the continental shelf, establishes the responsibility of the state for the regulation of exploration, exploitation and conservation of renewable and non-renewable resources, as well as the exclusive jurisdiction for scientific research and for the protection of the marine environment.

Four decrees were adopted on 2 August, 1979 for the application of Law No. 10 of 4 August, 1978.

- (1) Decree No. 1874 created the Coastguard, a section of the Department of the Navy, to control the application of the regulations adopted in pursuance of Article No. 8 of Law No. 10 of 1978. This Coastguard has, among its functions, the responsibility to protect the environment against pollution, to protect the natural resources and to control marine traffic.
- (2) The Decree No. 1875, on the prevention of marine pollution, gives a definition of marine pollution and deals with dumping and the prevention of pollution by ships and offshore structures. It stipulates, in particular, that ships and offshore structures must be in possession of a civil responsibility assurance policy and of a banker's

guarantee to cover damages that they could cause. To support this decree fines which range from 100,000 pesos to 5 million pesos can be imposed.

(3/4) Finally, Decrees No. 1876 and 1877 treat non-living and living marine resources.

Decree 1561 of 26 July, 1978 on the protection of non-marine waters, and the Decree 1681 of 4 August, 1978 on fisheries and the protection of biological resources, provide for the regulation of sensitive activities which could affect the biological resources. The National Institute for Natural Renewable Resources and the Environment (INDERENA) and the Directorate General for Maritime Affairs and Ports (DIMAR) co-ordinate the implementation of these decrees.

Colombia is well organized in terms of laws and administration. An inter-ministerial working group, the Colombian Oceanographic Commission reports to the President. One branch of this Commission is the Technical Committee on Marine Pollution, which is composed of representatives of DIMAR and the Department of the Navy, the Ministry of Foreign Relations, Meteorology (HIMAT), the National Institute for Geological and Mining Research (INGEOMINAS), the University, ECOPETROL (national petroleum company), and of tourism. The Chairman of the Technical Committee on Marine Pollution is a representative of DIMAR.

The Committee has been assigned the task to prepare a national contingency plan. This plan, of which there already exists a draft (Appendix B: item 1), designates the authorities which are competent and responsible both at the national and the local levels and takes into account the actual division of responsibilities. The plan will establish the operational organization, will identify and describe the sensitive zones, will provide information on oceanographic data, will carry out an inventory of the response equipment (personnel and material) and of the logistic resources (boats, planes, radio-communications, transport), and will provide a definition of the financial arrangements. The plan also includes creation of a national fund. A judicial instrument will provide the legal base for the national contingency plan and will re-enforce the responsibility of DIMAR at the national level for planning, co-ordinating and directing the response operations in the case of an accident of pollution by oil at sea and will permit DIMAR to use the national fund if necessary.

The DIMAR will be assisted by a central organization charged with implementing the plan and international relations in the context of bilateral or regional agreements. At the local level, the responsible authorities are (a) the harbour masters, who are also under the authority of DIMAR, and (b) an on-scene commander who is designated at the location of a response action and who either is the Harbour Master or operates under the authority of the Harbour Master.

The national contingency plan integrates the regional plans and the plans of the petroleum industry. Six regions have been identified corresponding to six critical zones: four on the Atlantic Coast, two on the Pacific. The petroleum industry, ECOPETROL, has already established an emergency plan for a response against pollution in their petroleum terminal at the port of Cartagena (see Appendix B: item 2). ECOPETROL possesses equipment for oil spill response (see Appendix B: item 3) and has established procedures for the formation of a response team. ECOPETROL has connections with the Clean Caribbean Co-operative (CCC).

(b) The responsible authorities

Law No. 7a of 1970 created the Directorate General for Maritime Affairs and Ports (DIMAR). This Directorate is attached to the Ministry of Defence and is part of the Department of the Navy. DIMAR has the responsibility for the control and surveillance of pollution of the marine environment under national jurisdiction (Decree of Law 2349, 1971). For this responsibility DIMAR can utilize the resources of the Navy and the Coastguard.

Decree No. 1457 of 7 July, 1978 (related to Law No. 2349) created an 'anti-pollution intervention force' which is charged with preventing, combating and limiting pollution of the sea and of the rivers in case of a spill. This decree provides for the activation of this force by the

Ministry of Defence in the case of a critical situation. This force comprises: (a) the executive committee, which is represented by the Ministry of Finance, Ministry of Defence, Department of the Navy, DIMAR and INDERENA; (b) a co-ordinator; and (c) an on-scene commander. This Decree also provides that in the case of a critical situation an anti-pollution fund can be created.

This situation has evolved sensibly with the recent reorganization of the Directorate General of the Maritime Affairs and Ports by the Law No. 19 of 1983 and the Decree No. 2324 of 18 September, 1984 taken in application of this Law. These specify and complete the spheres of influence and responsibilities of DIMAR in this domain by taking into account the texts adopted since 1970 that relate to the environment and the sea (Law No. 23 of 1973 and Law No. 10 of 4 August, 1978). In this reorganization DIMAR's responsibilities were extended and reinforced in the marine zone under Colombian jurisdiction, including up to 50 metres inland onshore. DIMAR exercises its responsibilities with respect to marine scientific research in conjunction with the Colombian Oceanographic Commission, within which the Technical Committee for Marine Pollution has been created.

The four Caribbean Coast Harbour Masters are under the authority of DIMAR and are charged with the application of the laws and rules under their jurisdiction. These Harbour Masters would be the On-Scene Commanders for spills within their area of jurisdiction.

The National Institute for Renewable Natural Resources and the Environment (INDERENA) has a general responsibility with regard to the environment. This Institute exercises its activities in the context of Law No. 23 of 1973 and the Decrees taken in application of this Law. INDERENA is consulted and gives advice for all affairs concerned with the environment. In addition, each development activity for the refining or transport of oil must submit an environmental impact study to INDERENA for approval. INDERENA is a member of the Colombian Oceanographic Commission and participates in the Technical Committee on Marine Pollution. The Institute can impose fines for environmental damage that results from oil spills; this is in contrast to DIMAR which can impose fines for an operational or accidental spill which may or may not cause environmental damage. INDERENA, in association with the Ministry of Foreign Relations, is the governmental focal point for UNEP-related activities whereas DIMAR is the focal point for IMO activities.

The Ministry of Foreign Relations works in conjunction with the Ministries and organizations which are concerned with the development of legislation and internal regulations concerning marine activities and in particular the marine environment. The Ministry negotiates international agreements (bilateral and multi-lateral) and follows the implementation of these agreements. Moreover, the Ministry of Foreign Relations follows, with INDERENA, the development of regional co-operation in the context of the Caribbean Action Plan and the Cartagena Convention.

(c) Response resources and training

A set of response equipment, that is adequate for small spills, is stocked by ECOPETROL in Cartagena and elsewhere (see Appendix B: item 3). ECOPETROL is a member of the Clean Caribbean Co-operative (CCC) and therefore has access to this and other US-based equipment. If a spill is not caused by ECOPETROL, DIMAR can request use of ECOPETROL's equipment and personnel, and can, if necessary, request CCC assistance.

ECOPETROL runs, on average, three training courses each year for operations managers and has six drills each year at the Cartagena refinery. ECOPETROL has a strike team which could act as the nucleus of an operation response team for large spills.

3.5 International conventions and regional agreements

Colombia has ratified only the MARPOL 73/78 Convention of the pertinent conventions. The implementation of this convention is not complete and apparently poses Colombia some problems. In particular, difficulties are being experienced in attempts to transpose it into the internal regulations and to ensure that its application will be effective.

The Colombian authorities are examining the possibility of ratifying the CLC and the Fund Conventions. In this matter, Colombia has asked for the assistance of IMO. It is particularly appropriate that the Colombians would like an activity to be developed, for example, in the form of a workshop or a colloquium with the assistance of experts to examine more deeply the problems associated with the ratification and implementation of IMO Conventions within their existing national legislation. In this connection it should be pointed out that IMO is organizing a Latin American Regional Seminar on the implementation of MARPOL 73/78 in September, 1986 in Buenos Aires, Argentina. IMO has also recently provided technical advice to Colombia in connection with requirements of MARPOL 73/78 for reception facilities in Colombian Ports.

The Convention of London of 1972 on dumping is also being examined with a view to future ratification. No work has been undertaken which concerns the Brussels Convention of 1969 on the right of INTERVENTION and its protocol of 1973.

Colombia has ratified the Cartagena Convention and its Protocol. Colombia participates actively in the Caribbean Action Plan as well as in the IOCARIBE Programme of the Intergovernmental Oceanographic Commission (IOC). Moreover, Colombia has concluded bi-lateral agreements on the delineation of marine frontiers with four neighbouring countries. By these accords, the states agree to co-operate with a view to avoiding, reducing and controlling pollution in the marine environment which affects the neighbouring states. The states concerned are the Dominican Republic, Haiti, Panama and Ecuador.

It is significant to note that in the near future a Colombian/Panamanian working group will meet to prepare a joint intervention plan for the Pacific zone. Colombia is already well involved in bilateral operations with Panama, both for the Pacific as well as the Caribbean zone, and therefore Colombia seems to have developed more co-operation with its Central American neighbours rather than with those countries situated to the east.

3.6 Summary and recommendations

(a) Summary

Colombia has a very localized risk on its Caribbean coast associated with the Cartagena and the (future) Coveñas facilities. A secondary risk exists from deep-water traffic that uses the Panama Canal. At the national level Colombia has a sophisticated legal and administrative framework for dealing with oil pollution and is in a favourable position for contributing to the development of regional co-operation. DIMAR is the lead agency for operational matters and INDERENA is responsible for environmental affairs.

The national oil spill contingency plan is in draft form at this time. A request was made that this plan be reviewed. The primary emphasis is to develop national regulations, procedures and responsibilities in order to provide a sound basis for acceptance and implementation of relevant international agreements.

Colombia could play a leading role in regional activities with the involvement or the organizational initiative of organizations such as INDERENA or the Colombia Oceanographic Commission. On the other hand, Colombia has ratified only the MARPOL 73/78 Convention but has requested assistance in the field of relevant international conventions with regard to their ratification, their transposition into internal law and for their application. The most urgent at

this time seems to be the CLC Convention and the Convention to create an international indemnity FUND. This assistance could be provided through a visit of experts, perhaps with a workshop or colloquium.

At the international level, Colombia is involved with the Pacific and South American sub-regions and should also be included in the Central American sub-region. This latter relationship is important as several islands off the Caribbean Coast of Nicaragua are Colombian.

(b) Recommendations

The following recommendations relate to national activities and are not in any order of priority and are intended as suggestions of ways in which Colombia's internal oil spill response capability could be improved.

- (1) Expert review of the draft Oil Spill Contingency Plan; with a primary objective to evaluate the goals of the plan, lines of communication and reporting and the legal responsibilities of the various agencies involved. This assistance could be requested of IMO.
- (2) Develop shoreline-coastal sensitivity maps for inclusion in the Oil Spill Contingency Plan to identify: (i) vulnerable areas, and (ii) risks to the environment.
- (3) Develop a shoreline response and clean-up manual that meets local Colombian needs, with a primary focus on mangrove and coral reef environments. This could involve initially or separately a seminar or workshop on shoreline clean-up methods related specifically to the Colombian coast.
- (4) Further expert advice could be requested to assist in the integration of relevant international agreements into the Colombian legislation. The primary focus should be on the MARPOL 73/78, CLC and FUND conventions. The advice may be best provided by a visit of experts followed by a workshop.

4. FRENCH DEPARTMENT OF GUYANA *

4.1 Geography - Coastal and marine environment

The 370 km coast of French Guyana is comprised predominantly of mud or sand shorelines, associated with mangroves and marshes, that are broken only occasionally by outcrops of resistant bedrock. Clays carried to the northwest from the Amazon River over the past 10,000 years have been deposited along the coastal plain to form a wide area of low relief that has slowly prograded seaward. The continuity of the relatively straight shoreline is interrupted by the presence of the estuaries of the rivers Oyapock, Approuague, Mahury, Sinnamary and Moroni.

The average tidal range is in the order of 3 m. The longshore current moves from the southeast towards the northwest, at speeds that vary in the order of 2-3 knots. The near-shore environment is characterized by a series of extensive mudbanks that are in the order of 50 km in length and 10 to 20 km wide. These mudbanks migrate alongshore at a rate of about 1 km per year towards the west (Wells and Coleman, 1981). The mudbanks absorb most of the incoming wave energy so that energy levels at the shoreline itself are generally low. However, as the mudbanks migrate alongshore any one section of the coast is subject to cycles of deposition and then erosion.

Except where rock outcrops form high relief, on the Cayenne Peninsula and at Point des Roches, the shoreline is generally low, frequently with a narrow steep sand-beach fronted by wide mudflats. Inland that gives way to mangroves and a low coastal plain. The estuaries are characterized by extensive mangrove or salt-marsh environments. The most extensive section of salt-marsh environments is in the west between Organabo and the Maroni Estuary. In this location there is a sand barrier beach which is the major egg-laying area for the luth turtle.

4.2 Petroleum related activities

French Guyana does not produce any hydrocarbons. Once every two weeks approximately, a small tanker delivers light oil products to shore facilities at Cayenne and at Kourou. This involves delivery of a total of approximately 4,000 tons of product. The distribution of oil from the French Antilles to French Guyana is handled by the Société Anonyme Raffineries Antillean (SARA). More significant than the local traffic is the passage of tankers, including many VLCC's, that traverse the adjacent continental shelf en route to the Caribbean and North America from the Middle East via the Cape of Good Hope or from Alaska via Cape Horn. This traffic involves the transportation of more than 700 M bbl of oil per year. The tankers are usually 100 km offshore and could not approach closer than 25 km, even in an accident, due to shallow water depths.

4.3 Spills risks and potential spill effects

The primary risks for marine pollution are from the accidental grounding or sinking of the local tankers, which would result in a spill that would be no greater than 4,000 tons of light oil products. The likelihood of a spill resulting from a collision, break-up or grounding of a deep-water tanker using the offshore ocean route is considered low. If a large spill were to take place offshore, that is seaward of the Guyana current which is composed of Amazon river water and sediments, it is unlikely that oil would reach the shoreline due to the presence of this natural oceanographic barrier.

* Referred to generally in the text as French Guyana. It is also important to note that Guadeloupe and Martinique are similarly Departments. Guadeloupe, Guyane and Martinique form the French administrative Antilles - Guyane region.

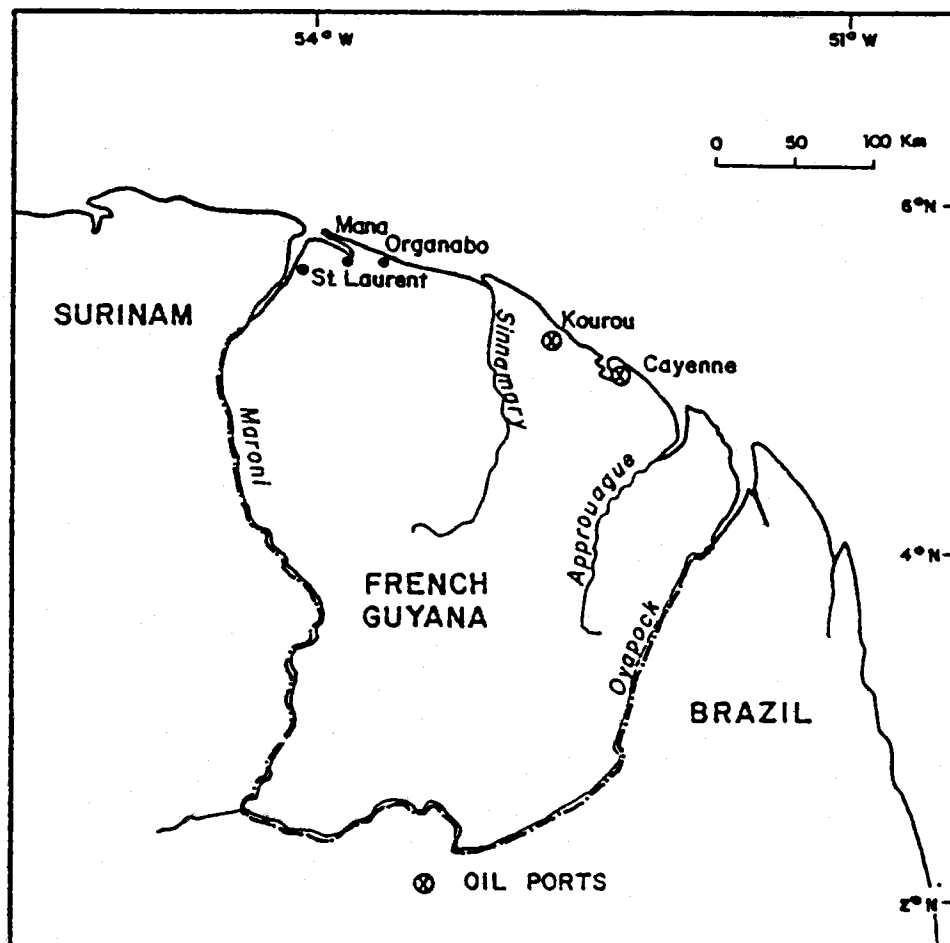


Fig. 4 Map of French Guyana

Although the risk factor is considered to be low, any large oilspill at the coast could have a significant impact. The coastal environment is dominated by mangroves and salt-marshes that are major breeding environments for shrimp and fish. In addition, this is a major environment for migratory bird species which reside in the area for 8 months each year. The shrimp are a major economic resource for French Guyana and over 100,000 tons are exported each year. The larval stages of the shrimp reside in the coastal mangrove environment. The entire coastal zone is used for subsistence fisheries activities.

No one particular location has been identified as being more sensitive to oilspills than another. However, aquaculture activities take place at St. Laurent and Mana in the west, which is also a very sensitive environment as the sand beaches are the largest egg-laying area in the world for the luth turtle. A wildlife refuge has been established in the estuary of the river Sinnamary and the Approuague river has significant tourism and fisheries activities.

4.4 National organization

French Guyana is a Département Français d'Outre Mer (one of the Antilles-Guyane Departments) and has an organization that is effectively identical to that of other coastal departments of France. This organization is adapted locally to the geographic situation and the administrative situation of the overseas department.

(a) National legislation

With some exceptions or small differences, the legislation and the regulations applied are the same as metropolitan France. Amongst these texts the most important are:

Prevention and control of the pollution by ships - the Law of July, 1983, limiting the pollution of the sea by hydrocarbons. This law imposes penalties for infractions to the MARPOL Convention 1973/78 relative to the prohibition of hydrocarbon discharges committed by a vessel flying the French flag, or by a vessel flying a foreign flag when these infractions are committed in the waters under French jurisdiction. In addition the captain or the responsible person for the conduct or for the working of a vessel is liable for punishment if, by imprudence, negligence or ignorance of the rules and laws the vessel has caused an accident or has not taken the necessary measures to avoid an accident which results in pollution in the French territorial or interior waters.

The Law of 2 January, 1979 relative to infractions that relate to marine traffic. This law severely punishes the captain of any French or foreign vessel which, in the French territorial or interior waters, infringes the marine traffic rules set down in accord with the London Convention of 20 October, 1972, which was designed to prevent collisions at sea. This penalty is considerably augmented if the vessel in case is transporting hydrocarbons or other dangerous substances as defined by law. This law includes punishments for the captain of a French or foreign vessel transporting a hydrocarbon cargo or other dangerous substances which enters French territorial or interior waters without informing the Prefect Maritime, or the Government Delegate, of the date and the hour of entry, the position, the route and the speed of the vessel, and also the nature and the importance of the cargo. The law is very specific with respect to reporting of marine accidents and of rendering assistance to vessels involved in accidents.

The Law of 7 July, 1976 relates to the prevention and to the limitation of marine pollution by dumping and to the response against accidental marine pollution. Article 16 of this law identifies the conditions of the application of the Brussels Convention of 1969 on the right of intervention. This article provides that the government may require the responsible party to take all necessary measures to prevent shoreline pollution. In a case where this requirement is not met, the government can execute the necessary measures and can recover its costs from the responsible party. The law emphasizes that the provision of funds for necessary goods and services for the execution of these measures can be obtained by contract or by requisition.

(b) The responsible authorities

At the central government level the Inter-ministerial Mission of the Sea oversees the co-ordination of state activities that relate to the sea. The mission ensures that the activities of different ministerial departments charged with the development and implementation of measures designed to prevent accidental pollution and to prepare for response operations are suitably co-ordinated. In the case of marine accidents the mission proposes the suite of operations to be taken by the different organizations to combat pollution.

The Ministry of Foreign Relations co-ordinates the actions of France in the context of the Caribbean Action Plan and the Cartagena Convention and its Protocol. The Ministry of Defence provides the overseas departments with materials and resources for the pollution response and provides assistance to the Regional Naval Commanding Officer in case of an accident, by the provision of national resources and, if necessary, by the negotiation of international resources.

The Secretary of State responsible for the Sea provides, maintains and repairs booms and specific materials for the terrestrial aspects of spill response. The Ministry of the Interior (Overseas Departments) gives help to the local authorities, particularly in the event of accidents where the latter furnish local materials and personnel. In the case of the simultaneous implementation of the POLMAR-MER and POLMAR-TERRE plans, the co-ordination of the response is assured at the central level by the Ministry of the Interior.

The Ministry of the Environment provides the intervention funds for pollution response and evaluates demands for assistance presented by local authorities. CEDRE provides advice and guidance necessary in the preparation of contingency plans and in the case of a pollution incident.

At the regional level (in the Departments of Antilles and Guyane) the Delegate of the Government (Decree of 25 May, 1979 relative to the organization of the actions of the state on seas adjacent to overseas departments) is invested with the general responsibility of the sea (i.e. maritime zones under French jurisdiction). This responsibility includes the co-ordination of different departments for the prevention and response against marine pollution. The Commissaire of the Republic of the Department of Martinique is the Delegate of the Government (appointed by the President) for the waters that border the coast of the Departments of Antilles and Guyane. The Delegate is the qualified authority to address claims specified by Article 16 of the Law of July, 1976 and to take necessary measures in urgent situations provided for by the Convention of Brussels in 1969 on the right of intervention on the high seas. He is assisted by a marine committee which brings together the responsible administrative authorities, the defence services and the public bodies that are involved in marine activities.

The Regional Naval Commanding Officer (the Commanding Officer of the Navy of the Antilles and in Guyane) (Decree of 25 May, 1979) assists the Delegate of the Government in the exercise of his assignments and responsibilities for the sea. Under the authority of the Delegate of the Government the Commanding Officer co-ordinates the action at sea and, if necessary, implements all available specialist marine and aerial resources. The Regional Commander can delegate his authority to a local officer of Marine Affairs.

At the local level the Commissaire of the Republic of the Department of Guyana (a civil servant) is responsible for onshore oil pollution. At the head of the region or of the department (Guyane is at the same time both in the region and a department) is the elected assembly, the regional council and the council general. These assemblies have certain decentralized responsibility and dispose of their own budgets. The elected mayor represents the state in his community and is the executive agent of the municipal council. He is in charge of security, safety and public health. In particular, he must assure the safety of the beaches which belong to the community and must clean or have cleaned wastes such as hydrocarbons.

The specific organization for the response against accidental marine pollution in the French overseas department is fixed by the Statute of 8 September, 1980 (Appendix C: item 2). This Statute:

- defines the responsibilities of different ministerial departments, administrations and organizations that participate in preparation and maintenance activities for pollution response;
- fixes the areas of responsibility of the authorities charged with conducting or co-ordinating the response and its preparation;
- distinguishes between the actions at sea and the actions inland as well as between minor versus major spills;
- broadly distributes responsibilities at the local level and provides central co-ordination; and
- identifies the methods of preparation for response and the conduct of the response.

(i) Response at sea: the Delegate of the Government in Martinique is responsible for the preparation of the response and the conduct of the response at sea in this region. Under the authority of the Government Delegate, the Regional Naval Commanding Officer has established an oil spill contingency plan (POLMAR-MER) for the Antilles-Guyane region (Appendix C: item 1). In addition he is responsible for the direction of all emergency operations for response to oil spills at sea.

Spills of limited size are dealt with on the initiative of the Naval Commander with his own resources, if necessary supplemented by those of other administrative divisions. The District Officer of Maritime Affairs in Cayenne, delegated by the Regional Naval Commander, can take it upon his own responsibility to conduct the actions in his district. In the case of a major accident, the Delegate of the Government of Martinique implements the POLMAR-MER plan which permits the Regional Naval Commander to deploy resources available from the administrative departments of the area and from private resources under contract or by requisition. The Naval Commander is assisted by a support staff and can, in agreement with the Ministry of the Environment, use emergency expenses from the intervention fund. In the case where there is a threat against the shoreline, he informs the local Commissaire of the Republic of the department concerned, as well as the Minister in charge of overseas departments.

(ii) Response on land: the Commissaire of the Republic in Cayenne is responsible for the preparation and for the conduct of the response on land. Under his authority, a response plan is prepared and collaboration is established between the relevant administrative divisions, the local elected bodies and users of the marine environment. The POLMAR TERRE Plan for the Department of Guyane has not yet been prepared. In all cases the Commissaire of the Republic is responsible for the response operations on land within the limits of his department. He establishes the necessary links with the Regional Naval Commander or his Delegate. In Cayenne the Delegate of the Regional Naval Commander is the District Officer of Marine Affairs.

The response against small spills falls to the mayor of the affected area. The response against a medium-sized spill, which involves several communities, is directed by the Commissaire of the Republic. In the case of a major spill, the Commissaire of the Republic activates the POLMAR TERRE Plan. He arranges the local resources, the resources of the administrative departments, and the private resources either under contract or by requisition. He is assisted by a support staff, which is composed of representatives of the service departments. He can, after agreement with the Ministry of the Environment, utilize emergency expenses from the intervention fund. In cases where POLMAR is not activated the response and costs are incumbent upon the local elected government (the Mayor) for operations on land and normally to the central government for operations at sea.

(c) Response resources and training

The primary government response resources are located at the Martinique naval base. These include booms, sorbents and spray booms; the latter are specially fitted to two naval vessels and over 50 m³ of dispersants are stocked locally (Appendix C: item 3). In French Guyane itself a small stock (800 litres) of dispersant is maintained. If necessary, other equipment can be supplied from stockpiles at Brest and Marseilles.

A major spill training exercise is scheduled in Martinique in December, 1985.

4.5 International conventions and regional agreements

France has ratified all the relevant conventions from IMO with the exception of the 1973 Protocol of the INTERVENTION Convention. This latter is expected to be ratified soon. The necessary regulatory arrangements have been made to incorporate these conventions within the national legal system. The French Parliament has adopted the Law authorizing the ratification of the Convention of Cartagena and its Protocol. France participated in the meeting held in St. Lucia in May, 1984 which approved, in the context of the Protocol of the Cartagena Convention, a sub-regional contingency plan for the Caribbean islands.

France has not completed any bilateral accords in this area which concern the Department of Guyane. However, the local authorities have expressed an interest to establish contacts with their neighbouring countries (to know the responsible authorities, their addresses, telephones, telexes, etc.) and to be informed on their organization. They are ready to exchange information with these states and are ready to examine practical and operational procedures and to work together to start to put into place the Protocol.

4.6 Summary and recommendations

(a) Summary

The French Department of Guyane is an area of low-level petroleum activity with no production and a relatively small volume of imported products. The risk of marine pollution exists primarily from local coastal tankers with a minor threat being posed from deep-water tankers that pass offshore on the oceanic route to North America and the Caribbean. Spill response notification procedures and responsibilities are well organized within the framework of French national legislation. Marine spills would be handled by the Commissaire de la République at Fort de France, Martinique, assisted by the Regional Naval Commanding Officer. Onshore operations are the responsibility of the Commissaire de la République de la Région/Département de la Guyane in Cayenne.

The Marine Contingency Plan (POLMAR MER) for the region is in place but the onshore plan has not been prepared. Resources and advice are available locally and from metropolitan France, in the event of major spill incident. However, the technical response manual is not site-specific and little or no information is provided on shoreline clean-up methods, especially for mangrove environments.

Although France has ratified all relevant conventions and is an active participant at Regional IMO or UNEP meetings, the Department of Guyane has little direct contact with its neighbouring countries on oil pollution matters.

French authorities in the Antilles-Guyane region could have a significant leadership role in the area with respect to co-ordination and organization. The role could be significant if Guyana, Suriname and French Guyana, and their neighbours, Brazil and Venezuela, can develop local activities and planning, as Guyana and Suriname lack similar levels of organizations and resources compared to French Guyana.

It is important to note that French Guyana should interface with Brazil for notification and operations as oil may move to the northwest along the coast. In addition marine species present in French Guyana waters may be recruited in Brazil's coastal environment.

(b) Recommendations

As the Department of Guyane is well organized at the national and local levels three points only are raised which could improve the existing local national situation:

- (1) Establish an on-land contingency plan to deal with oil on the shore (POLMAR-TERRE);
- (2) Develop a site-specific response manual for French Guyana that provides local details on shoreline character and environmental sensitivity. This could include a workshop or seminar on shoreline response (methods) and sensitivity.
- (3) Linked with this latter could be the development of a shoreline clean-up manual for mangrove and salt-marsh shorelines, and training sessions or workshops for onshore operations.

5. GUYANA

5.1 Geography - Coastal and marine environment

The coast of Guyana is approximately 450 km in length and is characterized primarily by mudflats which give way landward to mangroves and occasional sandy beaches. The continuity of the coast is interrupted by the estuary of the Essequibo river. Secondary estuaries are associated with the Courantyne, Abary and Waini rivers.

The semi-diurnal tides have a spring range of 2-4 m. The coast is affected by waves generated in the northern South Atlantic which lose most of their energy on the shallow near-shore mudbanks which characterize the entire coast. As a result there are low wave-energy levels at the shoreline and in many sections the coast consists of mud deposits or mangrove environments. Sediment transport is to the west under the influence of the Guyana Current and extensive mudbanks, which can be up to 50 km in length and 20 km wide, migrate from the southeast to the northwest at rates in the order of 1 to 2 km per year (Wells and Coleman, 1981).

5.2 Petroleum related activities

Oil reservoirs have been located in the extreme west of the country in the Takutu Basin. These finds have not been developed at the present time and all of the hydrocarbons that are used in the country are imported through Trinidad. Reception and storage facilities exist in Georgetown (Ramsburgh), New Amsterdam, Providence and the bauxite plants at Linden and Kwakani, respectively on the Demerara and Berbice rivers.

The total consumption for the country is on the order of 4.3 M bbl per year of which 2 M bbl are sold to GUYMINE by Esso and shipped directly to the bauxite plants by sea and then upriver. The remaining oil products are handled locally by the Esso, Guyana Oil Co., Shell and Texaco companies. The capacity of the vessels that deliver to the bauxite plants is in the order of 50,000 bbl. The tankers which supply Georgetown, New Amsterdam and Providence visit Suriname prior to discharging their cargoes in Guyana, so that they are not fully loaded. These vessels have a capacity of about 40,000 bbl. Small volumes of oil are transferred by river and along the coast using local tankers and barges.

5.3 Spill risks and potential spill effects

The risks for marine pollution of the environment are related to: (a) the traffic of large deep-water tankers in passage between the Cape of Good Hope and the Caribbean or North American refineries; and (b) local coastal tankers that carry imported oil for local consumption. The offshore tankers are generally in the order of 100 miles from shore and the risk of a large marine spill is considered to be low, but should one occur the volume of oil would likely be very high. The local tanker traffic has a capacity that ranges between 10-40,000 bbl per vessel. About 100 tanker visits are made each year to Georgetown and to the bauxite plants upriver. In total Georgetown handles about 800 ships per year.

The primary risk associated with the river traffic of hydrocarbons is in the Essequibo-Berbice-Demerara system. Ships can travel upriver as far as 100 miles.

Oil spills can affect the mangroves, which are major spawning areas for many marine and coastal species, in particular the shrimps which are an important part of the Guyana economy. Oil could also affect the river irrigation systems and local town water supplies which are derived from the rivers. Most of the population lives along the coastal estuaries or on the rivers. The coastal beaches are not considered to be an important oilspill risk.

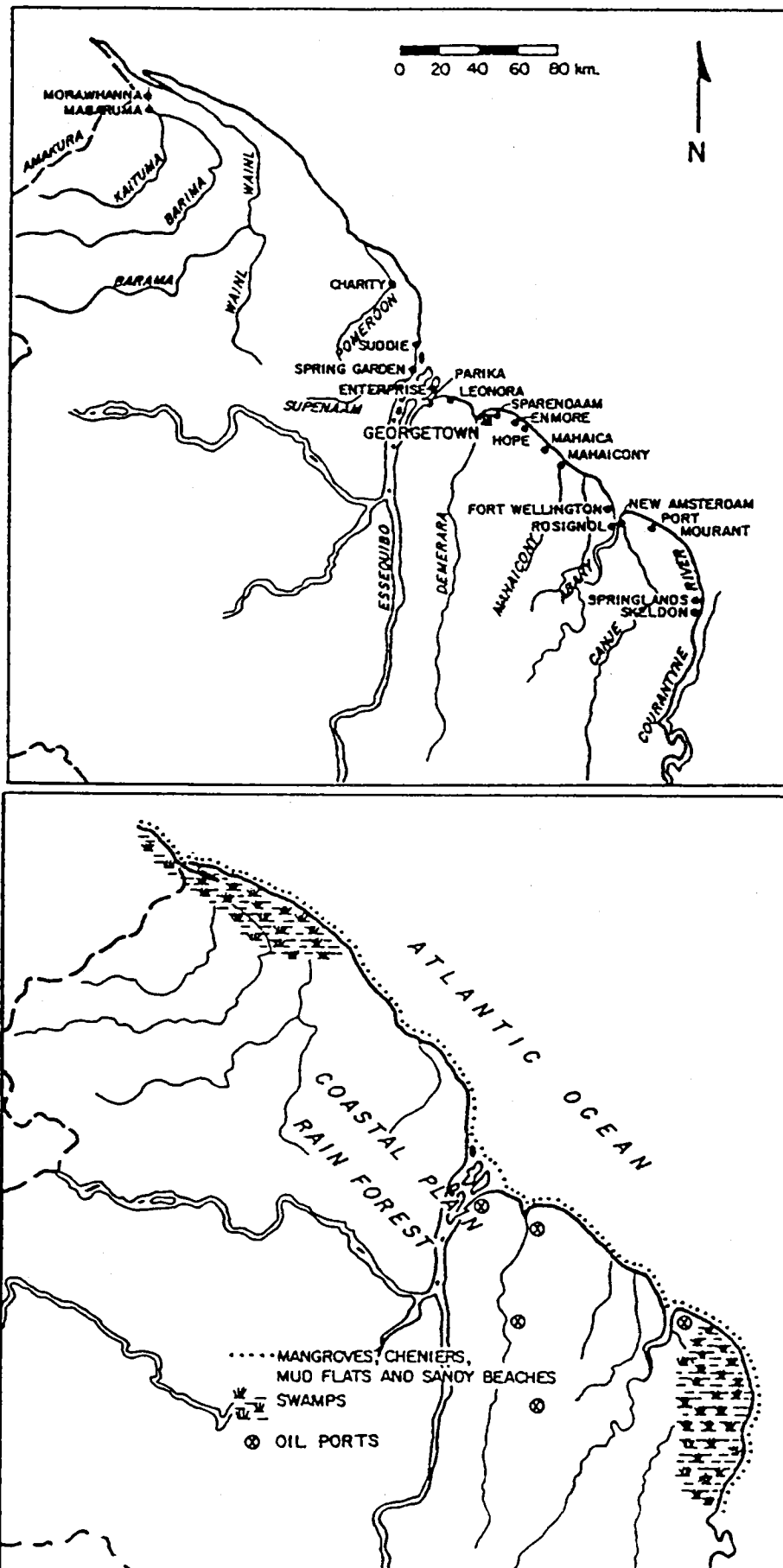


Fig. 5 Map of Guyana

5.4 National organization

(a) National legislation

The only legislation that relates to marine pollution is the Transport and Harbours Act (1973) that prohibits the pumping of bilges in ports. On the basis of this law, the Ministry of Transport and Harbours is empowered to make regulations and to impose fines, although these cannot exceed Guy \$750.000.

The Maritime Boundaries Act (1977) provides for the passing of legislation to support the control of marine pollution from vessel traffic and/or from offshore activities. However, this supporting legislation is not yet in place.

(b) The responsible authorities

The Department of International Economic Co-operation of the President of the Republic is interested in the Caribbean Environmental Programme initiated by UNEP. The Ministry of Energy and Mines, which is also the National Agency for Energy, appears to be the organization most ready to take charge of the preparation of spill response activities and to assure the co-ordination of other ministries or agencies concerned.

The Ministry of Transport uses the authority of the Harbour Master and the Chief Pilot to exercise its operational responsibilities and control. The Guyana Defence Force and the Fire Service could also assume some operational responsibility for pollution response.

The Ministry of Public Health, which is principally concerned with the pollution of rivers and canals and the very important question of water quality, has a plan for response in the event of an accident causing the pollution of interior waters. Environmental affairs are the responsibility of the Ministry of Public Health, whereas fisheries matters are dealt with by the Ministry of Agriculture. The problems of the pollution of the sea and of rivers are intertwined in this country; for effective response activities the Ministry of Health and the Ministry of Transport would have to co-operate closely.

The Institute of Applied Science and Technology has an environmental unit that is concerned with the overall questions that relate to the environment. They have studies in progress to evaluate the Caribbean Action Plan and the Cartagena Convention and its Protocol and could be the focal point for the Caribbean Action Plan in Guyana. They are examining also the ratification and the financial consequences of their participation in the Fund Convention. The Institute would be able to play an important role at the Guyanese national level in the case of an eventual participation of this country in international environmental affairs.

(c) Response resources and training

The Esso, Shell and Texaco companies have internal oil spill contingency plans that relate to their individual local operations. No national contingency plan exists and the question appears not to have been raised to date. The international oil companies indicated that in the event of a large spill they would notify the Guyana Defence Force (Maritime Command), Ministry of Home Affairs and the Harbour Master.

The internal oil spill response plans are approved by each company's regional headquarters and the companies hold lists of equipment that can be obtained from elsewhere in the Caribbean (e.g. Barbados, Trinidad). The local companies themselves are not members of the Clean Caribbean Co-operative. Staff of the 3 international companies have had some training and a few (10) drums of dispersant are stored in Guyana.

The state of preparedness is probably adequate for small spills at one of the international company's transfer facilities. Any other spill would not have a pre-planned response and no local equipment would be available.

5.5 International conventions and regional agreements

Guyana is a member of IMO but has not ratified any relevant agreements. The Institute of Science and Technology will, upon completion of its review, make a recommendation to the President of the Republic concerning the ratification of the Cartagena Convention and its Protocol. Guyana has no bilateral agreements with neighbouring states.

5.6 Summary and recommendations

(a) Summary

Guyana has a low level of activity in the petroleum industry, but does import over 4 M bbl of oil by sea each year. The risk areas include the rivers and estuaries where much of the country's population is concentrated. The government organizations have no legislation, plan or resources to deal with spills. The international oil companies could probably respond adequately to small spills at their facilities.

The lead agencies in the development of oil pollution control would most probably be:

- (i) For environmental affairs:
 - the Ministry of Public Health
 - the Ministry of Agriculture (Fisheries)
 - the Institute of Applied Science and Technology
- (ii) For legislation and organization:
 - the Ministry of Transport
 - the Ministry of Energy and Mines
 - The Guyana Defence Force

In addition, the Ministry of Foreign Affairs would be involved with international agreements.

The various government agencies met by the mission expressed an interest and a desire to obtain further information and assistance at both local and regional levels.

(b) Recommendations

Guyana's need for assistance is primarily at the national level to prepare an organization for response and secondarily at the regional level to become involved in co-operative programmes. This need was recognized by an IMO mission on marine pollution to Guyana (IMO, 1980). The following suggestions and recommendations are developed from the results of the 1980 mission and from this mission, they aim at providing a basic response capability as a first step towards developing a national response plan and to involvement at sub-regional level with neighbouring states. A suggested draft marine pollution contingency plan was prepared in 1980 by the IMO Consultant (Appendix D: item 1).

- (1) Prepare: (a) a procedure for reporting and notification of spills; (b) an inventory of resources available within the country and from neighbouring states; and (c) an organizational framework with defined lines of communication and responsibilities for both oil on the sea and at the shorelines. (Note: all items should include industry as well as government agencies).

- (2) Establish a legal framework for pollution control responsibilities, for an oil spill contingency plan and for clean-up funds.
- (3) Identify areas and activities that are vulnerable to spilled oil and prepare local or site-specific response plans. Guyana would benefit from a river spill response manual.
- (4) Develop an inter-ministerial group to be the recipient for IMO and UNEP information and contacts concerning marine pollution activities.

6. NETHERLANDS ANTILLES

6.1 Geography - Coastal and marine environment

The three islands of Aruba, Bonaire and Curaçao, which fall within the area of this study, lie about 30 miles off the northwest coast of Venezuela. The coastal character is one of predominantly low bedrock (limestone) cliffs with occasional sections of coral reefs and mangroves with lagoons. Sediment transport on the islands' coasts is predominantly from the east towards the west under the influence of the Northeast Trades. This results in a general pattern of coral reef development on the exposed and relatively sediment-free eastern ends of the islands, with more beaches and a greater volume of sediments in the intertidal zones of the western sections.

6.2 Petroleum related activities

The islands do not produce hydrocarbons but historically have been a major entrepot for Venezuelan oil and as recently as 1982 the island's refineries were handling as much as 1,000,000 bbl/day. By 1984 this volume had been reduced to about 400,000 bbl/day, of which half originated from Venezuela. During this year (1985) the major refinery at Lago on Aruba operated by Esso was closed and the Shell refinery at Willemstad was also planned to close. However, the Lago operation is being used for storage and trans-shipment and the Willemstad refinery has been leased to PDVSA of Venezuela for a (initial) period of 5 years and is now under the management of Maraven. The Bonaire trans-shipment terminal (BOPEC) continues to operate and has a storage capacity of 10,000,000 bbl with a 450,000 bbl/day handling rate. It is not known at this time what volume of oil is moving through the terminal. The Curaçao Oil Terminal (COT) in Bullen Bay near St. Willibrordus, and the Caracas Bay terminal, both on Curaçao, continue to operate. The former (COT) has a storage capacity of 17,000,000 bbl and presently handles on the order of 100,000 bbl/day, a rate that is probably only slightly higher than that at the Bonaire terminal.

The petroleum related activities for these three islands are undergoing a major readjustment at the present time. The considerable reduction in both refining and trans-shipment activities, due to changes in both the local and regional, i.e. Venezuelan, as well as international oil trading patterns, may be a temporary feature or may have long-term implications. Present risks analyses based upon traffic patterns and volumes of oil in shipment have been made out of date by these recent changes in oil movements.

6.3 Spill risks and potential spill effects

The risk to the islands is relatively high as fully-laden deep-water tankers frequent the coastal waters. Thus, an accident or grounding could result in the release of several millions of barrels of oil. A major spill could have a long-term (5 to 10 years) effect on the coastal ecosystems and these effects could extend over a wide geographic area.

The coastal and marine resources that are at risk from a marine oil spill are primarily the productive mangrove environments, coral reef systems and the recreational beaches. The coast of Aruba is particularly sensitive as it is an area that derives major revenues from tourist use of the coast. On Curaçao two coastal facilities (the desalination plant and the power plant) have saltwater intakes that are immediately down-drift of the Willemstad Refinery. A spill from this refinery or from the ships entering Schottegat Bay could result in a serious threat to these two important facilities.

6.4 National organization

The Netherlands Antilles (Aruba, Bonaire, Curaçao, Saba, Sint Eustatius and Sint Maarten) are an autonomous territory that, with the Netherlands, form the Kingdom of the Netherlands. This arrangement is scheduled to change in January, 1986 when Aruba will no longer be part of the Netherlands Antilles but will become a third part, along with the Netherlands Antilles and the

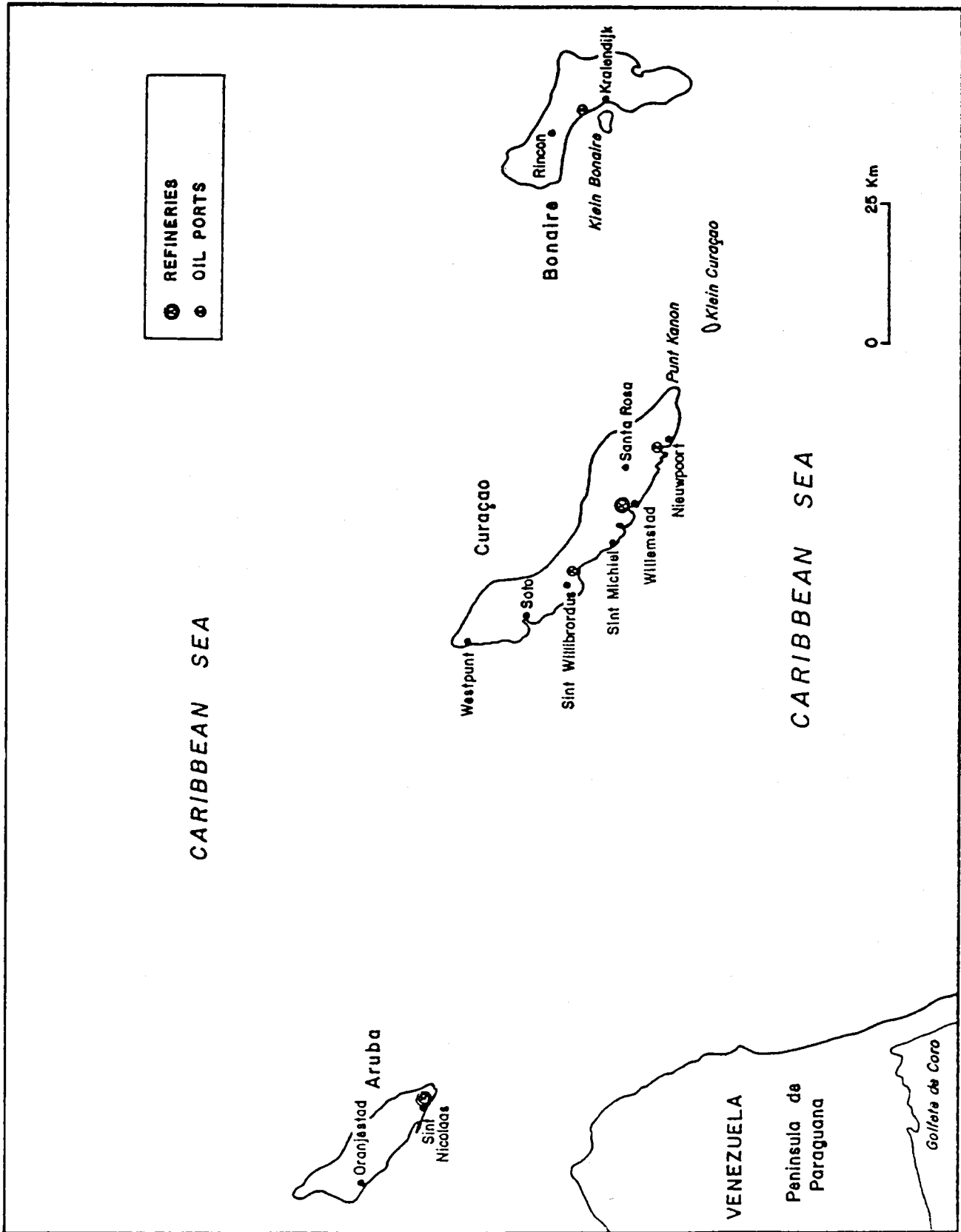


Fig. 6 Map of Netherlands Antilles

Netherlands, of the Kingdom of the Netherlands, (see Appendix E: item 3). Within this federal type of arrangement, the Kingdom provides a central government that deals with foreign affairs and defense and that provides a Supreme Court. The Netherlands Antilles has a Governor, a Council of Ministers and an elected legislature. At the next level of government, each of the six islands has a Lieutenant Governor and an Island Government. Each of the three levels of government has its own responsibilities. Foreign relations are within the domain of the Kingdom of the Netherlands Government in The Hague. The Antillean Government apparently has responsibility for contingency planning in this region and the Island Governments have the responsibility for oil spill clean-up.

(a) National legislation

Few existing laws are applicable to oil spill response preparations, operations or funding. In a recent spill of 4,000 metric tons in 1984, the national (Antillean) government encountered difficulties in recovering approximately US \$2 M claimed against the vessel owners. Although it is understood that the CLC, ratified by the Kingdom of the Netherlands, applies to the Netherlands Antilles, the local supporting laws are not in effect. In two recent oil spill incidents, less effect national laws (e.g. Code of Commerce/Commercial Law) were applied in order to obtain pollution compensation.

The Netherlands Antilles has an inadequate legal framework for dealing with spill response and liability. The Government has recognized that problems have resulted from the lack of a legal and operational framework and requested IMO for assistance to prepare a Pollution Contingency Plan and to review existing and to recommend additional regulations for the Netherlands Antilles. This assistance has been provided by the IMO Regional Consultant to the Wider Caribbean on Marine Pollution. As a result a draft Oil Spill Contingency Plan has been suggested that deals with notification, organization and responsibility, liability, documentation, clean-up and disposal methods, etc. (Appendix E: item 2), and legal provisions to support the organization are recommended.

(b) The responsible authorities

The Ministry of the Environment and of Health is best prepared at present to co-ordinate and supervise response activities. The Ministry has participated in the Caribbean Environmental Programme and the Cartagena Convention and Protocol meetings. For spill incidents, this Ministry would work closely with the Port Authority which would be the operational focal point. The Port Authority would work closely with the various private oil companies that operate the oil installations on the islands. The oil companies (which now include the Venezuelan national oil company, PDVSA) have taken internal responsibility to deal with oil spills and have a well-developed response capability despite the lack of government initiatives or regulations that affect their operations. The Governor of the Netherlands Antilles is responsible for international relations between the islands and neighbouring states.

The draft Oil Spill Contingency Plan (Appendix E: item 2) recommends that the primary responsibility be vested in the Executive Council with the Harbour Master acting as On-Scene Co-ordinator.

(c) Response resources and training

The major petroleum facilities on Aruba and Curaçao are well stocked to cope with spills, and personnel are trained on a routine basis. On Bonaire, BOPEC similarly has a spill equipment inventory. The present status of the oil companies with the Clean Caribbean Co-operative (CCC) is not clear.

With the closing of the Lago refinery on Aruba and the management changeover at the Willemstad refinery on Curaçao the status of the response equipment may have changed. Even if the resources on Aruba remain physically in place, it is not known if steps will be taken to maintain the equipment and to retain trained personnel. The equipment at the Willemstad refinery has been transferred to PDVSA but how spill response and contingency planning will be handled is not known at present.

6.5 International conventions and regional agreements

The Kingdom of the Netherlands negotiates all foreign treaties and agreements but these must then be implemented by the Antillean Governments. The Kingdom has ratified the Caribbean Action Plan and the Cartagena Convention and Protocol and all relevant oil conventions of IMO but the Government of the Netherlands Antilles has not approved any agreements to date as not all six island Governments have approved these agreements. According to the Kingdom of the Netherlands, only Intervention (69) and MARPOL (73/78) conventions apply to the Antilles and Aruba (see Appendix E: item 3). The Netherlands Antilles is involved in the UNEP and IMO programmes and does contribute to the Caribbean Action Plan Trust Fund.

A bilateral agreement between the Kingdom of the Netherlands and Venezuela was concluded in 1978 to delimit marine boundaries between Aruba, Bonaire, Curaçao and Venezuela and to provide for co-operation in the event of oil spills in this area. Informal, but direct, contacts between government and industry organizations in the Netherlands Antilles and Venezuela are an important aspect of local co-operation for oil spill response.

Although the legal framework for international agreements and co-operation has not been developed there exists a practical and working relationship with Venezuela that would be of great importance in the event of a spill incident.

6.6 Summary and recommendations

(a) Summary

The Netherlands Antilles have major oil trans-shipment and refinery facilities so that the area has a high tanker traffic density. The Government at present lacks the organizational and legal framework with which to respond to spills or to obtain compensation. The Government is aware of these deficiencies and requested assistance from IMO to prepare a Pollution Contingency Plan and to recommend appropriate supportive legislation. The IMO Regional Consultant on Marine Pollution has presented (1985) a series of recommendations that would enable the Netherlands Antilles to develop the necessary organizational and legal framework to deal with an oil spill in its national waters (Appendix E: item 1).

The private oil companies have maintained substantial amounts of oil spill response equipment with trained support personnel on all three islands, but with the recent changes at the refineries the status of this equipment and the personnel is not known.

The Netherlands Antilles have a bilateral agreement with Venezuela and there is a good working relationship between the petroleum industries of Venezuela and the Netherlands Antilles for oil pollution and between the Netherlands Antilles Port Authority (Curaçao) and the Venezuelan Coastguard for Search and Rescue Activities. The present status of implementation of relevant IMO Conventions, ratified by the Kingdom of the Netherlands, within the Netherlands Antilles, is not clear.

(b) Recommendations

A recent report by the IMO Regional Consultant on Marine Pollution has addressed the basic legal and organizational needs of the Netherlands Antilles (Appendix E). Based upon this report, the following recommendations are made:

- (1) Adopt the draft oil spill contingency plan, including the identification of response resources and of sensitive areas and the enactment of laws to support the response organization.
- (2) Review IMO conventions and protocols that relate to marine pollution and the Cartagena Convention and Protocol with a view to clarifying the status of implementation and defining any necessary supporting regulations and legislation.
- (3) Review of oil company plans for their response capabilities on Aruba, Bonaire and Curaçao to determine the present status and to determine if these resources will be maintained or downgraded in the future.

7. SURINAME

7.1 Geography - Coastal and marine environment

The coast of Suriname is relatively straight for 350 km and is characterized by four large estuarine systems (Marowijne: Suriname; Coppename: Corantijn). The shoreline is characterized by low-relief and by sediments that are derived from the Amazon and other more local rivers and that continue to build up the shoreline. Sandy beaches are most common on the eastern sector and rare in western and central Suriname. Where present, sand beaches are usually backed by low dune systems. The tidal range is in the order of 2 m at neap tide and 3 m at spring tide. The predominantly westerly longshore drift is a function of the primary direction of wave approach which is from the northeast or east.

The most characteristic feature of the coastal environment is the presence of wide shallow mudbanks on the order of 50 km in length alongshore and 10 to 20 km wide offshore. The mud flats may be up to 1,000 m wide at low tide. They migrate slowly towards the west at an average rate of 1.5 km per year. This migration results in alternating sequences of erosion and deposition on a given section of shoreline (Wells and Coleman, 1981; Rine and Ginsburg, 1985).

7.2 Petroleum related activities

Suriname produces about 1,000 bbl per day of light oil which is used domestically. This oil is from an onshore reservoir (the Tambaredjo Field) at Calcutta on the Saramacca River and is transported inland by barges along a small canal. Offshore exploration has produced some oil shows but no major finds. Exploration continues to be active both onshore and offshore. About 4 M bbl per year is imported from Trinidad through Paramaribo, Paranam (on the Suriname River) and Nieuw-Nickerie. Approximately 2 M bbl per year is shipped directly to the Surinam Aluminium Company (SURALCO) plant at Paranam by vessels that carry on the order of 80 to 100,000 bbl each. The remaining imported oil involves shipments of between 4 and 6 vessels per month which carry about 20 to 35,000 bbl. These vessels are full on arrival in Suriname, prior to further discharges at ports in Guyana. Small barges that transport the oil upriver have a capacity to the order of 350 bbl each. The barge that distributes oil from the Tambaredjo Field has a capacity of between 2,000 and 2,500 bbl.

7.3 Spill risks and potential spill effects

There is an extensive offshore traffic of tankers transitting from the Middle East to North America and the Caribbean. These generally do not approach within 100 miles of the coast and because of limited water depths cannot approach closer than 25 miles. The risk of a spill from these offshore vessels is considered to be small and it is possible that a major spill of oil on the water surface would not be able to reach the coastline because of the oceanographic barrier provided by the Guyana current. The primary risk of a marine spill is related to the local coastal traffic. Approximately 800-900 vessels per year use Paramaribo, excluding coastal trade vessels, barges and fishing boats. Coastal tankers with a capacity of up to 35,000 bbl each regularly use the coastal waters and barges with a capacity of up to 500 bbl similarly use the river systems for distribution. The SURALCO plant up the Suriname River is supplied with fuel oil in loads of 80 to 100,000 bbl.

The coastal fisheries industry is an extremely important part of the Suriname economy and is valued to the order of US \$70 M per year. This is equivalent to half of the non-bauxite export trade and is a crucial element of foreign currency earnings. The shrimp nursery areas are in the mangrove and lagoon environments and the most critical areas are thought to be the coastal sections immediately to the east of the Suriname, Coppename and Corantijn rivers. These areas are very difficult for spill response operations due to poor access in environments that are characterized by brackish water mangroves and lagoons. The coastal fisheries are also critical in terms of subsistence activities and 80% of the population lives on the coast or in the estuarine environments. The sand beaches of Suriname are important nesting sites for Olive, Ridley, Green, Leatherback and Hawksbill turtles.

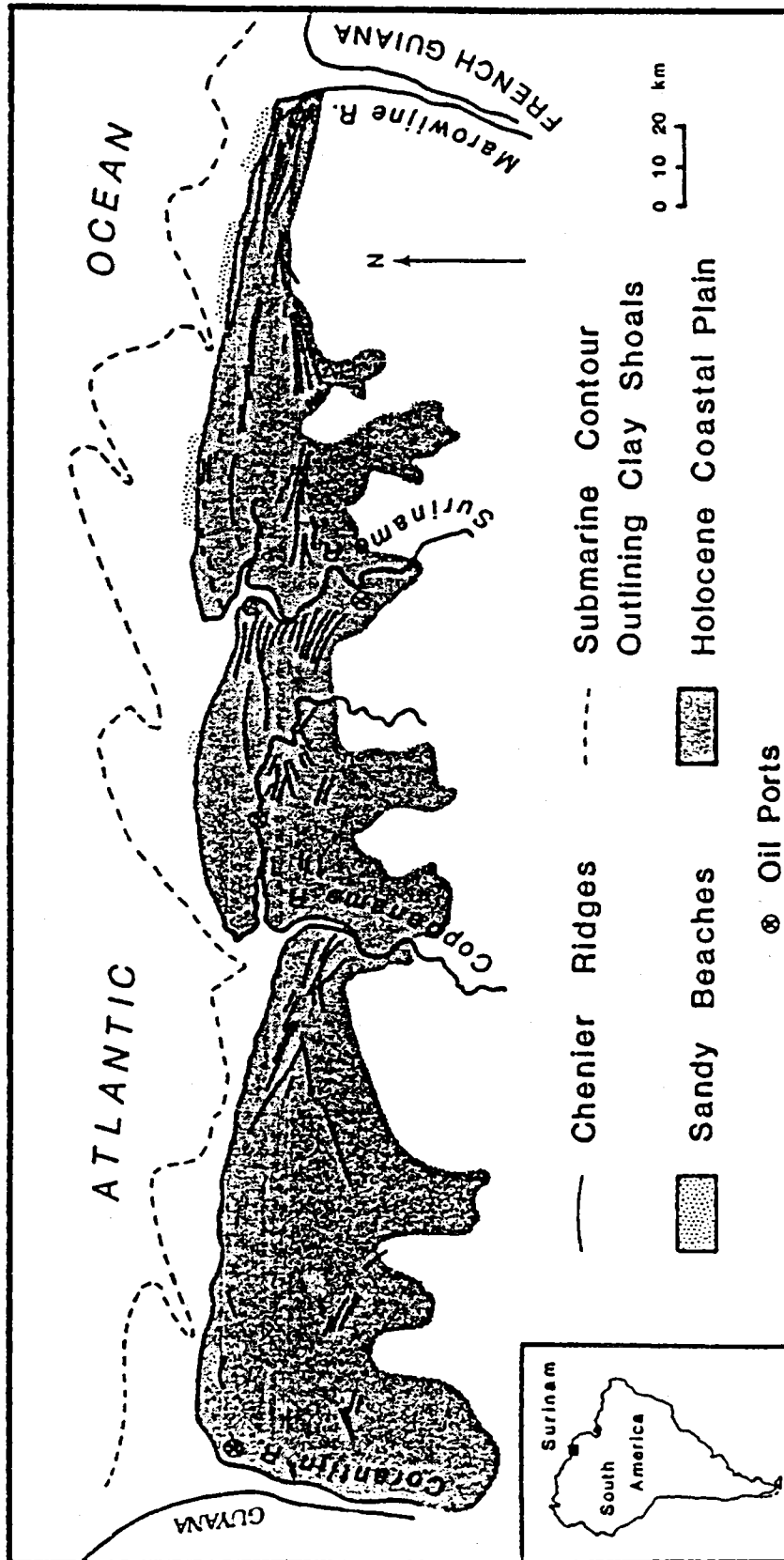


Fig. 7 Coastal Features of Suriname

7.4 National organization

(a) National legislation

Suriname has only a few laws that could be used to support oil spill response activities, although a recent decree on oil exploration contains some clauses for the protection of the environment from pollution. The only relevant legislation in place is the Harbour Law, which, under the authority of the Ministry of Transport, includes outdated legislation to prevent spills in ports and to enable fines to be levied for such spills.

This apart, there is little relevant legislation. At present, the Organization of American States (OAS) is actively involved in Suriname with a draft Water Management Law that includes aspects of local petroleum traffic.

(b) The responsible authorities

The Ministry of Transport and the Port Authority have the general responsibility for the prevention and control of pollution of the sea and in the rivers. This Ministry deals with IMO on marine and shipping affairs, through the Ministry of Foreign Affairs. The Ministry of the Army and the Police possesses naval resources for fishing surveillance, and for Search and Rescue. There is an organization in place for search and rescue.

The Ministry of Agriculture, Animal Husbandry, Fisheries and Forestry has appreciated the ecological and economic effects that would result from marine pollution in Suriname. They have catalogued the sensitive areas and their advice would be very valuable if it should become necessary to undertake a spill response action. The Ministry would like to develop an organization and to encourage co-ordination of spill response activities at a central level. The Deputy Permanent Secretary of this Ministry is the Suriname representative to IMO for marine environmental affairs. This Ministry has taken responsibility for evaluating the use of chemical dispersants in terms of environmental effects.

The Ministry of Education, Sciences and the Environment would be responsible, with the Ministry of Foreign Affairs, to examine the Cartagena Convention and its Protocol.

The Ministry of Natural Resources and Energy directs Suriname's petroleum related activities. The State Oil Company Suriname (Staatsolie), which exports oil from the Tambaredjo Field, reports through a Board to the Minister.

(c) Response resources and training

The local Esso, Shell and Texaco companies are responsible for most of the oil movements on water in Suriname, except for those to the SURALCO plant. Each company has an internal response plan for small spills and would call upon the regional headquarters if further assistance and resources were to be required. Some staff have been involved in training and a small stock (2 bbl) of dispersant is held in Paramaribo.

At the SURALCO facility at Paranam three skimmers, boom, pumps, sorbents and 20 collapsible 300 gallon storage containers are stocked to respond to spills during off-loading of the Bunker C at the plant (Appendix F: item 1). This equipment and personnel are available for use on spills elsewhere in Suriname.

No national oil spill contingency plan exists or is envisaged. In the event of a spill outside the control of the three international companies or SURALCO, the lead government agency would most likely be the Ministry of Transport through the Harbour Master's office.

7.5 International conventions and regional agreements

Suriname has not participated in the work or the negotiations of the framework of the Caribbean Environment Programme. They have not signed the Cartagena Convention and its Protocol. However, they have let it be understood that they would be prepared to co-operate in this context. They would like to study the Action Plan and the Convention and its Protocol. They have not concluded any bilateral agreements but they have taken steps to exchange information with their neighbours (Brazil, French Guyana, Guyana and Trinidad) with respect to Search and Rescue.

Suriname has ratified the OILPOL Convention of 1954, the INTERVENTION Convention of 1969 and the DUMPING Convention of 1972. However, it does not seem that the necessary arrangements have been made for the implementation at the national level for the applications of the conventions.

7.6 Summary and recommendations

(a) Summary

The oil handling companies in Suriname are in a position to respond to small oil spills at or near the transfer facilities. In the case of (i) a large spill, or (ii) a spill which is not the direct responsibility of one of the three international companies or SURALCO, the government, which at present has no organization, training or resources to respond, would have to be directly involved.

The Ministry of Transport and the Ministry of the Army and Police would probably have the primary operational responsibility, with support from the Ministry of Agriculture, Animal Husbandry, Fisheries and Forestry, and the Ministry of Education, Sciences and the Environment on environmental affairs. However, the exact role of each organization would have to evolve during the incident.

The country imports about 4 M bbl per year, of which the majority passes through the Suriname river estuary, with 2 M bbl alone going upriver to Paranam. The areas at risk therefore include riverine and estuarine environments in addition to the coast itself.

Suriname has ratified several international agreements but in recent years has not been active in the programmes of the Caribbean Region.

(b) Recommendations

Suriname would benefit directly from assistance at the national level to prepare the response framework necessary to deal with a marine or river spill. A secondary level of assistance could focus on regional and sub-regional co-operative programmes. As an initial step towards providing a basis for development the following recommendations provide for a national oil spill contingency plan and for the involvement of Suriname at the sub-regional level with neighbouring states.

- (1) Prepare: (a) a procedure for reporting and notification of spills, (b) an inventory of resources available within the country and from neighbouring states, and (c) an organizational framework with defined lines of communication and responsibilities for both oil on the sea and at the shorelines. (Note: all items should include industry as well as government agencies).
- (2) Establish a legal framework for pollution control responsibilities, for an oil spill contingency plan and for clean-up funds.
- (3) Identify areas and activities that are vulnerable to spilled oil and prepare local or site-specific response plans. Suriname would benefit from a river spill response manual.
- (4) Develop an inter-ministerial group as the contact point for IMO and UNEP activities related to marine pollution.

8. TRINIDAD AND TOBAGO

8.1 Geography - Coastal and marine environment

The coast of Trinidad is characterized by two parallel structural outcrops that trend east-west and that form the northern and southern shores of the island. Between these two bedrock uplands is a low-lying area in which the shorezone is characterized by beaches and mangroves. The north coast has mainly steep rock and cliffs, and this coast is particularly rugged along the northeast section with relief decreasing towards the west. The south coast has rock outcrops that are fronted by sand beaches, again with decreasing elevations toward the west where some low-lying wetland environments are present. The exposed east coast of Trinidad is composed of three bay systems that are separated by resistant rock headlands. Mauyaro, in the south, is backed by low cliffs which have been eroded to give extensive sand intertidal deposits. Cocos Bay in the centre is a 20 km long barrier sand beach that encloses the large freshwater Nariva Swamp. The northern, Matura Bay, is a sand beach backed in part by low cliffs, swamps and dunes. The exposed eastern Atlantic shore is in marked contrast to the sheltered Gulf of Paria western coast which is a relatively sheltered environment that faces the South American mainland, in particular the Orinoco Delta. The shorezone is characterized by low cliffs on the northern and southern promontories which give way to extensive mudflats and sand beach environments between Port of Spain and San Fernando. Two extensive swamps occur at Caroni, immediately south of Port of Spain, and at South Oropuche/Rousillac. Tobago has a predominantly rocky shoreline with only a few pocket beaches.

Fringing reefs are found off the southeast and northeast coasts but are absent or poorly developed elsewhere. The primary longshore currents are towards the north on the east coast and towards the west on the south and north facing coasts. Within the Gulf of Paria there is a current that runs clockwise from the northwest to the south and then west along the coast. The tidal range in the area is approximately 0.5 m with a maximum of 1.0 m at spring tides. The total length of the Trinidad coast is 500 km, compared to that of Tobago which is 130 km. The actual lengths of beach for the two islands are 170 and 35 km respectively.

8.2 Petroleum related activities

Trinidad and Tobago have a very active petroleum industry that includes both on and offshore oil production as well as refining facilities. The area has a long history of natural marine and terrestrial oil seeps. The current production is on the order of 165,000 bbl of crude oil per day, of which 40,000 bbl are derived from fields off the southwest coast and 90,000 bbl off the east coast. The two major refineries have a total capacity of about 350,000 bbl/day with present operations on the order of 75,000 bbl/day. These refineries are located on the west coast of Trinidad.

An estimated 200,000 bbl of crude oil and products are trans-shipped each day through the island. Ninety per cent of this trans-shipment travels through the Gulf of Paria. To this movement must be added the tanker traffic that passes through Galleon Passage, between the islands of Trinidad and Tobago, which is only 20 miles wide. An estimate indicates that at any one time on the order of 100 tankers are in transit in the area of the southern Windward Islands. In addition, it has been estimated that there are more than 1,000 local tanker movements per year through the Gulf of Paria. Many of these are tankers that service adjacent Caribbean islands.

8.3 Spill risks and potential spill effects

Two major incidents in recent years, an offshore blowout and a collision between two tankers (Aegean Captain-Atlantic Empress), illustrate the high risk of marine pollution in the waters of Trinidad and Tobago. There is a very high traffic density of both large and small tankers and other vessels which pass through national waters or which load/discharge their cargoes in Trinidad. The seas around the two islands are a crossroads for both local and high seas routes. The national oil spill clean-up plan identifies five high risk areas:

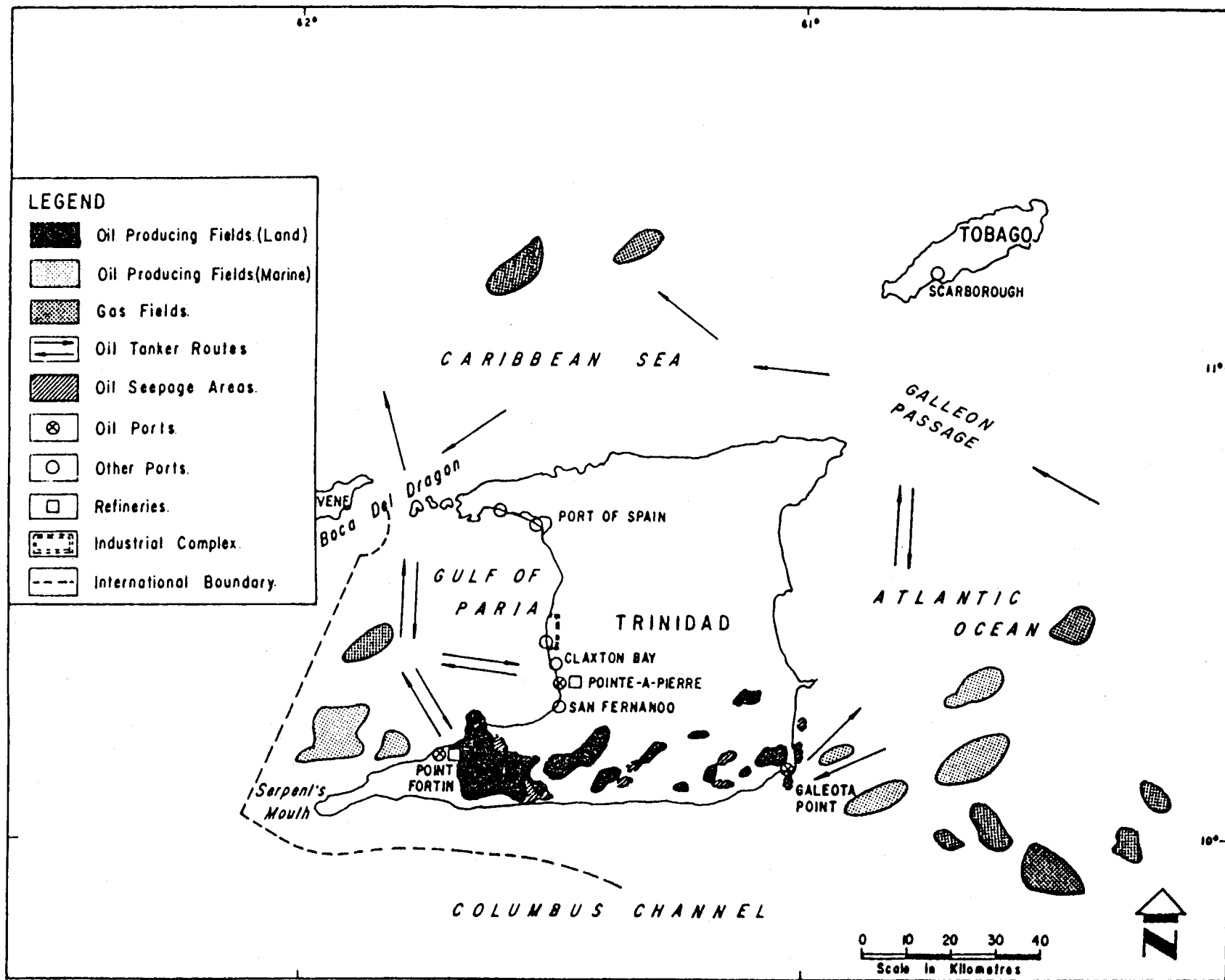


Fig. 8 Map of Trinidad and Tobago

- I the area around and to the west of Port-of-Spain
- II the southeast Gulf of Paria
- III the southwest Gulf of Paria
- IV the southeast coast of the island, and
- V Galleon Passage

The most likely types of oil that would be spilled are crude oil, Bunker C and No. 6 fuel.

The national oil spill clean-up plan identifies and describes five sensitive coastal areas:

- (i) Point Gourde to Entrada Point area: scenery; beach homes; major recreation area
- (ii) Maqueripe Bay (north coast): recreation area; possible underwater park
- (iii) Toco Reef (north coast): fringing coral reef
- (iv) Soldada rock (southwest corner of island): bird sanctuary; many pelicans
- (v) Port-of-Spain area: populated and recreation area

The plan also notes that much of the coast of both islands would be adversely impacted by marine pollution in terms of recreation (both local and tourist) and the coastal marine ecosystem.

Near-shore fisheries are an important economic activity with over 25 trawlers in operation. The total landings are in the order of TT \$100 M/year and 90% of the fishing is artisanal. The spill from the Aegean Captain-Atlantic Empress collision is reported to have caused a large fish kill, although documentation is poor.

8.4 National organization

(a) National legislation

Marine pollution from oil spills is covered by two laws and by the national oil spill clean-up plan.

The Law on Oil Pollution of the Territorial Waters (1951) (Appendix G: item 1) provides for fines and imprisonment for a vessel owner or ship's Captain that voluntarily discharges oil in territorial waters or in port areas. The law does not apply for accidental spills if the Captain has taken all reasonable measures to prevent leakage.

The Petroleum Regulations (1970) (Appendix G: item 2) provide legislation for exploration, exploitation, refining and transportation activities both on land and at sea. The act rests licencing authority with the Ministry of Energy and Natural Resources. Under a licence the operator must avoid pollution of the seas, beaches and tidal rivers and must provide a reasonable compensation for all losses and damages caused by himself or one of his agents.

(b) The responsible authorities

The Ministry of Energy and Natural Resources has general responsibility for petroleum affairs on land and sea as defined in the Petroleum Regulations. With the exception of the regulations concerning ships, it is the critical authority for the prevention and control of pollution by oil. Under its authority the national contingency plan has been developed. The Ministry has a line budget for pollution by hydrocarbons. The National Controller, who reports directly to the Minister, represents the Government at international meetings related to marine pollution.

The National Oil Spill Clean-up Plan was completed in 1979 and updated in 1984 (Appendix G: item 3). The Plan was developed by the Committee for Contingency Planning under the authority of the Ministry for Energy and Natural Resources. The Chairman of the Committee is the National Controller who works through an operational committee, a technical sub-committee and a communications sub-committee. The operational committee is responsible for equipment, training and policy. The National Controller is also a participant in regional marine pollution activities in the Caribbean area. The plan identifies the role and responsibilities of the different state and private agencies. The national plan has been approved by Cabinet but, at present, is not supported by national regulation so some aspects are developed on the basis of a voluntary arrangement between the various government and industry organizations. The plan recognizes five geographic areas of high risk (see Section 8.3) each of which is the responsibility of a regional controller. In the event of a spill the National Controller supervises the regional controller and co-ordinates the support activities of the various government and industry organizations. Clean-up costs are covered at the initiation of an operation by a fund that is maintained by the Government and the petroleum companies.

The petroleum companies have internal contingency plans for their own operations, and work closely with the National Controller to support activities outside their direct areas of responsibility.

The Coastguard has an operational responsibility within the national contingency plan. At the initiation of a response, the Coastguard becomes the communication centre for the operation and it provides response resources and trained personnel. It has a budget for response equipment and for training, although these are considered to be insufficient to cover all areas which are not covered by the petroleum companies. The Harbour Master has the responsibility for the proof and prosecution of pollution infractions. It is directly responsible for oil spill prevention and clean-up within the limits of the port district and for submarine pipelines that cross the coast.

The Ministry of the Environment, through the CAIRIRI petroleum laboratory, tests dispersants, approves dispersants and determines places where they can be used.

The Ministry of Public Works and Transport is responsible for economic policy on marine transport. It works in liaison with the permanent IMO Committee and the other ministries concerned to develop regulations on the prevention of pollution by ships. It also examines the question of the responsibility and indemnity.

The IMO Standing Committee was established in 1980 to review all IMO Conventions and to advise the Government on ratification and on necessary legal support for conventions that are ratified.

The Institute of Marine Affairs has no direct responsibility for marine pollution or response. However, it offers expertise in the area of protection of the marine environment. It is not directly involved with the national committee on the contingency plan. The potential of this institute could be better exploited both at the national and regional levels.

(c) Response resources and training

The various government and industry organizations maintain a variety of response equipment, probably sufficient to deal with all but major spills (Appendix G: item 4). The petroleum companies are members of the Clean Caribbean Co-operative and can call upon supplementary resources through this agency.

A number of government and industry personnel have taken training courses and the Coastguard routinely runs deployment exercises. However, the level of training was considered at several meetings to be an area for potential improvement.

8.5 International conventions and regional agreements

Trinidad and Tobago have participated in numerous IMO/UNEP meetings relating to marine pollution and to the Caribbean area but have not ratified any of the relevant conventions. The IMO Standing Committee is presently reviewing several conventions but does not expect any direct action in the immediate future. Despite this lack of legal involvement Trinidad and Tobago participated in the development of the sub-regional Oil Spill Contingency Plan at the 1984 meeting in Saint Lucia. In the UNEP sub-regional division Trinidad and Tobago are part of two adjacent units (Island States and Territories - South America and contiguous islands). In 1985 the country received assistance from IMO on legal aspects of the conventions and this was considered to be a valuable step towards eventually integrating the conventions into the national legal system.

No bilateral agreements are active at the present time as the agreement with Venezuela has lapsed and must be renegotiated.

8.6 Summary and recommendations

(a) Summary

Trinidad and Tobago are well prepared at the national level in terms of legal, organizational and operational factors. The national oil spill clean-up plan defines roles and responsibilities and there exists a substantial pool of equipment and trained personnel. The waters around the islands are extremely crowded, in terms of petroleum production and shipment, and the danger of spills is high. The nature of the risk also involves the likelihood of very large spills (one of over 3 M bbl occurred in 1979) which would be beyond the capability of local response resources.

Although the country is very active in the area of international and regional meetings on marine pollution and the environment and has a Standing Committee to review IMO conventions, these conventions remain in review and none of the relevant IMO/UNEP agreements have been ratified to date. Nevertheless Trinidad and Tobago could play a leading role for sub-regional co-operation or activities. In this context it is interesting to note that an IMO Regional Advisor on Maritime Safety and related pollution problems is presently based in Trinidad and Tobago. One area in which improvement could be made for Trinidad and Tobago is to upgrade the documentation aspects of spills. This could involve the development of fingerprinting techniques for oil identification which would provide a more solid basis for legal actions against polluters.

(b) Recommendations

At the national level the country is well organized so that the following recommendations are intended primarily to improve the existing situation rather than to initiate any new activities.

- (1) An oil spill seminar, similar to one held earlier, is planned for 1986. Technical assistance, in the form of speakers, or funds could be requested to support this planned seminar.
- (2) The Institute of Marine Affairs could be more directly involved with the national oil spill operational committee to provide advice on environmental aspects of pollution and on environmental monitoring.
- (3) Trinidad and Tobago are encouraged to develop onshore and offshore exercises. These could be conducted with assistance from IMO if requested and participants from neighbouring states could be invited to attend.

9. VENEZUELA

9.1 Geography - Coastal and marine environment

The coastline of Venezuela is approximately 3,000 km in length and is an area of small tidal ranges, generally less than 0.5 m, that is affected by the Trade Winds from the northeast quadrant. The Trades produce a predominantly westward longshore current on most sections of the north coast. The southeast coast is characterised by the extensive Orinoco delta.

The Character of the shorezone is very varied ranging from high cliffed coasts with fringing reef environments, to the extensive mangroves and mudflats of the Orinoco Delta. The primary features of the physical character of the coastal environments are summarized on the following page.

9.2 Petroleum related activities

The oil and gas industry in Venezuela is controlled by Petroleos de Venezuela S.A. (PDVSA), which is a holding company with a number of subsidiaries that include four major operating companies: Corpoven, Maraven, Meneven and Lagoven. The stock of PDVSA is held by the Ministry of Energy and Mines and the President of PDVSA reports directly to the Minister.

Venezuela produces about 1.4 M bbl/day of which ninety per cent is exported. Ninety per cent of these exports are crude oils with the remainder being primarily refined heavy fuel oils. Venezuela has a production capacity that is about 2.5 M bb./day but the industry is operating at a reduced scale at this time. By far the greatest producing area is Lake Maracaibo. Eighty per cent of Venezuela's production comes from the Lake Maracaibo area with 60% being derived from offshore areas within the lake. Oil from the producing areas around the lake is pipelined to refineries at Cardon and Amuay for subsequent export.

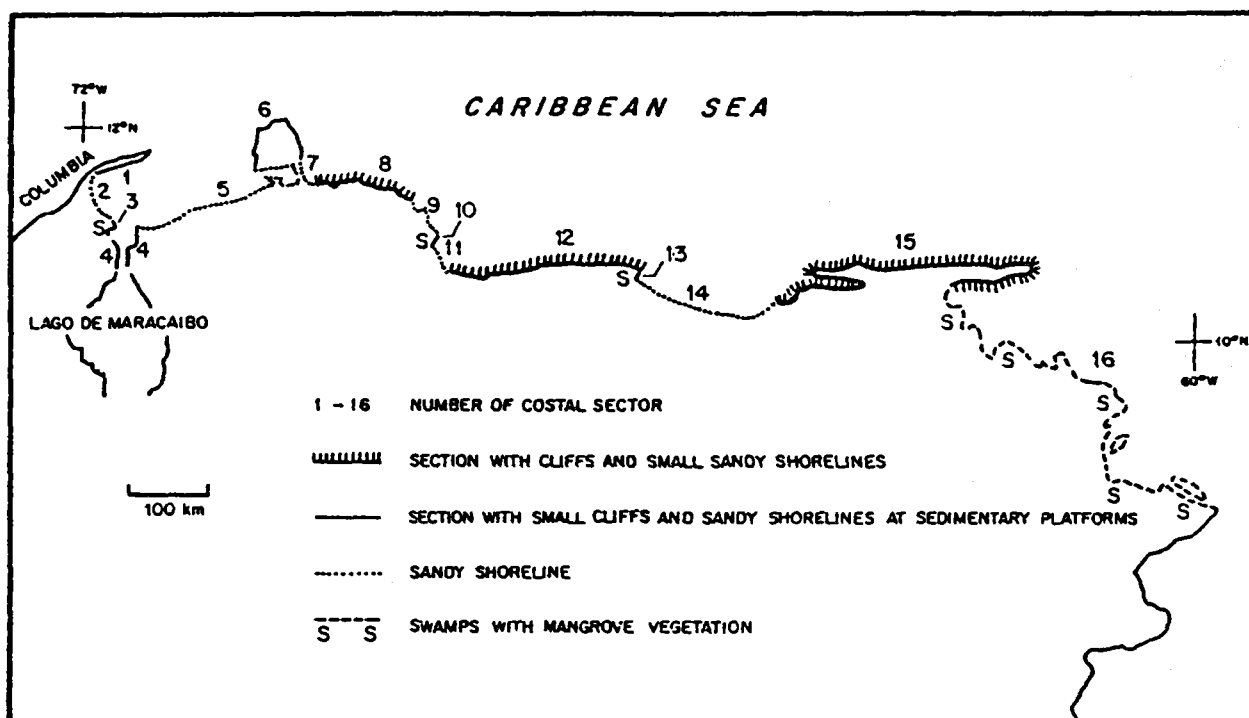
The oil and gas handling system in the Lake Maracaibo area is relatively complex. There exists in the order of 17,000 km of underwater pipelines, many of which are more than twenty years old. Southern Lake Maracaibo is a fresh water environment, but to the north at Bachaquero (the major oil production area) it becomes brackish. This environment is one that can be very corrosive.

Using the regional breakdown that has been developed for the national contingency plan (Appendix H: item 2), the distribution of marine terminals by area is as follows:

1. Lake Maracaibo	11
2. Parguano	2
3. Golfo Treste	6
4. Golfo de Cariaco	4
5. Orinoco	3

The two largest loading facilities in Lake Maracaibo are at Puerto Miranda (Maraven) and La Salina (Lagoven). The Maraven terminal at Puerto Miranda exports approximately 300,000 bbl/d of crude oil. The terminal has a 5.7 M barrel capacity and can handle loaded tankers of 85,000 tons. To the order of 42 tankers utilize this terminal each month. The Corpoven refinery/terminal facility at Bajo Grande has a capacity of about 60,000 bbl/day. The remaining oil and gas from the Lake Maracaibo area is pipelined to major refineries/terminals at Amuay (Lagoven) and Cardon (Maraven), on the Peninsula de Paraguana, from where it is exported.

Twenty per cent of production is derived from inland areas in the east and south of Venezuela. The oil is shipped by pipeline and is then exported either: (1) down the Orinoco river from a terminal at Puerto Ordaz; (2) down the Rio San Juan from a refinery/terminal at Caripito; (3) from the refineries/terminals at Puerto La Cruz; or (4) from the refineries/terminals in the Golfo Treste area.



1. Exposed low cliffs, intermixed with shallow bays characterized by gravel beaches and dunes.
2. Sandy beaches backed by mangroves.
3. Low coast with mangroves in sheltered areas.
4. Steep coast with mangroves.
5. Low coast, sand beaches, dunes and a bird-foot delta at the Rio Mitare in the Golfete de Coro.
6. Cliffed coasts with fringing reefs on the exposed eastern shore.
7. Sand beach backed by dunes.
8. Upland cliffed coast with pocket beaches.
9. Sand coast, offshore fringing reef and coral islands (cayos).
10. Mangroves, fringing reefs and cayos.
11. Low eroding sand coast.
12. High coast with sand, gravel beaches; in the west there is a ria coast of cliffed rocky headlands, bay-head beaches and mangroves.
13. Mangroves.
14. Barrier beach - lagoon coast.
15. Rocky cliffed coast with occasional mangroves and offshore corals.
16. Extensive deltaic environment of barrier beaches, mudflats and mangroves.

The primary marine activities are related to the movement of crude oil tankers from coastal terminals to foreign refineries, with a minor amount of local coastal transport of products.

9.3 Spill risks and potential spill effects

Surveys conducted for the national oil spill contingency plan identified that the highest risk area, in terms of frequency and sizes of spills, was related to tankers from the Middle East and Africa using the Netherland Antilles. This risk analysis identified that a spill as large as 350,000 tons might be expected in this area. The risks were identified on the basis of many foreign flag ships using the area, and the presence of coral reefs. Since that study was conducted, in 1981, the status and volumes of oil being handled by the Aruba and Curaçao refineries have changed and the potential for such a spill risk has decreased from this source.

The next highest risk was identified as tankers in the vicinity of Lake Maracaibo. The problem in this location being the restricted navigation area, the high density of traffic and the cargoes of heavy crude oil. The risks were considered to be greatest in the channel itself and inside the lake.

The third area of risk is Puerto La Cruz, considered to be a medium to low risk because of shallow waters, a restricted port entrance and the high density of local traffic.

The primary coastal areas sensitive to oil spills were considered to be:

- (a) The Orinoco Delta - extensive mangrove environments with tankers downriver from Puerto Ordaz
- (b) Morrocoy Park - the national park of mangroves and coral reefs, an extensive fauna reserve and an important spawning/nesting environment
- (c) Los Roques - a national park that is an offshore coral reef

A series of second-rank sensitive areas are defined as follows:

- (d) Margarita Island - tourist and mangrove
- (e) Littoral Central - tourist environment near to Caracas
- (f) Carenero Tacarigua - tourist and bird sanctuary

9.4 National organization

(a) National legislation

Venezuela adopted legislation on pollution from oil at an early stage in the development of the industry. The initial Hydrocarbon Law in 1932 related to Lake Maracaibo and was followed (25 November, 1937) by a law to prevent pollution by hydrocarbons on the waters. This latter law puts the obligation to prevent pollution on the petroleum companies and provides for fines for infractions to the law. A new law on pollution by hydrocarbons is to be prepared in the near future.

More recently, 16 June 1976, the Venezuelan Congress adopted the Environmental Law which has as its primary objectives the conservation and protection of waters, flora and marine fauna. In order to achieve these objectives a National Council of the Environment, reporting to the President of the Republic was created which is charged with planning, co-ordination and the development of regulatory measures. The Council is composed of representatives of the relevant ministries and its President is named by the President of the Republic. In order to develop a national conservation plan for the defence of the environment, for the application of these

regulations and for the co-ordination of the responsible organizations, the Law of 1976 created the National Office of the Environment, which assists the secretariat of the National Council of the Environment. The Law stipulates that infractions relating to conservation and environmental protection will be dealt with on the basis of this or other applicable laws. In fact, a new penalty law on the environment is to be prepared. The laws on the territorial waters, the Continental Shelf and the protection of fisheries, and the law on the economic zone, do not contain any arrangements for the protection of the environment.

The national oil company, PDVSA, is a holding company that includes four operating companies - CORPOVEN, LAGOVEN, MARAVEN and MENEVEN - and that has initiated and developed a national contingency plan. This plan was started in 1981 and provides for the following organization:

- (i) at the central level the plan is co-ordinated by a committee, the President of which is the Manager of Environment Protection of PDVSA. This co-ordination committee provides the basis for the central committee of the national contingency plan, which is itself assisted by five regional committees and by the administrative operational units;
- (ii) At the local level, the country is divided into five zones of responsibility (Appendix H: item 2). Each zone is entrusted to one of the four operating arms of PDVSA. In each zone the national contingency plan is co-ordinated by a Regional Committee presided over by the regional director of the responsible company and composed of representatives of the relevant organizations. This plan was developed for and by the petroleum industry and is legally binding only upon itself.

This plan does not have a legal base, nor does it relate legally to government agencies, despite the fact that the organization provided for by the plan places the administrations and services of the state under the authority of PDVSA (operational command). The responsibilities of the various administrative bodies of the Government are not clearly established and this situation must be resolved. One could expect a number of conflicts of interest that might affect the efficiency of the system. At the present time, in the case of a serious accident, it is likely that there would be problems of responsibility. The individual administrations probably would wish to exercise their authority and guard the operational control of their resources and, in the absence of good will, the regional director of one of the PDVSA companies could not legally act to co-ordinate the use of these public resources. Industrial enterprise cannot use the prerogatives of government and it cannot use the law of intervention nor make requisitions. Close co-operation exists between industry and government but this cannot replace the legal framework that is necessary to support the plan.

The plan developed by the petroleum industry is good but it would be necessary particularly for a response to major accidents, that a plan be established by the government and put into operation under its responsibility. The legal authority rests with the administration and this should be developed in a manner that provides for continued collaboration with the industry.

(b) Responsible authorities

It is apparent from information available to the Mission that responsibilities at the administrative level do not seem to be clearly established. This situation has been recognized and steps are underway to revise existing legislation to avoid conflicts. The national Navy and, more particularly the recently created Coastguard, has the resources and has the mandate for the control of marine pollution. The Directorate of Hydrography and Navigation in part provides advice and assistance. The Director of Navigation and of Ports of the Ministry of Transport and Communications is responsible for questions relating to the security of navigation and the prevention of pollution by ships, in particular the application of the oil pollution convention.

The Directorate of Navigation and Ports delegates its authority to the Port Captains. The Ministry of Energy and Mines is responsible for the petroleum industry and in this role is responsible for oil pollution. This responsibility apparently is not clearly defined. The Ministry of the Environment and of Natural Renewable Resources has a general responsibility for environmental affairs and, as noted above, there exists a National Council and an Office of the Environment. The Ministry of Foreign Relations is responsible for legal matters and for international relations, notably international agreements. The Ministry of the Interior is responsible for matters of civil security (catastrophes).

In practice the present controlling organization in Venezuela for dealing with oil spills is entirely in the hands of the petroleum industry (PDVSA), whereas the legal responsibility rests with various government ministries. The industry and government agencies must act in close co-operation to be effective and steps are being taken to ensure that responsibilities are to be supported by relevant legislation.

(c) Response resources and training

PDVSA, through its four operating companies, has a wide range of response equipment which is stored at strategic locations. By most standards the resource base must be considered adequate for small and medium spills (Appendix H: item 3). Since 1984 a new inventory has been built up within the context of the national oil spill contingency plan. PDVSA is not a member of the Clean Caribbean Co-operative but has an agreement to rent equipment as needed.

Training programmes for operators of equipment and for decision-makers are organized routinely by PDVSA. It is possible that in future years these programmes may be open to agencies from other countries.

9.5 International conventions and regional agreements

Venezuela has signed the Cartagena Convention and its Protocol and the law authorizing the ratification is in congress. Venezuela has ratified only the OILPOL Convention of 1954 but ratification is in progress for the INTERVENTION, FUND, CLC and MARPOL 73/78 Conventions.

Venezuela has signed bilateral agreements with the Dominican Republic, France, the Kingdom of the Netherlands and the USA on marine limits. Future similar agreements are to be negotiated with Colombia, Guyana and Trinidad/Tobago. In addition, two bilateral accords that include arrangements with regard to marine pollution are in place. These are an agreement with the Dominican Republic (March, 1979) and an accord with the agreement with the Kingdom of the Netherlands (March, 1978), concerning the Netherlands Antilles (Aruba, Bonaire and Curaçao). An agreement with Trinidad and Tobago is in the process of renegotiation; one existed previously but has expired. These agreements provide that the parties exchange information on their legislation, their experiences, their organization and their relevant authorities in the area of marine pollution response. They agree to warn the other party in the case of pollution or the serious menace of pollution in the adjacent zones. They agree to develop, as far as possible, a joint intervention plan in order to take common measures and to carry out mutual assistance programmes. To date the agreements have not been put into place and no discussions have yet taken place to develop a joint plan. The present system of dealing with oil spills in Venezuela through the petroleum industry could be improved by the development of supporting regulations, which would then enable the development of co-operation based on interstate agreements.

It is important to note that PDVSA has informal and practical relations with the petroleum companies in the Netherlands Antilles and Trinidad and Tobago and now operates one of the Netherlands Antilles refineries. Also, the Venezuelan Coastguard has good relationships with the Coastguard of Trinidad and Tobago, and with the Harbour Master of Curaçao, in particular with respect to Search and Rescue.

9.6 Summary and recommendations

(a) Summary

Venezuela has developed a practical response organization, backed by modern equipment and ongoing training programmes. The national oil spill contingency plan includes a suitable reporting, notification, organizational and operational framework to deal with most spills. In addition, a series of environmental studies provide a basis for decisions regarding areas of risk and vulnerability. At the present time PDVSA acts as the co-ordinator of the plan.

The effectiveness of the plan depends upon the continued close co-operation between industry and government as the plan is not backed by up-to-date legislation. Steps are in progress to provide this upgraded legal support by defining the roles and responsibilities of PDVSA and government agencies.

The potential sources for large spills are associated with coastal and river traffic from terminals and refineries. The risk from non-Venezuelan activities associated with the Netherlands Antilles has been reduced considerably over the past two years with the closure of one of the large refineries on the islands.

Venezuela is in the process of evaluating several relevant IMO conventions and the Cartagena Convention and Protocol, but to date has ratified only OILPOL. Few agreements related to oil pollution are in place with neighbouring states but over the years Venezuela has developed close working relationships with many counterpart agencies in the adjacent countries. Interest was expressed to participate in sub-regional or regional activities of IMO and or UNEP on spill related matters.

(b) Recommendations

The relatively advanced status of Venezuela's oil spill response organization means that there are no urgent requirements at the national level. The following suggestions are intended only to supplement or improve the existing level of activities.

- (1) An independent review of the national oil spill contingency plan could be requested.
- (2) Develop more advanced training programmes which could improve the quality and efficiency of response operations (this could be on a joint basis with neighbouring states). Such programmes could focus on shoreline clean-up techniques and training for on-scene commanders. Venezuela would benefit from manuals for response and clean-up in river and mangrove environments.
- (3) Evaluate and ratify relevant IMO conventions for marine pollution. If requested, assistance could be provided to evaluate these conventions.
- (4) Provide legal support to develop regulations to support the national oil spill contingency plan.

10. SUMMARY REVIEW AND CONCLUSIONS

10.1 Regional (Wider Caribbean)

IMO and UNEP and other international and regional organizations have worked closely to develop the 'Convention for the Protection and Development of the Marine Environment of the Wider Caribbean' and its Protocol concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region', which were adopted at Cartagena in March, 1983. This Convention and Protocol provide the legal framework for the development of co-operative regional programmes aimed at the prevention, control and combating of marine pollution and for the provision of mutual assistance in the event of a major spill.

Within the sub-region of South America and the contiguous islands only three of the seven states have ratified the Cartagena Convention. With regard to IMO conventions, only France and the Netherlands have a good record for ratifying and implementing those conventions and protocols which relate to marine pollution. On the basis of our meetings, it was evident that some countries and organizations do not understand the legal aspects of oil spills nor the financial aspects associated with clean-up costs, damage costs and compensation.

Despite the existence of a unifying regional framework there are many factors which hinder effective co-operation. The four dozen (approximately) states and territories have extremely diverse physical, ecological, economic, political and cultural characteristics. Some are major oil producing nations whereas others have only small-scale petroleum related activities. A major unifying thread is the fact that the region is a crossroads of oil transportation between the Middle East, Africa, Alaska, Venezuela and North America. As much as 5 M bbl of oil passes through the Wider Caribbean area each day of the year. Some of this is handled within the region by refineries or by transfer facilities which act as distribution centres. Physically the region is characterized by many small islands and narrow straits or passages. With the large number of tankers, and other vessels, transiting through this island region at any one time, the risk of collisions and groundings of breakdown is high. Also the risk of a major oil spill is high. Discharges from bilge or tank washings are less of a problem for clean-up response, though still a concern, than large spills from marine accidents. These latter require a response that involves bilateral and regional co-operation agreements and an extensive resource base of often specialized equipment and trained personnel. The effects of spilled oil on the coastal and marine ecosystem and on economic activities (particularly fishing and tourism) could be very damaging locally and regionally.

10.2 Sub-regional (South America and contiguous islands)

The economic, cultural and political diversity evident at the regional level continues to be a divisive factor at the sub-regional level. No formal or informal arrangements exist at present to unify the countries of the sub-region, probably because there are no unifying factors that would encourage the natural evolution of co-operative agreements. This is significant as the development of future programmes must recognize that the sub-region is not a naturally cohesive unit. It is suggested (Section 11.2) that future programmes at the sub-regional level focus on natural groupings of states that have a direct common geographical interest. The most natural arrangement based on geographic factors is one that separates the Atlantic coast of the sub-region from the Caribbean coast.

Within the sub-region only one bilateral agreement exists; this is between Venezuela and the Netherlands Antilles. A second, between Venezuela and Trinidad-Tobago, has expired recently. There is an urgent need to encourage formal and informal contacts as the basis for improved co-operation, such as is occurring in the area of Search and Rescue.

The Cartagena Convention and its Protocol have been ratified by three of seven countries in the sub-region (Colombia, France, Venezuela), and two additional states are active participants in the Caribbean Environment Programme meetings and projects. With the exception of Guyana and

Suriname the countries of the sub-region are therefore directly involved in this Programme. Guyana and Suriname have an interest in developing higher levels of participation and are aware of some, but not all, of the existing Caribbean programmes that relate to marine pollution.

French Guyana, Suriname and Guyana have a relatively uniform coast that is characterized by mudbanks, mangroves and estuaries. The coastal environment is highly productive and is a focal area of artisanal and commercial fisheries. Detailed or up-to-date survey or review of environmental sensitivity has been conducted for this coast so that little information is available for this area on shoreline protection or clean-up priorities. By contrast such information has been evaluated in Colombia, Trinidad-Tobago and Venezuela. Linked to this, on the Atlantic coast of the sub-region, is the significance of the coastal boundary current that results from the Amazon river discharge. This (Guyana Current) is of fundamental importance in considering the movement and therefore the impact of spilled oil on this coast, yet no review to date has considered the effects of the Guyana Current on the fate of oil. Although perhaps less critical, a similar spill movement study could be conducted for the Caribbean Coast of the sub-region.

Within the sub-region the major stocks of oil spill control and clean-up equipment are held by the oil companies. In particular, Colombia, (Ecopetrol), Netherlands Antilles (the refinery and trans-shipment companies), Trinidad (the refinery and trans-shipment companies) and Venezuela (PDVSA) have local resources to meet small to medium spills (i.e. up to approximately 1000 barrels). Many of these operators can also call upon the resources of the Clean Caribbean Co-operative if their own equipment stocks are insufficient. Although French Guyana has very little local equipment the government can easily access resources from the French Antilles and from major national equipment stockpiles in metropolitan France. Virtually no equipment exists locally in Guyana or Suriname, other than resources designed to deal with very small spills at marine terminals.

However, the local managers of the international oil companies that operate in these two countries can call upon resources held by the parent company elsewhere in the Caribbean including in some cases Clean Caribbean Co-operative resources. With the exception of French Guyana, the majority of the spill control and clean-up equipment is held by the oil companies at the sites of the major marine transfer facilities in Colombia, Netherlands Antilles, Trinidad and Venezuela. However, a survey of the exact nature of further work is needed to provide a more precise catalogue of equipment of resources for each country. In some cases this has been done already by the responsible national agencies so that the task would not involve a large effort.

10.3 National

Each of the seven countries in the sub-region is at a different stage of development for oil spill response. The major producing countries (Colombia, Trinidad-Tobago, Venezuela) have evolved to a situation where their individual response capability could cope with most small or medium spills. By contrast, Guyana and Suriname have not considered how to deal with oil pollution problems. All countries, with the exception of French Guyana, can improve significantly their national legislation: (a) to cope with the integration of international conventions, and (b) to provide support for national contingency plans and for financial and liability aspects of marine pollution. With the exception of France and the Netherlands, the states of the region have adhered to very few of the international conventions that relate to marine pollution.

Few states have considered in depth problems associated with shoreline clean-up and the disposal of oily wastes. In many large spills a high proportion of oil reaches the coast and the largest amount of effort and money is often spent on onshore rather than offshore operations. Each state in the sub-region could benefit from a greater focus on shoreline problems and each would benefit from a National Shoreline Oil Spill Clean-up workshop. This could then be supplemented by the proposed shoreline response and clean-up manual described in Section 11.4.

The results of the review for each country are presented in the table on the following page.

	COLOMBIA	FRANCE (FRENCH GUYANA)	GUYANA	NETHERLANDS (NETHERLANDS ANTILLES)	SURINAME	TRINIDAD- TOBAGO	VENEZUELA
RISK OF OIL SPILLS	Medium	Low	Low	High	Low	High	High
SPILL SENSITIVITY	High	High	Moderate	Moderate	High	High	Moderate
IMO OIL SPILL CONVENTIONS/CARTAGENA CONVENTION RATIFIED	MARPOL 73/78 CARTAGENA	MARPOL 73/78 INTERVENTION CLC FUND CARTAGENA	None	MARPOL 73/78 INTERVENTION	INTERVENTION	None	None
BILATERAL AGREEMENTS FOR OIL POLLUTION	Dominican Rep. Ecuador Haiti Panama	None	None	Dominican Rep. (in prep) Venezuela	None	Venezuela (expired)	Dominican Rep. Netherland Antilles Trinidad- Tobago (expired)
OIL SPILL CONTINGENCY PLAN	Yes (draft)	Offshore - Yes Onshore - No	No	In preparation	No	Yes	Yes
INTERNAL INTERACTION	Organized	Organized	Not organized	Not organized	Not organized	Organized	Organized
RESPONSE EQUIPMENT	Yes	No (in Martinique)	Minimal	Yes	Minimal	Yes	Yes
NATIONAL TRAINING	Yes	Yes (not local)	No	No	No	No	Yes

11. RECOMMENDATIONS

11.1 Regional (Wider Caribbean)

Each country within the Wider Caribbean region is at a different level of development with respect to marine pollution. Some are well prepared and equipped to cope with marine spills, whereas others are totally unprepared. In order to improve on a regional level a staged approach is necessary to: (1) bring less well-prepared countries up to a minimal level, and at the same time (2) encourage better prepared countries to continue to develop their capabilities and to provide advice and, where appropriate, assistance to their neighbours pursuant to the Cartagena Convention and its Protocol.

Several discussions identified the need for a regional focal point which individual countries or organizations could contact for information or advice. For example, not all countries were aware that the IMO has a Regional Consultant for Marine Pollution based in the Caribbean Area*. Such a focal point would be able to disseminate relevant information as well as receive requests for advice and information. This requirement could be met perhaps by establishing a formal IMO and/or UNEP office in the region by extending the present role of the IMO Regional Consultant on Marine Pollution. Perhaps when the Regional Co-ordinating Unit for the Caribbean Action Plan is established in Jamaica, this unit, if technically staffed, could fulfill this function.

The recent major changes in petroleum production and transport patterns have made the 1984 survey out of date (it was based on 1982 information). There is a need to update the risk analysis from oil pollution for the region as a whole. Associated with this type of survey could be a regional oil spill equipment and resource inventory. These two studies could form part of a Regional Oil Spill Manual which is proposed in Section 11.4. Such a manual could go beyond the scope of a contingency plan and would be the framework for regional notification, communication, co-operation and training. This is similar to that being prepared for the Island States and Territories.

11.2 Sub-regional (South America and contiguous islands)

The sub-region is extremely heterogeneous in terms of its character and of the response capabilities of individual countries. Sub-regional programmes would present some practical difficulties in terms of their general applicability and it is optimistic to consider that major benefits would result from direct co-operation between all 7 states within the sub-region. The mission recognized that the sub-region is made up of a series of overlapping areas and we identify that the following areas (outlined in the map on page 27) more accurately reflect common interests in oil pollution response:

- Northeast Brazil, French Guyana, Suriname, Guyana, East Venezuela, Trinidad/Tobago
- Trinidad/Tobago, Windward Islands
- Central and Western Venezuela, Netherlands Antilles, Colombia
- Colombia, Panama, Costa Rica, Nicaragua

* At present the post is held by E. Morris: postal address, c/o The Puerto Rico Environmental Quality Board, P.O. Box 11488, Santurce, Puerto Rico, 00910.

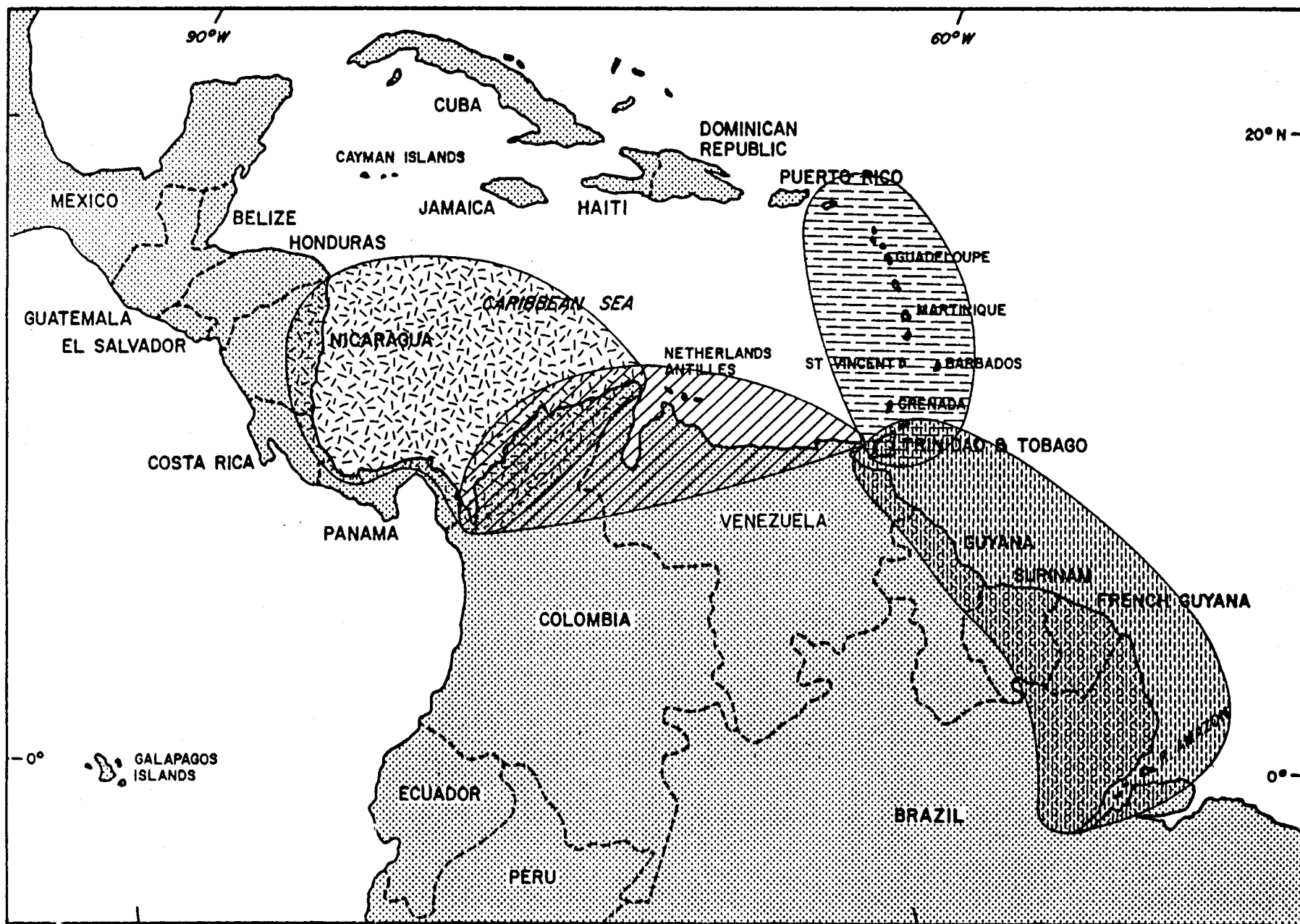


Fig. 10 Map of South American sub-region of the Wider Caribbean region

A similar situation exists for the Island States and Territories, which is heterogeneous and widespread. This sub-region, as well as the Central American sub-region could also benefit from a similar subdivision into practical areas of common interest. Each of the four areas defined above for the South American sub-region has a geographical overlap that relates to communications, notification, operations and co-operation in the event of oil spills. These suggested groups do not in any way limit or dilute potential assistance between States in accordance with the Cartagena Convention and its Protocol. Therefore, if sub-regional contingency plans could be developed the most appropriate approach would be to base these on cohesive geographical areas. Ideally these would form part of a hierarchy of contingency plans at the national, sub-regional and regional levels. Preparation for oil spills is most efficient when based on relatively small local areas in order to provide sufficient detail for operational planning. By contrast a response is most efficient when all States within a larger area are involved as this maximizes a broader resource capability. More specific recommendations for sub-regional contingency plans are described in Section 11.4.

Co-operation could be extended so that countries within each group could hold joint workshops or training programmes which would act as a catalyst for further interaction. The more developed countries, in terms of response capabilities, could provide advice and assistance where necessary. A separate example of joint activities is the oil spill seminar planned by Trinidad in 1986 which could be open to neighbour countries for participation.

11.3 National

It is recognized that each country has different requirements and therefore the recommendations and suggestions presented in the text are intended to provide internal improvements for the individual countries. In the cases of Guyana and Suriname there is an immediate need to prepare a national contingency plan because the internal organization and responsibilities are undefined at present. By contrast, Colombia, French Guyana, Trinidad/Tobago and Venezuela have progressed to a more sophisticated level of requirements that are perhaps less urgent. The following summary of recommendations omits those which apply in all cases (e.g. the need for a shoreline clean-up manual) and identifies where relevant the immediacy of the item.

COLOMBIA

- Review of draft Oil Spill Contingency Plan
- Development of shoreline sensitivity maps
- Request advice on relevant conventions to assist in the integration of these into the legislative framework

FRENCH GUYANA

- Establishment of POLMAR TERRE for oil on the shore
- Development of a shoreline sensitivity map

GUYANA

- Immediate preparation of an Oil Spill Contingency Plan (notification; organization; resource inventory)
- Development of legislation to support response actions
- Identification of sensitive coastal areas
- Establish contact points within the Government for IMO and UNEP affairs

NETHERLANDS ANTILLES

- Adoption of the draft Oil Spill Contingency Plan
- Review of relevant IMO and UNEP Conventions
- Review of oil company plans for the future of their response capabilities

SURINAME

- Immediate preparation of an Oil Spill Contingency Plan (notification; organization; resource inventory)
- Development of legislation to support response actions
- Identification of sensitive coastal areas
- Development of IMO and UNEP contacts through relevant Government agencies

TRINIDAD AND TOBAGO

- Develop onshore and offshore training exercises
- Review of relevant conventions and development of supporting national legislation
- Request technical assistance to the planned 1986 Oil Spill Seminar

VENEZUELA

- Review of Oil Spill Contingency Plan
- Develop advanced training programmes (shoreline clean-up, on-scene co-ordination)
- Review relevant IMO conventions
- Development of legal support for Contingency Plan and for international conventions

It is evident that at the national level each country should identify a contact point for IMO and UNEP communications relating to marine pollution. Some countries already have such a focal point established. Others need to take this action so that relevant information can be directed to the responsible location for subsequent internal action. The establishment of internal contact points would be a key element towards regional and sub-regional co-operation. The most effective contact point is an inter-ministerial group, rather than one department, agency or person. It is recommended that such a group include representatives from the navy (or coast guard), environmental agencies, foreign affairs ministry and the local oil companies.

Where procedures exist to communicate and co-operate with neighbour states in the field of Search and Rescue we recommend that if there is no other existing structure or service for marine pollution that the Search and Rescue system of communication and co-operation should be used.

We recommend that bilateral agreements on co-operation to combat marine pollution be developed between neighbour states. The arrangements could include co-operation on information sharing, surveillance, reporting and training.

Co-operation can only be fully achieved if individual countries ratify and implement the Cartagena Convention and its Protocol (four of the seven countries in this sub-region have not ratified to date). At the more general level, only France and the Netherlands have a good record for the ratification and implementation of relevant IMO conventions. The remaining countries could request technical assistance to understand the technical, legal and financial aspects of the IMO conventions before they can consider ratification.

A basic need common to all of the sub-region is a shoreline response and clean-up manual that includes specific advice on mangroves, coral reef environments and estuaries. The Mission noted a considerable emphasis on marine rather than onshore operations and recommends that this imbalance could be corrected by a shoreline manual and by workshops that deal specifically with near-shore and onshore operations (for example: the IMO/UNEP/OAS workshop held in Barbados in 1983). In this context the problem of disposal of oily wastes from clean-up operations has not been fully considered by most states.

11.4 Recommended projects and activities

The mission recognized that it is possible to present an extensive list of recommendations and suggestions. It also recognized that a useful and practical approach would be to outline a programme of staged activities that would allow for the evolution of participating countries collectively and individually. On this premise, the following programme is proposed as a means of assisting the countries of the sub-region, as well as the region as a whole, in preparing for marine oil spills.

The primary objective of future programmes is to develop the response capability of individual states so that regional co-operation can evolve within the Caribbean Action Plan and the Protocol of the Cartagena Convention. It is suggested that the approach should be staged so that those countries which need to develop a minimum level of response capability can do so whilst the more advanced nations can focus on less fundamental activities. The recommended approach is to develop a series of co-operative programmes and individual projects. Each of these is a contribution to the long-range goals and meets either urgent needs or identifiable information deficiencies. To achieve collective development we recommend three long-range co-operative programmes:

- (1) Develop an Oil Spill Response Handbook or Manual for the Wider Caribbean region
- (2) Develop an Oil Spill Contingency Plan for the Atlantic Coast of the South American sub-region
- (3) Develop an Oil Spill Contingency Plan for the Caribbean Coast of the South American sub-region

The individual projects meet more specific needs and are designed to be of direct benefit to all or some of the states in the sub-region. Particular attention is paid to the need for an improved onshore response capability. Each of the programmes and projects is described on the following pages.

Considerable improvements can be made by states without external assistance. For example, (a) in the establishment of inter-ministerial groups to act as focal points for marine pollution and (b) to define sensitive coastal and marine environments. In some instances the recommendations at the national level outlined in Section 11.3 may benefit from external assistance. Such requests must originate from the state directly to an appropriate agency. If there is any doubt as to the correct procedure or contact, then the IMO Regional Consultant for Marine Pollution may be able to provide advice (see page 56).

TITLE 1: DEVELOPMENT OF AN OIL SPILL RESPONSE MANUAL FOR THE WIDER CARIBBEAN REGION

OBJECTIVE: Prepare a manual that would combine with sub-regional and national oil spill contingency plans to provide a broad co-operative response capability within the region for marine and coastal oil pollution.

SCOPE: The manual or handbook is envisaged to be a comprehensive document similar to the Bonne Agreement that would include the following:

(A) Information:

- IMO/UNEP contact points in each country
- List of responsible organizations (with their area of responsibility, contact name, telephone, telex, etc.) within each country
- Regional updated oil spill risk analysis
- Regional environmental sensitivity analysis
- Inventory of available spill response equipment and trained personnel

(B) Notification:

- Regional notification procedures
- Information format

(C) Organization:

- Regional command structure
- Regional operational structure
- Regional communications structure
- Summary of national oil spill contingency plans

(D) Compensation:

- Procedures for costs
- Procedures for financial assistance

(E) Guidelines:

- Summary of legal, administrative and financial agreements between states and an outline of international conventions

(F) Technical response manual:

- Operational methods at sea
- Dispersant use guidelines
- Shoreline clean-up methods
- Mangrove protection and clean-up
- River clean-up methods

(G) Environmental sensitivity of marine and coastal environments within the Wider Caribbean

BENEFITS: Although local and national planning are a critical element for oil spill control and clean-up in terms of response, notification and clean-up, in the event of large spills there exists a major benefit if resources and assistance can be provided from a larger co-operative group. In addition, projects which have a common benefit (such as technical workshops or a shoreline clean-up manual for mangroves) could be easily combined within the manual to provide a readily available technical information base for the region.

TIMING: Various components of the suggested manual are defined in projects recommended by this mission. We would advise a target completion date for the Manual of December, 1987.

TITLE 2: DEVELOPMENT OF A SPILL INFORMATION AND DATA BASE BY THE IMO REGIONAL CONSULTANT

OBJECTIVE: Consolidate relevant information on contacts, reporting and resources in a single document

SCOPE: Collect and then circulate to states within the Wider Caribbean region information on national:

- marine pollution contact or focal points and agencies responsible for marine pollution (including telephone and telex numbers, addresses and contact names)
- spill reporting and notification procedures
- spill response equipment and materials

BENEFITS: The primary purpose and benefit is to develop an information and contact list for all states within the region. Some aspects of the project have been covered by this mission and by other studies, but have not been consolidated in one report or at one location.

The resulting data base could form an important component of the proposed Wider Caribbean Oil Spill Response Handbook.

TIMING: The project could commence without delay and would be expected to be completed within 9 months.

RESPONSIBILITY: This project could be undertaken by IMO and assigned to be the ongoing responsibility of the regional consultant on marine pollution in the Caribbean area.

TITLE 3: ATLANTIC COAST SUB-REGIONAL OIL SPILL CONTINGENCY PLAN

OBJECTIVE: Provide the neighbouring states of Brazil, French Guyana, Suriname, Guyana, Trinidad/Tobago and Venezuela with the co-operative framework for surveillance, reporting, notification and response in the event of a marine oil spill.

SCOPE: Geographically encompass the coast between the Amazon river and the Peninsula de Paria, including the Gulf of Paria, south and east coasts of the island of Trinidad.

The plan could include sections on:

- potential sources of pollution
- spill risks
- predicted spill movements
- environmentally sensitive areas
- co-operative surveillance operations
- bilateral notification and reporting procedures
- response co-ordination
- available response resources

BENEFITS: The sub-regional plan is intended to provide support between neighbour states for spills that (a) may exceed local or national operational resources, or (b) extend across national boundaries. The plan would be at a more general level than the national contingency plans and would focus more on co-operative aspects of reporting and of operations. In addition to the obvious benefits that would result during a spill incident, there is the additional value of an information exchange between states with relatively advanced levels of spill technology and those which have a less well-developed knowledge base.

TIMING: The most important components (notification, reporting, contact points) could be set-up rapidly (within a few months). A full contingency plan could be completed by the end of 1987.

TITLE 4: SOUTHERN CARIBBEAN SUB-REGIONAL OIL SPILL CONTINGENCY PLAN

OBJECTIVE: Provide the neighbouring states of Venezuela, Netherlands Antilles (Aruba, Bonaire, Curaçao) and Colombia with the co-operative framework for surveillance, reporting, notification and response in the event of a marine oil spill.

SCOPE: The geographical coverage would extend from Trinidad/Tobago (excluding the Gulf of Paria, south and east coasts of Trinidad) to the west to include the Caribbean coast of Colombia. This area would encompass Tobago and all of the Venezuela coast west of Pta. Pidrás, including Lake Maracaibo, and would include Aruba, Bonaire, Curaçao and the islands of Colombia would be included in a separate sub-regional plan that would encompass a south-west Caribbean area (see Figure on page 57).

The plan could include sections on:

- potential sources of pollution
- spill risks
- predicted spill movements
- environmentally sensitive areas
- co-operative surveillance operations
- bilateral notification and reporting procedures
- response co-ordination
- available response resources

BENEFITS: The sub-regional plan is intended to provide support between neighbour states for spills that (a) may exceed local or national operational resources, or (b) extend across national boundaries. The plan would be at a more global level than the national contingency plans and would focus more on co-operative aspects of reporting and operations. In addition to the obvious benefits that would result during a spill incident, there is the additional value of an information exchange between states with relatively advanced levels of spill technology and those which have a less well-developed knowledge base.

TIMING: The most important components (notification, reporting, contact points) could be set-up rapidly (within a few months). A full contingency plan could be completed by the end of 1987.

TITLE 5: REVISION OF MARINE TRAFFIC PATTERNS AND OIL SPILL RISKS IN THE WIDER CARIBBEAN

OBJECTIVE: Update the study published by Reinburg in 1984.

SCOPE: The present study was based primarily on data current to 1981 or 1982. Since then considerable changes have taken place in traffic patterns and volumes, both within and outside the Caribbean region. The study would update the spill risk information base where necessary to more accurately reflect conditions in 1986.

BENEFITS: National, sub-regional and regional contingency planning is more realistic if based upon up-to-date information. Major changes, such as the closure of refineries and transfer facilities, or the recent reduction in production levels have caused significant alterations to marine spill risks which are not properly reflected in published sources. As new proposed efforts to respond to oil pollution emerge for the Caribbean area these can be best developed if based upon accurate information.

TITLE 6: SHORELINE OIL SPILL RESPONSE AND CLEAN-UP MANUAL FOR TROPICAL COASTS

OBJECTIVE: Prepare an operations manual for shoreline protection and clean-up of tropical coastal environments (specifically including mangroves)

SCOPE: The manual is envisaged to have a general applicability throughout the tropics. It could include the following:

- (A) Shoreline processes and shoreline types
- (B) Fate and persistence of stranded oil
- (C) The impact of stranded oil
- (D) Shoreline protection
 - operational decisions
 - choice of methods (containment : dispersion : removal)
 - implementation of methods
- (E) Shoreline clean-up
 - operational decisions
 - choice of methods (removal, dispersion, cleaning, mixing)
 - implementation of methods
 - impact of operations
 - disposal of oily waters

BENEFITS: There is a general lack of expertise and emphasis on shoreline spill response. At present no operational manuals provide adequate detail for use on the range of tropical shoreline types (including beach rock; mangroves; coral reefs). This manual would provide a concise guide for spill response decisions and for the selection of appropriate techniques in tropical environments. The manual could be used as part of training programmes as well as for spill operations.

TITLE 7: RIVER/TIDAL ESTUARY OIL SPILL RESPONSE AND CLEAN-UP MANUAL

OBJECTIVE: Prepare an operations manual for the protection and clean-up of river and tidal estuary environments.

SCOPE: The manual would be complimentary to the shoreline manual (project 6). Shoreline clean-up for mangroves would not be included except for cases specifically relevant to riverine or estuarine environments. The manual could include the following:

- (A) Oceanographic processes and estuarine environments
- (B) River systems, river processes and river shorelines
- (C) Fate and persistence
- (D) Shoreline protection
 - operational decisions
 - choice of methods (containment : dispersion : removal)
 - implementation of methods
- (E) Shoreline clean-up
 - operational decisions
 - choice of methods (removal, dispersion, cleaning, mixing)
 - implementation of methods
 - impact of operations
 - disposal of oily waters

BENEFITS: As with the previous project on tropical shorelines, there exists no suitable decision or operations manual that can assist during training operations or spill operations. This manual would have a general application beyond tropical environments.

TITLE 8: THE EFFECTS OF THE GUYANA CURRENT ON MARINE OIL SPILLS

OBJECTIVE: Define the meteorologic and oceanographic conditions under which a marine oil spill would reach the coast between the Amazon river and Trinidad/Tobago.

SCOPE: Based on existing techniques, it is possible to define those conditions under which oil would be kept offshore by the Guyana Current or would be forced into the coastal zone to impact the shoreline. This study would therefore define whether or not a spill would reach the coast and would or would not therefore involve a response operation. The study would be based on existing meteorologic and oceanographic data. It would involve a theoretical evaluation of the problem and a practical application to the area in question.

BENEFITS: If it is possible to evaluate how a marine spill will move and whether or not it will impact sensitive coastal or marine environments, then available resources can be activated if necessary. Clearly the knowledge that a spill may not affect critical areas can result in immense savings of energy and money. (c.f. the "Argo Merchant" incident).

12. REFERENCES

12.1 Citations

- Bird, E.C. and Schwartz, M.L., (Eds.), 1985. The World's Coastline, Van Nostrand Reinhold Co., New York, 1071 p.
- Chapman, V.J. (Ed.), 1977. Ecosystems of the World: 1 - Wet Coastal Ecosystems. Elsevier, 428 p.
- Davies, J.L., 1980. Geographical Variation in Coastal Development (2nd Edition), Longman, 212 p.
- Dolan, R., Hayden, B., Hornberger, G., Zieman, J. and Vincent, M., 1972. Classification of the Coastal Environments of the World: Part 1 - The Americas. Tech. Rept. No. 1, Dept. Environ. Sci., Univ. Virginia, 163 p.
- IMO, 1983. Workshop Notes and Field Guide for IMO/UNEP/OAS Workshop on Oil Spills and Shoreline Clean-up in the Islands of the Wider Caribbean region, Bridgetown, Barbados, Jan-Feb, 1983. Project No. FP/0503-82-13 (2393), 186 p.
- McGill, J. T., 1958. Map of Coastal Landforms of the World. Geographical Review No. 48, p 402-505.
- Moller, T.H. and Giulini, L.T., 1983. Oil Spill Control on the Caribbean Coasts of Mexico, Panama and Central America. Mission Report to IMO London, 67 p.
- National Research Council, 1985. Oil in the Sea: Input, Fate and Effects. National Academy Press, Washington, D.C., 601 p. (published by John Wiley and Sons Ltd.).
- Reinburg, L., 1984. Waterborne Trade of Petroleum and Petroleum Products in the Wider Caribbean Region. Final report to US Coast Guard, Washington, D.C., Contract No. DTCG-23-84-C-40018, 118 p.
- Rine, J.M. and Ginsburg, R.W., 1985. Depositional Facies of a Mud Shoreface in Suriname, South America - a mud analogue to sandy shallow-marine deposits. Journal of Sedimentary Petrology, Vol. 55, p 633-652.
- Spitzer, J.D., 1985. Developing Marine Pollution Response Capability in the Wider Caribbean Region. Proc. 1985 Oil Spill Conf., Los Angeles, California, Amer. Petr. Instit. Pub. No. 4385, p 127-134.
- Wells, J.T. and Coleman, J.M., 1981. Periodic Mudflat Progradation, Northeastern Coast of South America: a hypothesis. Journal of Sedimentary Petrology, Vol. 51, p 1069-1075.

12.2 IMO/OAS/UNEP publications and reports

- International Maritime Organization (IMO), 1977. Conference on the Establishment of an International Compensation Fund for Oil Pollution Damage, 1971. Publication 420, 72.10.8, IMO, London.
- IMO, 1977. International Convention on Civil Liability for Oil Pollution Damage. Publication 410, 77.16.E, IMO, London.
- IMO, 1977. International Conference on Marine Pollution, 1973. Publication 520, 77.14.E IMO, London, 168 p.

IMO, 1977. International Convention relating to Intervention on the High Seas in cases of Oil Pollution Casualties, 1969. Publication 402, 77.15.E, IMO, London.

IMO, 1978. International Conference on Tanker Safety and Pollution Prevention, 1978. Publication 088, 78.09.E, IMO, London, 106 p.

IMO, 1980. Marine Pollution Prevention and Control. Mission Report of the Inter-Regional Consultant on Marine Pollution to the Republic of Guyana, Project No. A6/A//UNDP/INT/MAR/POL., IMO, London, 32 p.

IMO, 1982. Inter-governmental Conference on the Convention on the Dumping of Wastes at Sea. Publication 532, 82.03.E, IMO, London, 32 p.

IMO, 1983. International Convention for the Prevention of Pollution of the Sea by Oil, 1954, as amended in 1962 and 1969. Publication 500, 81.06.E and supplement Publication 504, 81.07.E, IMO, London, 21 p.

IMO, 1984. Report on IMO/OAS/UNEP/MAB Government Experts Meeting on Sub-regional Oil Spill Contingency Planning for the Island States and Territories of the Wider Caribbean Region, Saint Lucia, May 7-11. IMO, London.

Organization of American States (OAS), 1979. Framework of a Caribbean Regional Oil Spill Control Plan - Meeting of Task Force on Coastal Pollution and Oil Spill Control, Port of Spain, Trinidad and Tobago, May 7-11, 1979. OAS, Washington, D.C.

OAS, 1980. Report on OAS/IMO/UNEP/USMAB Meeting of the Smaller Caribbean Islands on Oil Spill Contingency Planning, San Juan, Puerto Rico, June 16-20, 1980. OAS, Washington, D.C.

OAS, 1980. Report on OAS/IMO/UNEP/MAB Meeting of Caribbean Islands on Oil Spill Contingency Planning, Bridgetown, Barbados, November 24-28, 1980. OAS, Washington, D.C.

OAS, 1982. Report on OAS/IMO/USAID/Government of Puerto Rico Workshop on Oil Pollution Regulations and Enforcement, San Juan, Puerto Rico, October 11-15, 1982. OAS, Washington, D.C., 34 p.

OAS, 1983. Report on OAS/IMO/UNEP Seminar-Workshop on Preparation of the Sub-regional Emergency Plan for Control of Oil Spills in Mexico, Central America and Panama, Panama City, Panama, October 24-29, 1983. OAS, Washington, D.C., 47 p.

OAS, 1984. Seminar on Marine Pollution Response, Tampico, Mexico, October 1-5, 1984. OAS, Washington, D.C.

United Nations Environment Programme (UNEP), 1980. Report of the Meeting of Government Nominated Experts to Review the Draft Action Plan for the Wider Caribbean Region, Caracas, Venezuela, January 28-February 1, 1980. UNEP, Nairobi.

UNEP, 1981. Report on Second Meeting of Government Nominated Experts to Review the Draft Action Plan for the Wider Caribbean Region, Managua, Nicaragua, February 23-27, 1981. UNEP, Nairobi.

UNEP, 1981. Report of the Inter-governmental Meeting on the Action Plan for the Caribbean Environment Programme, Montego Bay, Jamaica, April 6-8, 1981. UNEP, Nairobi.

UNEP, 1981. Report of Meeting of Legal Experts on the Draft Regional Arrangements for the Wider Caribbean Region, New York, December 7-11, 1981. UNEP, Nairobi.

- UNEP, 1981. Report of the Meeting of the Monitoring Committee on the Action Plan for the Caribbean Environment Programme, New York, December 14-16, 1981. UNEP, Nairobi.
- UNEP, 1982. Achievements and Planned Development of UNEP's Regional Seas Programme and Comparable Programmes sponsored by other bodies. UNEP Regional Seas Reports and Studies No. 1, Regional Seas Programme Activity Centre, Geneva, Switzerland, 65 p.
- UNEP, 1982. Report of the Second Meeting of Experts on Draft Regional Arrangements for the Wider Caribbean Region, New York, July 7-16, 1982. UNEP, Nairobi.
- UNEP, 1983. Action Plan for the Caribbean Environment Programme. UNEP Regional Seas Reports and Studies No. 26. Regional Seas Programme Activity Centre, Geneva, Switzerland, 19 p.
- UNEP, 1983. Report of the Third Meeting of Experts on the Draft Regional Arrangements of the Wider Caribbean region, Cartagena de Indias, March 14-19, 1983. UNEP, Nairobi.
- UNEP, 1983. Report of the Second Meeting of the Monitoring Committee on the Action Plan for the Caribbean Environment Programme, Cartagena de Indias, March 18-19, 1983. UNEP, Nairobi.
- UNEP, 1983. Report of the Second Inter-governmental Meeting on the Action Plan for the Caribbean Environment Programme, Cartagena de Indias, March 24-26, 1983. UNEP, Nairobi.
- UNEP, 1983. Convention on the Protection and Development of the Marine Environment of the Wider Caribbean Region. Protocol concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region, United Nations, New York, 25 p.
- UNEP, 1983. Report of the Third Meeting of the Monitoring Committee on the Action Plan for the Caribbean Environment Programme, Havana, Cuba, November 8-10, 1983. UNEP, Nairobi.

12.3 Recommended spill-related publications

(a) Contingency planning

1. Manual on Oil Pollution: Section 11 (Contingency Planning). June, 1978 - available from IMO, London. Provides guidelines on methods for establishing a response organization and preparing a national or local contingency plan.
2. Sub-regional Oil Spill Contingency Plan for the Island States and Territories of the Wider Caribbean Region: Report of IMO/OAS/UNEP Meeting: St. Lucia, 7-11 May, 1984 - available from IMO, OAS or UNEP. Reports on the meeting discussions and reviews the status of oil spill contingency planning in the area; presents a recommendation on the sub-regional oil spill contingency plan.

(b) Oil Spill Response

1. IMO Manual on Oil Pollution: Section IV (Practical Information on Means of Dealing with Oil Spillages). February, 1980 - available from IMO, London. Reviews the behaviour of oil spills at sea, methods of containment and removal from the sea surface, shoreline clean-up and the disposal of oil and oily debris.
2. A Field Guide to Coastal Oil Spill Control and Clean-up Techniques: 1981 Report No. 9/81 - Available from CONCAWE, Den Haag, Netherlands.
3. Manual of Practice for Protection and Clean-up of Shorelines: August, 1979 - 2 volumes. Report No. EPA-600/7-79-187 by the US Environmental Protection Agency. Available from National Technical Information Service, US Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161, USA.
4. Protection, Clean-up and Restoration of Salt Marshes Endangered by Oil Spills - a Procedural Manual: November, 1978. Report No. EPA-600/7-78-220 by the US Environmental Protection Agency. Available from National Technical Information Service, US Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161, USA. This report also includes mangrove environments.
5. A Catalogue of Oil Spill Containment Barriers: 1983: Report No. EPS-3-EC-83-5. Available free of charge from Environmental Protection Service, Environment Canada, Ottawa, Canada.
6. A Catalogue of Oil Skimmers: 1983: Report No. EPS-3-ED-83-1. Available free of charge from Environmental Protection Service, Environment Canada, Ottawa, Canada.
7. IMO/UNEP Guidelines on Oil Spill Dispersant Application and Environmental Consideration: 1982. Available from IMO, London. Contains practical information on the use of dispersants for dealing with oil spills at sea.
8. Manual of Practice - Chemical Agents in Oil Spill Control: June, 1982. Report No. EPA-600/8-82-010 by the US Environmental Protection Agency available from National Technical Information Service, US Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161, USA.
9. Oil Spill Chemical Dispersants: 1982. Tom E. Allen, Editor. ASTM Special Tech. Publication No. 840. ASTM, 1916 Race Street, Philadelphia, PA 19103. USA. Proceedings of October, 1982 Symposium. Useful state-of-knowledge compendium of papers.
10. The Basics of Oil Spill Clean-up: 1979. Environment Canada. Available from Minister of

Supply and Services, Ottawa, Canada. Catalogue No. En 40-311/1978. An excellent primer, focuses on southern Canada but has wider application.

11. Workshop Notes and Field guide for IMO/UNEP/OAS Workshop on Oil Spills and Shoreline Clean-up in the Islands of the Wider Caribbean Region. 1983. IMO Project No. FP/0503-82-13 (2393), Bridgetown, Barbados, Jan-Feb, 1983. 186 p. Available from IMO, London and UNEP, Nairobi.

(c) Inland spills

Revised Inland Oil Spill Clean-up Manual: CONCAWE Report No. 7/81, 149 p. Available from CONCAWE, Den Haag, Netherlands.

(d) Disposal

Disposal Techniques for Spilt Oil. CONCAWE Report No. 9/80, 51 p. Available from CONCAWE, Den Haag, Netherlands.

(e) Fate and effects

1. Oil in the Sea: Input, Fate and Effects: 1985. National Academy Press, Washington, D.C. USA. 601 p. Distributed by John Wiley and Sons Ltd. Excellent, comprehensive up-to-date summary of the state of knowledge.
2. The Fate of Petroleum in the Marine Environment: August, 1978. R. B. Wheeler. Special Report, Exxon Production Research Co.
3. Restoration of Habitats Impacted by Oil Spills: 1984. J. Cairns & A.L. Buikema (eds), Butterworth Publishers, Boston/London, 182 p.
4. The Effects of Weather Systems, Currents and Coastal Processes on Major Spills at Sea. S.P. Murray, pages 169-227 in G. Kullenberg, 'Pollutant Transfer and Transport in the Sea', 1982. CRC Press Inc., Boca Raton, Florida, USA. Detailed review of state-of-knowledge on the movement of oil on the sea by meteorologic and oceanographic forces.

(f) Summary papers

Technical Information Papers Series

Available from the International Tanker Owners Pollution Federation Ltd., Staple Hall, 87-90 Houndsditch, London EC3A 7AX.

1. Aerial Observations of Oil at Sea
2. Use of Booms in Combating Oil Pollution
3. Aerial Application of Oil Spill Dispersants
4. Use of Oil Spill Dispersants
5. Use of Skimmers in Combating Oil Pollution
6. Recognition of Oil on Shorelines
7. Shoreline clean-up
8. Disposal of Oil and Debris
9. Contingency Planning for Oil Spills
10. Effects of Marine Spills

Note: (i) Also available in other languages

(ii) ITOPF will also have training films and video-tapes on oil spill response available in the near future.