

Overview of the Sub-regional Preliminary Transboundary Diagnostic Analyses for the Caribbean Large Marine Ecosystem and its Adjacent Region, the North Brazil Shelf



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1. Introduction

Many living marine resources in the Caribbean Region are in a state of crisis, largely as a consequence of human activities. The majority of the human population in the Caribbean region lives in the coastal zone, and there is high dependence on living marine resources and on the marine environment for employment and food, as well as for tourism. There is also high demand for seafood in the tourism industry, a mainstay of the economy in many of the region's countries. Some species, such as lobster, shrimp and conch, are in high demand for export. Most of the coastal fishery resources are intensively exploited by large numbers of small-scale fishers, a consequence of which is widespread depletion of these coastal resources. This situation must be reversed in accordance with the targets identified at the World Summit on Sustainable Development (WSSD) in 2002.

The decline of coastal resources has led to increasing dependence and growing fishing pressure on offshore fisheries resources, some of which are already considered to be fully or overexploited. Other living resources such as mangroves, seagrass beds and coral reefs and some associated reef organisms, which should be considered as non-extractable, are also under threat from human activities and natural environmental variability such as global warming. Coral reefs are extremely important for tourism economies and, together with mangroves and seagrass beds, provide important ecosystem services such as coastal stabilization and defense against sea level rise and storm surges, and nursery areas for commercially and ecologically important species. However, these habitats are also severely degraded by human activity and require urgent attention for restoration.

The fact that many of the living marine resources of the Caribbean LME and its adjacent region, the North Brazil Shelf, are shared between the countries suggests that ecosystem management and the recovery of depleted fish stocks will require cooperation at several geopolitical scales. However, the institutional, legal and policy frameworks or mechanisms for managing shared living marine resources across the region are inadequate.

This is compounded by the limited capacity at the national level and gaps in data and information, particularly related to the transboundary distribution, dispersal and migration of the marine organisms and the impact of changes in productivity and climate, as well as integrated biogeophysical, social and economic data. Such data and information are essential to better understand the functioning of the marine ecosystems and the effectiveness of management decisions; long-term programmes to collect and integrate such data are critical. In cases where information exists, it is often not easily or readily accessible or available for region-wide decision-making. These deficiencies in data and information, coupled with the lack of an effective mechanism for shared living marine resource governance, result in major challenges that must be addressed if the goal of ecosystem management of transboundary resources and the relevant WSSD targets are to be achieved.

National governments within the Wider Caribbean have acknowledged that the current state of the Caribbean Sea requires immediate attention and action. To address the various concerns, the countries have undertaken a number of initiatives and have succeeded in obtaining financial assistance from the Global Environment Facility (GEF) under its International Waters focal area, for the Caribbean Large Marine Ecosystem (CLME) Project entitled "The sustainable management of the shared living marine resources of the Caribbean Large Marine Ecosystem and its adjacent region".

This overview paper outlines the approach and findings of a preliminary transboundary diagnostic analysis (TDA) conducted during the Project Development Facility – Block B (PDF-B) Phase of the CLME Project¹.

2. Methodology

A TDA is a scientific and technical assessment through which the water-related environmental issues and problems of an LME are identified and quantified, their causes analyzed and their social, economic, environmental and institutional impacts

¹ A PDF Block B grant of US\$700,000 was provided to IOC (UNESCO) to assist the countries in the collection of information and supporting documentation necessary to complete a Full-Sized Project proposal to GEF.

assessed. It uses the best available verified scientific and technical information to assess the state of the environment and the root causes of its degradation. The analysis is carried out cross-sectorally, focusing on transboundary problems without ignoring national concerns and priorities.

The preliminary TDA of the Caribbean LME and the adjacent North Brazil Shelf will be updated and completed during the full-sized project. Additionally, given the complexity and diversity of the region in terms of its biogeophysical, socio-economic, legislative and cultural characteristics, the CLME Regional Steering Committee approved a sub-regional approach to assessing the status of the region's living marine resources.

Information needed to assess the status of each of the three sub-regions (Insular Caribbean; Central South America; and Guianas-Brazil Shelf), major areas of concern, possible causes and potential impacts were discussed at the TDA Training/Kick-Off Session Regional Workshop in October 2006. Participants at the workshop were members of the CLME Technical Task Team, and consisted of technical experts from throughout the region. These included persons nominated by their national governments to contribute to the preliminary assessment of their respective sub-regions, experts from academia, regional living marine resource management organizations, non-governmental organizations (NGOs), international consulting companies and UN agencies.

Recognizing the extensive effort of previous relevant assessments within the region, the CLME experts unanimously agreed that the CLME Project should build on the findings of these assessments. Therefore, in identifying major transboundary areas of concern within the geographic scope of the CLME Project, the results of previous sub-regional stakeholder-based assessments, including the Global International Waters Assessment (GIWA²) project, were used as a starting point for discussion at the October Workshop. GIWA used a network of regional experts in natural and environmental science, sociology, economics and health sciences with representatives from all the countries on a given sub-regional task team. The GIWA experts

came from government agencies, academia, the private sector and other organizations in which knowledge resides (Daler *et al.* 2001). Thus, many of the CLME technical experts had also been members of the GIWA Network and other region-wide networks such as the White Water to Blue Water network³ and UNEP's Global Environment Outlook (GEO) network for Latin America and the Caribbean⁴. GIWA used four sub-regions (Small Islands; Colombia/Venezuela; Central America and Mexico; and the Caribbean Islands of the Greater Antilles and the archipelago of the Bahamas), with which two of the sub-regions of the CLME Project (Insular Caribbean and Central/South America) overlap.

The approach of the GIWA sub-regional task teams was future-oriented and policy-based, focusing on major environmental concerns, trends and emerging issues along with their causes and socio-economic impacts. While this information provided critical background knowledge on the CLME Project area, the emphasis of the CLME Technical Task Team was on the identification of current major transboundary areas of concern that negatively impacted the sustainability of the region's living marine resources. Given the significance of these resources to the social, cultural and economic well-being of the Caribbean people, the CLME Technical Task Team focused on understanding of the linkages between the identified problems and their underlying societal root causes, as well as the preliminary identification of possible solutions to address the problems. Given that the TDA is not a negotiated document but an objective assessment of the priority areas of concern and their causes, the preliminary TDA was not expected to focus on recommendations for strategic action.

Information generated at the October workshop was subsequently enhanced through a suite of thematic reports prepared by regional/international experts, with input from the CLME Technical Task Team. These reports were then examined at a regional Project Concept/TDA Synthesis Workshop (February/March 2007) at which participants included more than fifty experts from throughout

³ <http://www.wv2bw.org>, accessed April 8, 2007

⁴ <http://www.grid.unep.ch/activities/assessment/geo/>, accessed April 24, 2007

² <http://www.giwa.net>, accessed April 8, 2007

the region. The outputs of the workshop included an approved Full-Sized Project Concept paper and revised preliminary assessments for the three CLME project sub-regions.

The current preliminary TDA for the CLME Project was designed to consist of:

1. A synthesis of the major transboundary issues within each of the three sub-regions, a preliminary assessment of root causes and suggested options for further consideration and inclusion in a strategic action programme (SAP);

2. Specific information on each of the three sub-regions regarding the issues, problems, possible causes, potential environmental impacts, socio-economic consequences and options to address these problems, presented in the following reports:

- Thematic Report for the Central/South America Sub-region;
- Thematic Report for the Guianas-Brazil Sub-region;
- Thematic Report for the Insular Caribbean Sub-region.

Additional background technical reports developed by regional/international experts and the CLME Project Coordinating Unit to provide supporting information for the preliminary TDA and Full-Sized Project document include:

- Report on Fisheries Governance for the CLME and Adjacent Regions;
- Report on Transboundary Non-Extractable Living Marine Resources/Biodiversity Governance and Monitoring and Reporting for the Caribbean LME and Adjacent Regions;
- Preliminary Stakeholder Assessment.

Additional information on the CLME Project, current status, ongoing work and upcoming activities is provided in the following documents, available on the project website at <http://www.cavehill.uwi.edu/cermes/clme.html>:

- Report of the Inter-Agency Consultation Meeting, Panama, April 2006;
- Report of the First Regional Steering Committee Meeting, Panama, August 2006;

- Approved PDF-B Project Implementation Plan, August 2006;
- Report of the TDA Training Workshop and Kick-Off Session, Barbados, October 2006;
- Technical reports in support of the Project Concept/TDA Synthesis Workshop on the project components;
- Approved Project Overview Paper, March 2007;
- Report of the Project Concept/TDA Synthesis Workshop, Jamaica, March 2007 (pending).

3. Description of the Basin

The Wider Caribbean Region (WCR) extends from the mouth of the Amazon River, Brazil, through the Insular Caribbean, Central America, the Gulf of Mexico and along the east coast of North America to Cape Hatteras. This area also corresponds to the region covered by the FAO Western Central Atlantic Fishery Commission (WECAFC). Within the WCR are three large marine ecosystems (LMEs): The Gulf of Mexico LME, the Caribbean Sea LME, and the North Brazil Current LME (Figure 1) with a total area of approximately 15 million km² of which some 1.9 million km² is shelf area (Breton *et al.* 2006). These LMEs are closely linked, particularly the latter two, as the oceanography of the Caribbean Sea is strongly influenced by the highly productive upstream North Brazil Shelf LME. The Gulf of Mexico LME is most influenced by inputs from the Mississippi and other North American rivers. The drainage basin of the Wider Caribbean covers 7.5 million km² and encompasses eight major river systems, from the Mississippi to the Orinoco (Hinrichsen 1998).

The boundaries of the CLME Project do not include the Gulf of Mexico LME, which has its own GEF-funded International Waters project. The CLME Project encompasses the Caribbean Sea LME and the North Brazil Shelf LME and includes 26 countries and 19 dependent territories of France, the Netherlands, United Kingdom and United States (Annex 1). These countries range from among the largest (e.g. Brazil, US) to among the smallest (e.g. Barbados, St. Kitts and Nevis), and from the most economically developed to the least developed.

Sixteen of the islands are considered small island developing states (SIDS).

The following concise overview of the physical and geographic characteristics, the socio-economic situation and ecological status of the CLME Project area is based on information provided in the GIWA Caribbean Sea assessment (UNEP 2004a, UNEP 2004b, UNEP 2006), GEO assessment for Latin America and the Caribbean (UNEP 2000), other regional documents including the Caribbean Sea Ecosystem Assessment (CARSEA), CLME reports and submissions and the NOAA LME website⁵.

3.1 Physical and geographical characteristics

Despite the connectivity between the two LMEs comprising the CLME Project (the Caribbean LME and the North Brazil Shelf LME), each has distinctly different physical and geographical characteristics.

The Caribbean Sea is a semi-enclosed ocean basin encompassing an area of 2 515 900 km², making it the second largest sea in the world (Bjorn 1997, Sheppard 2000, IUCN 2003). Its average depth is 2 200 m, with the deepest part, known as the Cayman Trench, plunging to 7 100 m. The Caribbean Sea is noted for its many islands, and is bounded by the islands of the Lesser Antilles to the east and southeast, the islands of the Greater Antilles (Cuba, Hispaniola and Puerto Rico) to the north, and by Central and South America to the west and southwest (Figure 2). It is located within the tropics, with surface water temperature ranging from a minimum of 3° Celsius and an annual average of 27° Celsius.

The region was formed during the Jurassic period. With the division of the mega-continent Pangaea 180 million years ago came the separation of the lands that would become North and South America. The subduction of the Cocos and Nazca plates and the continuous collision of continental plates produced continental and submarine mountain ranges including the rise of Central America, which formed a biogeographical bridge, allowing the migration of floral and faunal species between

North and South America – an important factor in the region's high biodiversity (Windevoxhel 2003). Three main rock types dominate the coastline: limestone, igneous rock and eolianite or beach rock. In addition, there are unconsolidated deposits such as beaches, alluvial fans, alluvial plains and dunes (Sheppard 2000).

The Caribbean Current transports water northwestwards through the Caribbean Sea and into the Gulf of Mexico, via the Yucatan Channel (Figure 3). The source of the Caribbean Current is the equatorial Atlantic Ocean via the North Equatorial, North Brazil and Guyana Currents. Water flows into the Caribbean Sea mostly through the Grenada, Saint Vincent and Saint Lucia passages in the southeast, continuing westward as the Caribbean Current – the main surface circulation in the Caribbean Sea. The strongest flow is found in the southern one-third of the Sea and belongs to the Caribbean Current (Gyory *et al.* 2004). In this area, surface velocities can reach 0.7 ms⁻¹ along the coasts of Venezuela and the Netherlands Antilles. There are also strong currents (0.6 ms⁻¹) along the Panamanian and Colombian coasts, but there is little flow over the Central American Rise, since most of the northwestward flow is channeled to the southwest of Jamaica. The flow turns sharply westwards as it crosses the Cayman Basin and enters the Gulf of Mexico through the Yucatan Channel as a narrow boundary current, called the Yucatan Current, which hugs the Yucatan Peninsula (Gyory *et al.* 2004).

The winds in the Caribbean Sea region generate a circulation cell where deep waters upwell along the north coast of South America and surface waters (enriched by upwelling and by discharges from the Orinoco River) are advected northwards into the region, especially during the rainy season. In agreement with Sheppard (2000), satellite images in the visible spectrum clearly show the meridional spreading of green water in the eastern Caribbean. Tidal currents are the dominant component of the offshore currents superimposed on the mean circulation. Tides throughout the northeast Caribbean Sea exhibit a complex behaviour. Caribbean waters are well stratified, with water at different depths moving in different directions. The structure and composition of the Caribbean's

⁵ <http://na.nefsc.noaa.gov/lme> , accessed April 9, 2007.

surface water follows a well-defined seasonal pattern (Sheppard 2000).

The adjacent region of the North Brazil Shelf LME is also characterized by its tropical climate. The LME owes its unity to the North Brazil Current (NBC), which flows parallel to Brazil's coast and is an extension of the South Equatorial Current coming from the east. Large anticyclonic rings shed by the current swirl northwestwards along the South American coast, often reaching the eastern edges of the Lesser Antilles, where they eventually become absorbed into the Caribbean and Florida Currents.

Defined and influenced by the NBC, the North Brazil Shelf LME extends along northeastern South America from the Parnaíba River estuary in Brazil to the boundary with the Caribbean Sea and has a surface area of about 1.1 million km². Shelf topography and external sources of material, particularly the Amazon River with its average discharge of 180 000 m³s⁻¹, exert a significant influence on the marine ecosystem. Amazon discharge is complemented by that from other rivers such as Tocantins, Maroni, Corentyne and Essequibo.

The LME is characterized by a wide shelf, and features macrotides and upwellings along the shelf edge. It has moderately diverse food webs and high production due in part to the high levels of nutrients coming from the Amazon and Tocantins rivers, as well as from the smaller rivers of the Amapa and western Para coastal plains.

3.2 Socio-economic situation

The physical expanse of the region's coastal zone is significant, encompassing the entire land mass for many of the islands. Additionally, for countries such as the island nations of the Caribbean, Panama and Costa Rica, marine territory represents more than 50 per cent of the total area under national sovereignty. In general, the region's coastal zone is where the majority of its human population lives, and where most economic activities also take place.

In 2001, the population of the Caribbean Sea region was around 74 million, with 82 per cent in Colombia and Venezuela, 13 per cent in Central America and Mexico, and 5 per cent in the Small Islands. The population in these sub-regions shows different trends in population growth. While in

Colombia, Venezuela and Central America the average annual growth rate is close to 2 per cent (1996-2002), in the Small Islands it is less than 1 per cent (Source: GIWA Caribbean Sea Assessments; Data for Aruba, Cayman Islands, Guadeloupe, Martinique, Montserrat, Netherlands Antilles and Turks and Caicos are not included).

The population distribution also varies considerably throughout the region. In the Insular Caribbean, 28 million of the estimated 35 million people inhabit the two large islands of Cuba and Hispaniola (Breton *et al.* 2006). A similar contrast in population distribution is noted in the Central American states as compared to the large coastal cities found in Mexico, both on the Caribbean and Gulf of Mexico coasts.

Taking into account the population growth rate for each country in the Caribbean Sea region, it is expected that the number of inhabitants would be close to 89.2 million in 2020 (Source: GIWA Caribbean Sea Assessments; data for Aruba, Cayman Islands, Guadeloupe, Martinique, Montserrat, Netherlands and Antilles; Turks and Caicos are not included). When the population for Guyana, Suriname, French Guiana and the regions of Brazil and Florida that comprise the CLME Project are included, this number increases to approximately 100 million.

Additionally, the population in the Caribbean Sea region swells during the tourist season by the influx of millions of tourists, mostly in beach destinations. In 2004, the Mexican State of Quintana Roo received 10.8 million tourists with over 35 per cent of those arriving by cruise ships⁶. Almost all the countries in the region are among the world's premier tourism destinations, providing an important source of national income. At the same time, tourism investments also lead to important land use changes in coastal areas.

Many rural coastal areas are experiencing a gradual shift from dependence on local fisheries and agriculture towards the provision of tourism services and related activities. In 2001, all of the smaller Caribbean islands, except Trinidad and Tobago, depended on the service sector for between 60 to 80 per cent of their GDP, exceeding 90 per

⁶ <http://na.nefsc.noaa.gov/lme>, accessed April 9, 2007.

cent in the Cayman Islands, Martinique and the British Virgin Islands. This shows the high dependence of the region's economy on the service sector, particularly tourism, where 1 857 000 persons were estimated to be employed throughout the region in 2003 (CARSEA 2003). In Panama, 77 per cent of foreign exchange earnings come from the service sector, mainly shipping and banking.

Those countries where tourism and financial services are well developed have the highest per capita income (CIA 2007⁷). For example, the Cayman Islands and the British Virgin Islands recorded per capita GDPs of US\$43 800 and US\$38 500 respectively in 2004. In contrast, countries such as Haiti, Guyana and the small islands of Dominica and St. Lucia reported per capita GDP of US\$1 800, US\$4 700, US\$3 800 and US\$4 800 respectively. Thirteen of the countries are classified as middle-income countries and nine have per capita incomes above the average for middle-income countries, notably Barbados and Trinidad and Tobago, with a per capita GDP of US\$18 000 and US\$19 700, respectively.

Dependence on preferential trading arrangements, tourism and overseas development assistance has made most States vulnerable to external developments. The region has benefited from preferential trade schemes adopted by the United States, Canada and the European Union. In the case of the European Union, the Lomé Convention has provided free access to the European market for some products, as well as financial and technical assistance. Some Caribbean countries have had easier access to European Union markets than lower-cost competitors elsewhere in the region, although challenges to this preferential status are frequent.

Marine transportation of goods and tourists, and the resulting high traffic of vessels using the region's shipping lanes is a key activity. The 80 km long Panama Canal remains the principal global focus of maritime trade in the region, handling some 14 000 vessels each year. This represents approximately five per cent of total world trade⁸. Expanding ports

and maritime trade are often accompanied by intensified transportation corridors in coastal ocean areas, as is happening off Brazil. The transshipment of certain hazardous goods through the Caribbean Sea to global destinations is of concern, due to the environmental risks in the event of accidents involving the spillage of nuclear wastes, hydrocarbons or other toxic material. This would have significant ecological and socio-economic consequences to the countries in the region.

As previously mentioned, there is a high dependence on living marine resources for food, employment and income from fishing and tourism, particularly among the SIDS. The number of people actively involved in fisheries was estimated by CARSEA (2003) to be approximately 505 000 in the 1990s, a doubling of the numbers involved during the 1980s. Agriculture is still a significant export earner and means of livelihood in several countries, particularly for the Greater Antilles and the continental countries. Sugar and bananas are the most important agricultural products. In most of the continental countries and in the case of Trinidad and Tobago, the importance of the manufacturing and mining (including petroleum) sector is significant.

Over the past decade, the Caribbean countries have undertaken a number of economic reforms, with mixed results. For most countries, growth rates were positive during the 1990s, with most economies rebounding in 1996 and 1997 due to the improved performance of exports in general, and tourism and free trade zones in particular. However, economic growth has failed to keep pace with population growth in many of the countries and widespread poverty still exists, with some 38 per cent of the population in the Caribbean region classified as poor. With the urban population forecast to rise from 62 per cent in 1995 to 69 per cent by 2010 (United Nations Population Division 1997), urban poverty among the countries in the CLME Project area is of increasing concern.

The region is highly susceptible to natural disasters. Most of the islands and the Central American countries lie within the hurricane belt and are vulnerable to frequent damage from strong winds and storm surges. Recent major natural disasters include Hurricanes Gilbert (1988) and Hugo (1989), the eruptions of the Soufriere Hills Volcano in Montserrat (1997) and the Piparo Mud Volcano in

⁷ <https://www.cia.gov/cia/publications/factbook/index.html> , accessed April 24, 2007.

⁸ <http://www.pancanal.com> , accessed April 10, 2007

Trinidad (1997), as well as drought conditions in Cuba and Jamaica during 1997- 1998, attributed to the El Niño phenomenon. More recently Hurricane Georges devastated large areas, as did Hurricanes Mitch and Ivan (2004). In the case of Ivan, damages were extensive to both natural and infrastructural assets, with estimates reported by Grenada of US\$815 million, the Cayman Islands US\$1.85 billion, Jamaica US\$360 million and Cuba US\$1.2 billion⁹. Although the intense category 5 hurricanes Katrina and Rita did not make landfall in the Caribbean, in 2005, Hurricane Wilma devastated the Yucatan peninsula and has the distinction of being the most intense hurricane on record in the Atlantic.

There is an extremely wide variation in the level of the countries' capacities for living marine resource management. The region is also characterized by a diversity of national and regional governance and institutional arrangements, stemming primarily from the governance structures established by the countries that once colonized the region.

3.3 Ecological status

Productivity

There is considerable spatial and seasonal heterogeneity in productivity throughout the region. Areas of high productivity include the plumes of continental rivers, localized upwelling areas and nearshore habitats (e.g. reefs, mangrove forests and seagrass beds). From a site-specific perspective, the region's coastal habitats are largely influenced by the physical characteristics, including its geology, oceanography, hydrology and topography.

Two of the world's largest and most productive estuaries (Amazon and Orinoco) are found in the region. In some parts of the Caribbean Sea, shallow coastal shelves provide ideal conditions for mangrove swamps, seagrass beds and coral reefs, which dominate the coastal margins. In the North Brazil Shelf LME, mangroves dominate a major part of the coastline. These ecosystems are among the most productive in the world and harbour an enormous biodiversity. In addition, they perform essential ecological functions, such as acting as nursery areas for a variety of fish and invertebrates, water purification and providing coastal

stabilization and protection. They are closely associated, existing in a dynamic equilibrium influenced by coastal activities. Approximately 14 per cent of the world's coral reef is found in the Caribbean, with the Meso-American Barrier Reef system off the Central American coast of Mexico, Belize, Guatemala and Honduras being the second largest in the world (Breton *et al.* 2006).

The North Brazil Shelf LME is considered a Class I, highly productive ($>300 \text{ g Cm}^{-2}\text{yr}^{-1}$) ecosystem based on SeaWiFS global primary productivity estimates, and is the most productive part of the Brazilian shelf. The Amazon River and its extensive plume are the main source of nutrients for this LME. Studies of the primary productivity of this region have so far been scant, and there are no integrated estimates of the water column primary production. The sub-region has a high number of amphibians, birds and reptile species. Brazil's coral fauna is notable for having low species diversity yet a high degree of endemism.

In contrast to the North Brazil Shelf LME, the Caribbean Sea LME is considered a Class III, low ($<150 \text{ g Cm}^{-2}\text{yr}^{-1}$) productivity ecosystem, according to SeaWiFS global primary productivity estimates, although upwelling along the northern coast of Venezuela contributes to relatively high productivity in that area. Other factors contributing to the greater productivity of South America's northern coast are the nutrient inputs from rivers and estuaries. Other areas of high productivity within the rest of the LME are mangroves, seagrass beds and coral reefs. The remaining area of the LME is mostly comprised of clear, nutrient-poor waters.

The trophic connection between the productive areas and other, less productive systems (e.g. offshore planktonic or pelagic systems) is poorly understood for this region. Likewise, food chain linkages between resources with differing scales of distribution and migration, such as flyingfish and large pelagics, both of which are exploited, are not considered in living marine resource management. These linkages may be critical in preventing the stock depletion that has occurred in many other systems, where the requirements of and/or impacts on predators have not been considered in the exploitation of prey species, and *vice versa*.

⁹ http://en.wikipedia.org/wiki/Hurricane_Ivan

Fish and Fisheries

Throughout the Caribbean LME and adjacent Guianas-Brazil sub-region, fish and fisheries are an important contributor to employment, income and food security. The fisheries of the Caribbean Region are based upon a diverse array of resources and are conducted at industrial, artisanal and recreational levels. Of greatest importance are the fisheries for offshore pelagics, reef fishes, lobster, conch, shrimps, continental shelf demersal fishes, deep slope and bank fishes and coastal pelagics. Shrimp is of considerable importance in the Guianas-Brazil sub-region, and in Honduras and Nicaragua. The fisheries of the Guianas-Brazil sub-region have the highest percentage of discards, mostly as by-catch of shrimp trawling.

The lobster fishery is by far the most lucrative particularly in the Central-South America and Insular Caribbean sub-regions, and is harvested using a variety of fishing methods. There is a variety of less important fisheries such as for marine mammals, sea turtles, sea urchins and seaweeds. These fisheries vary widely in exploitation level, vessel and gear used, and approach to their development and management. In the Caribbean, mariculture is not as important as in some other tropical regions, such as Southeast Asia. Overall landings from the main capture fisheries rose from around 700,000 tonnes in 1975 to a peak of 1,100,000 tonnes in 1995 before declining to around 900,000 tonnes in 2003 (Figure 4). The decline in total annual catch has been accompanied by a decline in its economic value.

Caribbean fisheries are mainly artisanal, conducted by large numbers of small-scale fishers using a wide variety of gear, open, outboard powered vessels between 5 - 12 m in length, and landing their catch at numerous sites scattered around the region. Exceptions are the shrimp fisheries of the Brazil-Guianas shelf and the fisheries for large migratory pelagic fish species. In the shrimp fisheries, trawlers in the 20-30 m size range are used, and in the tuna fishery of Venezuela large (>20 m) longliners and purse seiners are used. In many countries there has been a recent trend towards more modern, mid-size vessels in the 12 - 15 m range, particularly for large pelagics, deep-slope fishes, and lobster and conch on offshore banks.

The highly migratory tuna and billfish resources sustain the largest catches, and are exploited by countries from within the region, as well as by foreign nations. These large pelagic species, which are assessed and managed by the International Commission for the Conservation of Atlantic Tuna (ICCAT), are the most 'high-profile' species of transboundary significance, being ocean-wide in distribution. However, only 13 of the countries are Contracting Parties to ICCAT. The Caribbean Community (CARICOM) Fishery Resources Assessment and Management Programme (now the Caribbean Regional Fisheries Mechanism - CFRAM) has been working towards the participation of CARICOM countries in ICCAT, most recently with assistance from FAO. A major problem is that many countries of the Caribbean, particularly the SIDS, at present take only a relatively small proportion of the catch of the species managed by ICCAT. By virtue of the size and productivity of their EEZs, these countries may be entitled to a larger share, but lack the technical capacity and the financial resources to participate in ICCAT where their case would be made.

Numerous medium-sized migratory pelagic species that are not managed by ICCAT are important to the fisheries of the Caribbean countries (e.g. dolphinfish, blackfin tuna, cero and king mackerels, wahoo and bullet tunas). The information base for management of these species is virtually non-existent.

Recreational fishing for large pelagics (e.g. billfishes, wahoo and dolphinfish) is an important but largely undocumented contributor to tourism economies, particularly in the Insular Caribbean. This creates an important link between shared living marine resources and tourism, but this aspect of shared living marine resource management has received minimal attention in most Caribbean countries (Mahon and McConney 2004).

While there is the tendency to think primarily of migratory large pelagic fishes as shared resources, it is important to note that reef organisms, lobster, conch and small coastal pelagics may also be shared resources by virtue of planktonic larval dispersal. In many species, larval dispersal lasts for many weeks (e.g. conch) or many months (e.g. lobster) and could result in transport across EEZ boundaries. Therefore, even these coastal resources have an

important transboundary component to their management. They are the resources that have been most heavily exploited by Caribbean countries and are severely depleted in most nearshore areas. Their status has been discussed and documented by FAO and WECAFC for several decades (FAO 1999). These early stages are impacted by habitat destruction and pollution as well as by overfishing of the spawning stock.

GIWA has issued a matrix that ranks the severity of four major concerns (unsustainable exploitation of fish and other living resources; habitat and community modification; pollution; and global changes, particularly climate change and sea level rise) and issues, as well as the predicted direction of future changes. Based on the assessment, GIWA characterizes the Caribbean LME as severely impacted in terms of overfishing and destructive fishing practices (two of the issues under the GIWA concern 'unsustainable exploitation of fish and other living resources').

Total catch and catch rates have been declining, especially in inshore areas. In addition, there is evidence that pelagic predator biomass has been severely depleted (Mahon 2002, Myers and Worm 2003). Both improved knowledge and appropriate institutional arrangements are required to implement effective transboundary fisheries management in the region.

Pollution and Ecosystem Health

Anthropogenic activities are bringing rapid and often irreversible transformation to coastal and marine areas of the CLME. Pollution, mainly from land-based sources, and degradation of nearshore habitats are among the major threats to the region's living marine resources. The CLME is showing signs of environmental stress, particularly in the shallow waters of coral reef systems and in semi-enclosed bays. Coastal water quality has been declining throughout the region, due to a number of factors including rapid population growth in coastal areas, poor land-use practices and increasing discharges of untreated municipal and industrial waste and agricultural pesticides and fertilizers.

Throughout the region, pollution by a range of substances including sewage, nutrients, sediments,

petroleum hydrocarbons and heavy metals is of increasing concern. The GIWA studies identified a number of pollution hotspots in the region, mainly around the coastal cities. Pollution has significant transboundary implications, as a result of the high potential for transport across EEZs in wind and ocean currents. Not only could this cause degradation of living marine resources in places far from the source, but it could also pose a threat to human and animal health by the introduction of pathogens. Pollution has been implicated in the increasing episodes of fishkills in the region, although this is not conclusive.

Coral growth can be limited by high turbidity, exposure to fresh water or air, extreme temperatures, pollution, and excess nutrients and sedimentation. Thus, coral reefs are good indicators of ecosystem health and of the severe damage that is being inflicted on the region's marine environment.

Recent studies have revealed a trend of serious and continuing long-term decline in the health of Caribbean coral reefs (Wilkinson 2002, Gardner *et al.* 2003). About 30 per cent of Caribbean reefs are now considered to be either destroyed or at extreme risk from anthropogenic pressures (Wilkinson 2000). Another 20 per cent or more are expected to be lost over the next 10 - 30 years if significant action is not taken to manage and protect them over and beyond existing measures. There have been unexplained episodes of massive coral bleaching and coral deaths in the region. Bleaching may be due to an increase in water temperatures. Bleaching occurs when the coral expels its resident symbiotic algae. Throughout the region, large sections of reefs are smothered by macroalgae. Two diseases affecting coral are white band disease, which has killed 90 per cent of *Acropora palmata* off Buck Island, St. Croix, U.S. Virgin Islands, and black-ring disease. Massive reef fish mortalities occurred in August 1980, following Hurricane Allen. The cause of death was not determined. The mass mortality of the sea urchin *Diadema* spp. in 1983 also remains unexplained.

Estimates of economic losses from coral reef degradation in the Caribbean range from US\$yr⁻¹ 350 million - US\$yr⁻¹ 870 million by 2015, compared to current benefits valued collectively at

US\$yr⁻¹ 3 billion - US\$yr⁻¹ 4 billion (Burke and Maidens 2004).

The major threats to the region's mangroves include coastal development and charcoal production. Mangrove forests have been disappearing fast over the past 20 years. Between 1990 and 2000, most of the countries showed decreasing mangrove cover (FAO 2003). As much as 65 per cent of Mexico's mangroves have already been lost (Suman 1994). Seagrass beds in some areas are impacted by chronic sedimentation and coastal development, and beaches are being lost through erosion.

In the adjacent areas of the North Brazil Shelf LME, biodiversity and habitats are under threat as a result of legal and illegal logging practices and mining in the Amazon basin. Artisanal and small-scale gold mining in the Amazon basin uses a mercury-based amalgamation process. The mercury released into the air in the form of vapour or lost in the rivers and soil is causing concern because of the potential long-term impact on aquatic habitats and human health. The technology used by the artisanal miners remains unchanged.

There is increasing boat traffic in the Amazon and coastal pollution. The mangrove estuaries of the northern coastline of Brazil and the Guianas are threatened by human interventions. Agricultural production in the North Brazil Shelf LME makes use of chemical fertilizers and pesticides, much of which eventually ends up in the coastal environment.

Continuing pollution and loss and degradation of the region's coastal habitats will impose serious economic consequences for, not only the tourism and fisheries sectors, but the economy of the entire region.

4. Priority Transboundary Issues

Initial identification of priority transboundary issues of concern for the CLME Project was obtained from previous assessments in which technical experts from within the region participated in a number of regional and sub-regional workshops in advance of the PDF-B Phase to identify and discuss these issues. Based on the findings of these assessments and subsequent discussion by technical experts at two CLME workshops, three areas of concern were determined to be priority transboundary problems

for the region. Within each of the three CLME sub-regions, these have been identified as:

- Unsustainable exploitation of fish and other living resources;
- Habitat degradation and community modification; and
- Pollution.

In addition, the impacts of climate change on the member countries, particularly the SIDS and countries with low-lying, flood-prone areas (e.g. Guyana) were also identified as a significant area of concern. However, given the linkages between climate change and sea level rise and the other priority areas identified above, climate change was not discussed separately, but treated as a cross-cutting issue within each of these areas of concern.

4.1 Unsustainable exploitation of fish and other living resources

Throughout the CLME and adjacent Guianas-Brazil sub-region, fish and fisheries are an important contributor to employment, income and food security. In the three sub-regions, most of the coastal resources including reef fish, conch and lobster are overexploited, and some of the large migratory pelagic species are thought to be already fully or overfished. While the degree of fisheries exploitation varies by species and among countries, assessments have revealed generally high exploitation levels that have resulted in declining catches and catch per unit effort, particularly in inshore areas throughout all three sub-regions. Overexploitation has also resulted in a number of threatened or endangered species, such as sea turtles and manatees. In general, the average trophic level of the catch from the CLME has been showing a declining trend over the past two decades, which is attributed to depletion of higher trophic level species. The environmental impacts, socio-economic consequences and causes pertaining to the unsustainable exploitation of fish and other living marine resources for each of the three sub-regions are summarized in Table 1. Reduced abundance of fish stocks, habitat degradation and threats to biodiversity are among the impacts shared throughout the region. In the Guianas-Brazil and Central-South American sub-regions, excessive by-catch of demersal species from shrimp harvesting is

another notable impact. The socio-economic consequences include loss of employment and income, loss of sustainable livelihoods in coastal communities and a decrease in food security, and are shared by all countries within the CLME Project area.

A preliminary analysis of the causes responsible for over-exploitation of living marine resources identified a range of factors. These include a lack of alternative sources of employment, pressures from the tourism sector and export demands, the lucrative nature of the lobster fishery, cultural norms, lack of appropriate and adequate management tools and weak governance mechanisms. For additional information on the linkages between the impacts of overfishing, consequences and causes as presented in Table 1, please refer to the sub-regional reports.

4.2 Habitat and community modification

In all three sub-regions a range of anthropogenic activities have resulted in severe degradation and community modification of essential coastal habitats, particularly around the smaller islands and along the mainland coast. Signs of environmental stress arising from both human activities and increased sea surface temperatures are evident in shallow-water coral reef habitats in all three sub-regions. Throughout much of the Project area, shoreline mangroves have been modified as a result of infrastructural projects and other forms of coastal developments.

Although habitat degradation and loss appear to be localized, the consequences may result in system-wide changes in the structure of marine living communities, through loss of feeding, spawning and nursery areas of species of ecological significance, such as those with important trophic interactions. In addition, loss of spawning and nursery areas and consequent impact on early life history stages may lead to a reduction in fish stock recruitment, thereby exacerbating declines in stock abundance due to overfishing.

Poorly planned coastal development can reduce the regional value of tourism and have negative spin-off effects in the global tourism marketplace. The environmental impacts, socio-economic consequences and societal causes pertaining to

habitat degradation and community modification for each of the three sub-regions are summarized in Table 2. Loss of ecosystem structure and function, threats to biodiversity and further declines in fisheries productivity are among the impacts shared by the three sub-regions. The socio-economic consequences arising from the loss of this natural capital are shared by all countries within the CLME Project area. Among the most significant are loss of tourism-related benefits, increased vulnerability of coastal areas and their human inhabitants to increased climate change impacts, and added costs associated with mitigating these impacts.

A preliminary analysis of the causes responsible for habitat degradation and community modification identified a range of factors. These include inappropriate land use practices, pollution, destructive fishing methods and in the case of the Insular Caribbean and Central-South America, unsustainable tourism practices. Weak and ineffective governance mechanisms, the need for tourism income to support the economy of many of the member countries and an almost total absence of integrated coastal zone planning and management also contribute to the problem of habitat loss in the region. Furthermore, uncertainties exist with respect to the cumulative effects of irreversible habitat changes in the coastal and nearshore environments due to anthropogenic activities. For additional information on the linkages between the impacts of habitat degradation and community modification, the consequences and causes as presented in Table 2, please refer to the sub-regional reports.

4.3 Pollution

As with habitat degradation and loss, while the impacts of pollution may be perceived as localized, this problem confronts all of the countries to varying extents and requires collective action to be effectively addressed. A significant contributor to marine pollution is land-based activities (GESAMP 2001). These include both point and non-point sources such as operational and catastrophic spillage from the region's mining and petroleum industries, other industries and the discharge of chemical fertilizers and pesticides from agricultural activities, which can have transboundary consequences of significant proportions. Additionally, it is estimated that less than 90 per

cent of sewage in the region undergoes any form of treatment. Pollution from marine-based sources (e.g. shipping) is also of concern.

The impacts, consequences and causes pertaining to pollution for each of the three sub-regions are summarized in Table 3. Deterioration of environmental quality, degradation of coastal ecosystems and threats to living marine resources are among the impacts shared throughout the three sub-regions. The socio-economic consequences arising from pollution are also common throughout the region and include loss of economic potential from diminished amenity value and threat to human health. Additionally, the loss of marine food sources due to contamination can lead to significant social and economic disruption. Declining coastal water quality and habitat destruction are linked in a cycle that threatens living marine resources, public health, shore-front properties and coastal tourism.

A preliminary analysis of the causes responsible for pollution identified a range of factors. These include poor land use practices, lack of cleaner production technologies in industry and poor waste handling. In the case of the Insular Caribbean and Central-South America, unsustainable tourism practices are also a principal cause of pollution. Weak and ineffective governance mechanisms, an absence of sufficient technical and financial resources, the world market demand for gold and an almost total absence of applying pollution control standards also contribute to the problem of pollution in the region. For additional information on the linkages between the environmental impacts of pollution, socio-economic consequences and causes as presented in Table 3, please refer to the sub-regional reports.

5. Stakeholder Analysis

To determine if the three transboundary areas of concern (unsustainable exploitation of living marine resources, habitat degradation and community modification and pollution) were still of priority concern for the countries within the region, the CLME Project Technical Task Team developed a questionnaire for distribution to all countries and key stakeholders within the Project area. The survey template (Annex 2) was sent to each country's National Inter-Ministerial/Sectoral Committee for a

consensus national response. Representation on these committees was multi-sectoral and included members from governments, the private sector and in some instances, civil society. Given the number of countries involved, the time-frame for conducting the PDF-B activities and the funding restrictions, CLME-member countries agreed that stakeholder input at the national and sub-national levels would be provided via the National Inter-Ministerial/Sectoral Committee. To date, 12 countries have provided responses and in all cases, have reaffirmed the importance of the three identified areas of concern. Effort is currently being strengthened to obtain responses from the remaining member countries and a full analysis of the responses will be included as part of the stakeholder analysis during the full-sized project.

A preliminary assessment of key stakeholders at the sub-regional, regional and international levels was conducted by a regional consultant for the CLME Project. This preliminary assessment focused on the mandate and responsibilities of these stakeholders with a view towards developing a strategy to enhance their involvement in the various components of the full-sized project. Please refer to the stakeholder report available on the Project website for the results of this assessment. A full stakeholder analysis is scheduled to be undertaken during the full-sized project.

6. Governance Analysis

The need for attention to the management of shared marine resources in the Wider Caribbean is well documented. From the early 1980s it has been a major subject for discussion by WECAFC (e.g. Mahon 1987) and was stressed at its Commission Meeting in 1999 (FAO 1999). These issues have been discussed and agreement reached on the need for a coordinated regional effort on shared resources at many other fora.

A number of regional and global binding and non-binding agreements exists, which seek to address the social, economic and governance issues related to shared marine living resource management. These include the UN Convention on Law of the Sea (UNCLOS), the UN Fish Stocks Agreement, the FAO Compliance Agreement and the FAO Code of Conduct for Responsible Fisheries. The

national level implications of several of these are being explored by the Caribbean countries. These implications include: (a) the need for capacity building at the national level to take part in international and regional level management of shared resources, and (b) the need for strengthening and expanding the scope of regional institutions to undertake this function.

Institutional arrangements for the management of transboundary living marine resources in the Caribbean region have been emerging, *de facto*, from the ongoing efforts of various institutions (Figure 5). These reflect the fact that the Caribbean does not have any major fish stocks attracting large commercial fleets, revenues from which can be expected to support a regional fisheries management institution. In other parts of the world, large valuable tuna or clupeid stocks have provided the incentive to establish management regimes to protect indigenous rights and to extract rents from non-indigenous fleets. The emerging approach in the Caribbean is more suited to the large diversity of resources that are already mostly exploited by indigenous fleets, so the issues relate primarily to conservation, optimization and intra-regional equity.

The emerging arrangements are flexible and involve networking and adaptation of existing institutions. This approach has been endorsed by the countries of the region at two meetings of FAO/WECAFC (1999, 2001). The arrangements involve a number of fledgling initiatives for various types of resources. For example, in the case of conch, the Caribbean Fishery Management Council has taken the lead in approaching regional management. However, some countries have difficulty taking part to the extent required for successful management. For shrimp/groundfish and flyingfish, WECAFC *ad hoc* Working Groups are the lead agencies. The newly established CRFM has identified large pelagics as a priority (Haughton *et al.* 2004).

The regional environmental legislative regime comprises different international conventions that are related to marine and coastal resource management. For the Caribbean region in particular, the United Nations Environment Programme (UNEP) has played a leading role in the establishment of a number of conventions, protocols and action plans. These include:

- Caribbean Action Plan

The objectives of the Caribbean Action Plan, adopted in 1981, is to provide assistance to all countries of the region, recognizing the special situation of the smaller islands; coordination of international assistance activities; strengthening existing national and sub-regional institutions; and, technical cooperation in the use of the region's human, financial and natural resources.

- Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (the Cartagena Convention), and its three protocols (Cooperation in Combating Oil Spills, Specially Protected Areas and Wildlife, and Pollution from Land-Based Sources and Activities).

The Cartagena Convention was adopted in Cartagena, Colombia in March 1983, and entered into force in October 1986 for the legal implementation of the Action Plan for the Caribbean Environment Programme (UNEP/CEP 1983). Its area of application comprises the marine environment of the Gulf of Mexico, the Caribbean Sea and the adjacent areas of the Atlantic Ocean, south of 30° N and within 200 nautical miles of the Atlantic Coasts of the United States. The legal structure of the Convention is such that it covers the various aspects of land-based marine pollution and oil spills for which the Contracting Parties must adopt measures. In addition, the countries are required to take appropriate measures to protect and preserve rare or fragile ecosystems, as well as the habitat of depleted, threatened or endangered species and to develop technical and other guidelines for planning and environmental impact assessments of important development projects in order to prevent or reduce harmful impacts. Other international conventions relating to the sustainable management of transboundary living marine resources and marine environmental protection in the Caribbean Sea region include:

- Convention on Biological Diversity;
- Convention on International Trade in Endangered Species;
- United Nations Framework Convention on Climate Change;

- Convention on Wetlands (the Ramsar Convention);
- International Convention for the Prevention of Pollution from Ships (MARPOL).

In 1991, the Marine Environment Protection Committee of the International Maritime Organisation designated the Wider Caribbean Region and the Gulf of Mexico as a Special Area under Annex V of the MARPOL Convention. More recently, on 20 December, 2006, the UN General Assembly adopted a resolution entitled: "Towards the Sustainable Development of the Caribbean Sea for present and future generations". This resolution is a culmination of efforts began almost a decade ago by organizations in the region including the Association of Caribbean States and CARICOM to secure the recognition by the international community of the Caribbean Sea as a special area in the context of sustainable development.

Additional information on these multilateral instruments of relevance to the CLME Project area are available in the CLME background document entitled *Transboundary Non-Extractable LMRs/Biodiversity Governance and Monitoring & Reporting for the Caribbean LME and Adjacent Regions (2007)*.

The reality of Caribbean ocean governance is a diversity of networks of actors serving various purposes that seldom intersect effectively (Figure 5). Notably absent in most cases are interactions at the critical stage of communicating analysis and advice to shape coordinated decision-making. Most countries also lack capacity, and there is seldom a clear mandate by any national, sub-regional or regional level institution for management policies that address integration among sectors.

7. Findings and Conclusions

Unsustainable exploitation of living resources, habitat degradation and community modification and pollution of the marine environment are interlinked, not only because of their synergistic impacts on living marine resources, but also because in general they have the same underlying and socio-economic, legal, and political root causes. Some of these underlying and root causes are also manifested at the regional level, for example,

deficiencies in institutional, policy and legislative frameworks for transboundary management of the living marine resources of the CLME.

Differences in size and capacity among the countries of the region present particular challenges in many areas. To engage effectively, smaller countries often require sub-regional organizations to provide technical support and collective representation. This can lead to issues of sovereignty that must be considered in strengthening policy cycles at sub-regional levels. At the technical level, data and expertise are highly aggregated in a few of the larger countries. The capacity to access and use the data is likely to be key challenges in building an equitable framework.

While its cultural diversity enriches the region, it also presents certain challenges. The development of shared principles and values, appreciation of the diversity of approaches that may be culture-based and the ability to communicate across language barriers are challenges that face all aspects of regional development and Caribbean Sea LME governance.

The socio-economic dependence of the countries, particularly the SIDS, on the living and non-living marine resources presents a considerable challenge for LME level governance that would result in sustainable management of the region's shared living marine resources. Sectoral decision-making at the national governmental level that seeks to enhance economic gain in one sector can often conflict with the achievement of economic, social and environmental goals set in other sectors.

Furthermore, in general many key stakeholders from the private sector, including resource users and civil society, whose actions can support or undermine governmental policy decisions, are not fully engaged in the decision-making process. The reasons for this may include lack of capacity, lack of institutional structures and proper organization by some of these stakeholders (e.g. fisherfolk organizations), lack of resources to participate and existing governance mechanisms that do not facilitate the participation and contributions of these stakeholders in the policy process.

Nonetheless, some limited progress has been made by the countries of the Wider Caribbean to manage their living marine resources at the national level

and sub-regional levels. While a range of options have been identified in the sub-regional reports to restore and sustainably manage living marine resources within the region (Tables 4, 5 and 6), addressing some external threats such as climate change are more challenging. The best hope lies in the use of ecosystem-based management approaches that protect coastal ecosystems and their living marine resources so that they are resistant and resilient to these external perturbations.

As highlighted in the options proposed, the marine resources of the Caribbean Sea are largely shared resources, and the effectiveness of any management initiative will depend on collaborative and cooperative actions at the regional level, or other appropriate scale, depending on the issue and the resource. As previously indicated, a number of regional initiatives and organizations already exist, and the establishment of an appropriate governance mechanism or framework for management of Caribbean transboundary living marine resources should be urgently pursued by implementing a range of policy options that focus on:

1. Strengthening national capacity to participate in regional management processes;
2. Strengthening emerging regional arrangements and organizations to play the role of ‘competent organizations’ as defined by the UN Fish Stocks Agreement; and,

3. Developing linkages among these arrangements and organizations.

This strengthening must span the full range of activities required for collaborative management of shared living marine resources, including: information gathering and sharing, analysis and interpretation, provision of advice, management decision-making and implementation. In most cases, there is adequate information for preliminary planning that identifies the strategic approach to be adopted, the associated information needs and interim management actions that can be taken while the information/advisory base is being strengthened.

The approach that is considered to be most likely to be successful in the context of the emerging Caribbean model for shared living marine resource management is that of “strengthening by doing”. By taking this approach, information, advisory, decision-making and implementation capacity can be strengthened in parallel (Fanning *et al.* in press).

The full implementation of a Caribbean LME governance framework in the Wider Caribbean can be expected to take several decades and to be a highly dynamic process requiring regular review and adaptation. It will require that existing organizations be willing to rationalize their current mandates and roles in the context of the framework, often expanding to take on the new responsibilities that will be essential for transboundary governance in the Wider Caribbean.

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Abbreviations and acronyms

CARICOM	Caribbean Community and Common Market
CARSEA	Caribbean Sea Ecosystem Assessment
CEP	Caribbean Environment Programme
CITES	Convention for International Trade in Endangered Species
CLME	Caribbean Sea Large Marine Ecosystem
CPUE	Catch per unit effort
CRFM	CARICOM Regional Fisheries Mechanism
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization (United Nations)
GEF	Global Environment Facility
GEO	Global Environment Outlook
GIWA	Global International Waters Assessment
ICCAT	International Commission for the Conservation of Atlantic Tunas
IOCARIBE	Intergovernmental Oceanographic Commission Regional Sub-Commission for the Caribbean and Adjacent Regions
IUU	Illegal, Unregulated and Unreported (fishing)
LME	Large Marine Ecosystem
MEA	Multilateral Environmental Agreement
MPA	Marine Protected Area
MSY	Maximum Sustainable Yield
NBC	North Brazil Current
NOAA	National Oceanic and Atmospheric Administration (US Department of Commerce)
NGO	Non-governmental Organization
OECS	Organization of Eastern Caribbean States
OLDEPESCA	Organización Latinoamericana de Desarrollo Pesquero
OSPESCA	Organización del Sector Pesquero y Acuícola del Istmo Centroamericano
PDF-B	Project Development Facility – Block B
POPs	Persistent Organic Pesticides
SAP	Strategic Action Programme
SIDS	Small Island Developing States
TDA	Transboundary Diagnostic Analysis
UN	United Nations
UNCLOS	United Nation Convention on the Law of the Sea
UNEP	United Nations Environment Programme
WCR	Wider Caribbean Region
WECAFC	Western Central Atlantic Fisheries Commission
WSSD	World Summit on Sustainable Development

Tables

Table 1. Impacts, Consequences and Causes of Over-Exploitation of Living Marine Resources in the Three Sub-regions of the CLME Project Area

	Central-South America Sub-region	Guianas-Brazil Sub-region	Insular Caribbean Sub-region
Environmental Impacts	<ul style="list-style-type: none"> • Changes in species and size composition • Reduced abundance of fish stocks due to destructive fishing practices • Excessive by-catch and discards of demersal species in the shrimp fishery • Threats to biodiversity from Illegal, Unreported and Unregulated (IUU) fishing • Habitat degradation 	<ul style="list-style-type: none"> • Changes in species and size composition • Reduced abundance of fish stocks due to overcapacity and destructive fishing practices • Excessive by-catch and discards of demersal species in the shrimp fishery • Threats to biodiversity from Illegal, Unreported and Unregulated (IUU) fishing • Habitat degradation 	<ul style="list-style-type: none"> • Reduced abundance of fish stocks • Changes in trophic structure of fish populations, with a trend towards small, low trophic level species • Threats to biodiversity and other changes in the ecosystem • Habitat degradation
Socio-Economic Consequences	<ul style="list-style-type: none"> • Loss of employment and financial gain accruing to coastal communities • Health-related injuries and death from fishing practices involving deep sea diving • Reduced food security (artisanal and industrial) • Erosion of sustainable livelihoods • Increase in operational expenses due to increasing distance to fish offshore • Increased conflicts and costs to ensure compliance due to poaching and illegal fishing • Missed opportunities due to under-utilization of pelagics and by-catch wastage • Loss of competitive edge in global marketplace 	<ul style="list-style-type: none"> • Loss of employment and financial gain accruing to coastal communities • Reduced food security (artisanal and industrial) • Erosion of sustainable livelihoods • Loss of foreign exchange earnings • Loss of competitive edge in global marketplace 	<ul style="list-style-type: none"> • Loss of employment and financial gain accruing to coastal communities • Reduced food security • Erosion of sustainable livelihoods • Increase in operational expenses due to increasing distance to fish offshore • Increased conflicts and costs to ensure compliance due to poaching and illegal fishing
Linkages To Other Transboundary	<ul style="list-style-type: none"> • Habitat degradation • Pollution 	<ul style="list-style-type: none"> • Habitat and community modification 	<ul style="list-style-type: none"> • Habitat degradation • Pollution

	Central-South America Sub-region	Guianas-Brazil Sub-region	Insular Caribbean Sub-region
Problems			<ul style="list-style-type: none"> • Climate Change
Transboundary Consequences	<ul style="list-style-type: none"> • Negative spill-over effects due to shared and migratory nature of the resources • Reduction in species of global significance • Illegal fishing by foreign vessels increasing local and regional conflicts • Inappropriate management of regional resources • Potential irreversible changes in the nature of the LME 	<ul style="list-style-type: none"> • Negative spill-over effects due to the shared and migratory nature of the resources • Illegal fishing by foreign vessels increasing local and regional conflicts 	<ul style="list-style-type: none"> • Negative spill-over effects due to shared and migratory nature of the resources • Reduction in species of global significance • Illegal fishing by foreign vessels increasing local and regional conflicts
Immediate Causes	<ul style="list-style-type: none"> • Catching of large quantities of immature and spawning individuals, particularly lobster, conch and demersal fishes • Non-selective fishing gear • Destruction of habitats and loss of biodiversity • Indirect fishing effort by the shrimp trawl fisheries on groundfish species • Harvesting of turtle eggs and meat by indigenous peoples • IUU fishing from both national and foreign fishers • Habitat loss or degradation from nearshore trawling and deforestation of mangrove forests • Chemical pollution from the agricultural and mining sectors • Low cost and ease of catching conch 	<ul style="list-style-type: none"> • The multispecies nature of these fisheries; • Overcapacity (fishing effort and processing infrastructure) in the mainly industrial shrimp fishery and in the mainly open access, multigear groundfish artisanal fishery • Indirect fishing effort by the shrimp trawl fisheries on groundfish species • Destruction of juvenile groundfish by “Chinese seines” and pin seines; • IUU fishing from both national and foreign fishers • Habitat loss or degradation from nearshore trawling and deforestation of mangrove forests • Chemical pollution from the agricultural and mining sectors. 	<ul style="list-style-type: none"> • Harvesting of fish beyond the level of MSY; • Catching of large quantities of immature and spawning individuals • Destruction of habitats and loss of biodiversity
Underlying Causes	<ul style="list-style-type: none"> • Fishing over-capacity in the shrimp and lobster fisheries • Failure to acknowledge full impact of artisanal fishing effort • Destructive fishing methods • Lack of alternative food source 	<ul style="list-style-type: none"> • Foreign markets’ demand for shrimp and groundfish • High level of investment in shrimp fishery • Local demand for groundfish as a source of food • Need for foreign exchange 	<ul style="list-style-type: none"> • Open access • Fishing over-capacity • Government subsidies • Improvements in gear and technology • Destructive fishing methods

	Central-South America Sub-region	Guianas-Brazil Sub-region	Insular Caribbean Sub-region
	<ul style="list-style-type: none"> • Foreign markets' demand for shrimp and lobster • Inadequate institutional and legal frameworks for fisheries and coastal zone management • Insufficient technical and financial capacity • Lack of information on the biology, economic and social status of each of the major fisheries • Variations in national regulations affecting management and limited monitoring, enforcement and surveillance • Foreign poaching due to poor surveillance 	<ul style="list-style-type: none"> • Dependence on the groundfish fishery as a source of employment and income in many rural communities • Government subsidies • Inadequate institutional and legal frameworks for fisheries and coastal zone management • Insufficient technical and financial capacity 	
Root Causes	<ul style="list-style-type: none"> • Rural poverty • Illiteracy • Lack of political will • Lack of integrated governance structures and weak governance where it exists • Lucrative nature of the lobster fishery • Little clarity in access rights policies that are divorced from the sustainability levels of the resources • Open access nature of fisheries • Lack of consensus in the use and management of shared resources • Lack of EEZ delimitation • Lack of priority for the fisheries by governments • Cultural practices by indigenous peoples • Natural phenomena • Excessive nationalism 	<ul style="list-style-type: none"> • The need by the shrimp industry to obtain adequate returns on their large capital investment • Rural poverty • Illiteracy • Lack of integrated governance structures and weak governance where it exists. 	<ul style="list-style-type: none"> • Inadequate information and assessment tools and information • Inadequate fisheries management and control • Lack of collaborative management at the regional level • Insufficient technical and financial capacity • Growing population pressure for food and employment • Limited resources and human capacity • Lack of political will • Insufficient stakeholder involvement and public awareness • Inadequate planning at all levels • Low priority afforded fishing relative to other economic sectors • Failure to integrate environmental considerations in development plans • Inadequate institutional and legal frameworks at the national and regional levels for fisheries and integrated coastal zone management

	Central-South America Sub-region	Guianas-Brazil Sub-region	Insular Caribbean Sub-region
			<ul style="list-style-type: none">• Cultural and language barriers• Natural phenomena

Table 2. Impacts, Consequences and Causes of Habitat Degradation and Community Modification in the Three Sub-regions of the CLME Project Area

	Central-South America Sub-region	Guianas-Brazil Sub-region	Insular Caribbean Sub-region
Impacts	<ul style="list-style-type: none"> • Loss of ecosystem structure and function • Reduction/loss of biodiversity • Reduction in fisheries productivity • Introduction of invasive species 	<ul style="list-style-type: none"> • Modification or loss of ecosystems (mangroves/corals) and ecotones • Reduction/loss of biodiversity; • Reduction in fisheries productivity 	<ul style="list-style-type: none"> • Loss of ecosystem structure and function • Reduction/loss of biodiversity • Reduction in fisheries productivity
Socio-Economic Consequences	<ul style="list-style-type: none"> • Loss of employment and financial gain accruing to coastal communities from declining fish stocks • Deterioration in quality of life among coastal communities • Increased conflicts between local population and tourists • Loss of social welfare particularly among rural and indigenous communities • Loss of competitive edge in the global market as a tourism destination 	<ul style="list-style-type: none"> • Loss of employment and financial gain accruing to coastal communities from declining fish stocks • Deterioration in quality of life among coastal communities 	<ul style="list-style-type: none"> • Loss of employment and financial gain accruing to coastal communities from declining fish catches • Loss of tourism-related employment and financial gain accruing to coastal communities and national treasury from diminished amenity value of area • Loss of natural coastal protection function • Increased vulnerability and cost of protection of coastal land, infrastructure, and humans to damaging waves and storm surges. • Reduced existing income and foreign exchange from other sectors • Reduced investment potential • Loss of educational and scientific values • Loss of competitive edge in the global market as a tourism destination
Linkages To Other Transboundary Problems	<ul style="list-style-type: none"> • Over-exploitation of living resources • Pollution 	<ul style="list-style-type: none"> • Over-exploitation of living resources • Pollution 	<ul style="list-style-type: none"> • Over-exploitation of living resources • Pollution • Climate Change
Transboundary Consequences	<ul style="list-style-type: none"> • Loss of feeding, spawning and nursery grounds for species with transboundary distribution • Loss of genetic and biological diversity • Potential irreversible changes in nature of the LME 	<ul style="list-style-type: none"> • Loss of feeding, spawning and nursery grounds for species with transboundary distribution • Loss of genetic and biological diversity • Potential irreversible changes in nature of the LME 	<ul style="list-style-type: none"> • Loss of feeding, spawning and nursery grounds for species with transboundary distribution • Loss of over-wintering mangrove and nearshore habitat for migratory species (e.g. birds) • Loss of genetic and biological diversity • Potential irreversible changes in nature of the LME

	Central-South America Sub-region	Guianas-Brazil Sub-region	Insular Caribbean Sub-region
Immediate Causes	<ul style="list-style-type: none"> • Removal of coastal habitat for fuel and housing • Trawling activities and other destructive fishing practices • Sediment load from rivers • Waste discharges coastal communities and aquaculture farms • Physical alteration for tourism, housing and industrial developments in the coastal zone • Abandonment or loss of fishing gear 	<ul style="list-style-type: none"> • Removal of coastal habitat for energy/fuel • Clearing for agriculture (rice), aquaculture (shrimp culture) and other development activities 	<ul style="list-style-type: none"> • Overfishing and excessive harvesting (e.g. of mangrove trees) • Diseases and coral bleaching • Physical and biological alteration • Damage and destruction, including removal and burial of coastal and nearshore habitats
Underlying Causes	<ul style="list-style-type: none"> • Cheap cost of destructive fishing traps • Non-existing standards or standards with limited application and enforcement • Unsustainable tourism practices • Improper land use and poor agricultural practices • Poorly planned coastal development • Inadequate waste management • Natural causes 	<ul style="list-style-type: none"> • Inadequate land use policies • The need to produce crops for food (nutrition) and export • Limited job and income earning opportunities in other sectors 	<ul style="list-style-type: none"> • Destructive fishing methods • Rising demand for food • Excessive harvesting of mangrove trees • Unsustainable tourism practices • Improper land use and poor agricultural practices • Poorly planned coastal development • Inadequate waste management • Invasive species
Root Causes	<ul style="list-style-type: none"> • Inadequate planning at all levels • Poor legal framework at the regional and national levels • Weak and ineffective regulatory and institutional frameworks • Failure to integrate environmental considerations in development plans • Cultural differences 	<ul style="list-style-type: none"> • Inadequate integrated development strategies • Lack of integrated planning among the economic sectors • Insufficient consideration of the environment in development plans 	<ul style="list-style-type: none"> • Growing population pressure for food, employment and housing • Insufficient stakeholder involvement and public awareness • Inadequate planning at all levels • Poor legal framework at the regional and national levels • Weak and ineffective regulatory and institutional frameworks • Failure to integrate environmental considerations in development plans • Cultural and language barriers • Natural phenomena • The lack of economic valuation of ecosystems

	Central-South America Sub-region	Guianas-Brazil Sub-region	Insular Caribbean Sub-region
			and their services <ul style="list-style-type: none">• Limited integrated watershed and coastal area management.

Table 3. Impacts, Consequences and Causes of Pollution in the Three Sub-regions of the CLME Project Area

	Central-South America Sub-region	Guianas-Brazil Sub-region	Insular Caribbean Sub-region
Impacts	<ul style="list-style-type: none"> • Deterioration of environmental quality • Degradation of coastal ecosystems • Threats to living marine resources • Changes in structure of reef communities 	<ul style="list-style-type: none"> • Deterioration of environmental quality • Degradation of coastal ecosystems • Threats to living marine resources 	<ul style="list-style-type: none"> • Deterioration of environmental quality • Degradation of coastal ecosystems • Threats to living marine resources
Socio-Economic Consequences	<ul style="list-style-type: none"> • Diminished aesthetic value and amenity of areas for recreational and other uses • Reduced revenues from tourism • Deterioration in human health 	<ul style="list-style-type: none"> • Loss in revenues from fish products • Deterioration in human health from disease vectors, HABs, heavy metals, toxins and POPs 	<ul style="list-style-type: none"> • Threats to human health from disease vectors, HABs, heavy metals, toxins and POPs • Diminished aesthetic value and amenity of areas for recreational and other uses • Reduced revenues from tourism
Linkages To Other Transboundary Problems	<ul style="list-style-type: none"> • Habitat degradation • Decline in abundance of living marine resources 	<ul style="list-style-type: none"> • Habitat degradation • Decline in abundance of living marine resources 	<ul style="list-style-type: none"> • Habitat degradation • Decline in abundance of living marine resources
Transboundary Consequences	<ul style="list-style-type: none"> • High potential for transport of pollutants across EEZs in wind and ocean currents • Transboundary impacts from plumes of major continental rivers and pollution in large bays 	<ul style="list-style-type: none"> • High potential for transport of pollutants across EEZs in wind and ocean currents • Transboundary impacts from plumes of major continental rivers 	<ul style="list-style-type: none"> • High potential for transport of pollutants across EEZs in wind and ocean currents • Transboundary impacts from plumes of major continental rivers • Extra-regional atmospheric transport of dust, POPs and other contaminants to the region
Immediate Causes	<ul style="list-style-type: none"> • Atmospheric deposition and flooding • Chemical fertilizers and pesticides in run-off from agricultural areas • Microbial and nutrient loading from tourism, fish processing and residential developments • Ballast water discharges • Use of chemicals in fishing practices 	<ul style="list-style-type: none"> • Farmed areas concentrated in the coastal belt • Culture practices for agricultural crops resulting in drainage directly to waterways and the sea • Lack of treatment or monitoring of the effluents and non-point sources of discharge • Use of least expensive technology available for mainly artisanal mining • Inadequate construction and maintenance of storage facilities for the waste containing 	<ul style="list-style-type: none"> • Point and non-point land-based sources of industrial and urban waste • Operational spills in ports and marinas • Runoff of agricultural fertilizers and pesticides • Dumping of solid waste • Land degradation • Atmospheric deposition

	Central-South America Sub-region	Guianas-Brazil Sub-region	Insular Caribbean Sub-region
	<ul style="list-style-type: none"> Discharges and spillages from the petroleum sector 	<p>cyanide from large scale mining operations</p>	
Underlying Causes	<ul style="list-style-type: none"> Poor agricultural practices (including excessive use of fertilizers and pesticides) Unsustainable tourism practices Poorly planned coastal development Inadequate waste management and disposal Deficient information and limited application of national and international standards 	<ul style="list-style-type: none"> Inadequate land use policies The need to produce crops for food (nutrition) and export Limited job and income earning opportunities in other sectors The demand for gold in the world market Unemployment and lack of income earning opportunities Illegal immigration Insufficient institutional capacity to regulate the mining sector 	<ul style="list-style-type: none"> Poor agricultural practices (including excessive use of fertilizers and pesticides) Unsustainable tourism practices Poorly planned coastal development Inadequate waste management and disposal Limited cleaner production technologies in industry
Root Causes	<ul style="list-style-type: none"> Weak and ineffective legal, regulatory, and institutional frameworks General lack of environmental quality standards and legislation Limited financial and human resources Poor surveillance and enforcement, and limited compliance Lack of adequate data and information due to irregular or no monitoring and assessment 	<ul style="list-style-type: none"> Inadequate integrated development strategies Lack of integrated planning among the economic sectors Insufficient consideration of the environment in development plans Poverty Illiteracy Need for adequate returns on investment Weak governance 	<ul style="list-style-type: none"> Weak and ineffective legal, regulatory, and institutional frameworks General lack of environmental quality standards and legislation Limited financial and human resources Poor surveillance and enforcement, and limited compliance Lack of adequate data and information due to irregular or no monitoring and assessment Scientific activities are not integrated Insufficient certification of laboratories. Limited financial resources for infrastructure maintenance and renovation Limited use of appropriate, efficient and cost-effective pollution prevention technologies

Table 4. Proposed Options to Address Over-Exploitation of Living Marine Resources in the Three Sub-regions of the CLME Project Area

Central-South America Sub-region	Guianas-Brazil Sub-region	Insular Caribbean Sub-region
<ul style="list-style-type: none"> • Develop a harmonized system to gather information on artisanal fishing effort and to reduce fishing effort on stocks that are over-exploited • Application of fish licensing system • Prohibition on stock in danger of extinction • Development of marine turtles conservation plan • Development of regional consultation process to harmonize standards regarding administration and management of transboundary LMRs • Socio-economic valuation of the resources • Increase public awareness and education • Establishment of harmonized spatial and temporal protection zones • Development and harmonization of a sub-regional sport fishing strategy • Development of mechanisms for improved stakeholder participation in the management process • Development of a binding short, medium and long term plan to address transboundary impacts that affect marine resources 	<ul style="list-style-type: none"> • Determination of the level of poverty in the fishing communities and the identification of alternative livelihood programmes • Institutional strengthening of the fisheries administrations and research institutions at the national and sub-regional levels • Harmonization of fisheries and related legislation • Strengthening of the existing mechanisms for sub-regional collaboration in resource assessment and management • Development of mechanisms for improved stakeholder participation in the management process • Development of mechanisms for conflict resolution • Development of a sub-regional database for fisheries and related data/information • Evaluation of the tools being used for fisheries management in the sub-region • Continued assessment, including bio-economic assessments, of the shrimp and groundfish resources • Review and determination of the most suitable methods for by-catch utilization and reduction • Determination of the extent of IUU fishing in the sub-region and the development of mechanisms to combat it at the national and sub-regional levels • Determination of the environmental factors that may be influencing recruitment to the shrimp fishery. 	<ul style="list-style-type: none"> • Major reduction in fishing effort and elimination of unsustainable fishing practices • Wider ratification and effective implementation of the relevant UN and regional and sub-regional fisheries agreements or arrangements • Implementation of ecosystem approaches to LMR management at the regional and sub-regional scale • Establishment and effective management of a sub-regional and/or regional network of marine parks and protected areas, based on sound science • Integrated Watershed and Coastal Area Management • Clear delimitation of EEZs

Table 5. Proposed Options to Address Habitat Degradation and Community Modification in the Sub-regions of the CLME Project Area

Central-South America Sub-region	Guianas-Brazil Sub-region	Insular Caribbean Sub-region
<ul style="list-style-type: none"> • Development of mechanisms for improved stakeholder participation in the management process • Development of binding short, medium and long term plan to address transboundary impacts that affect marine resources 	<ul style="list-style-type: none"> • Strengthening of the institutional framework for integrated coastal zone management • Improved land use policies • Improved knowledge of the role that the entire shallow, brackish-water stretch along the seashore plays in the mobilization of nutrients and energy transfer in the lower levels of trophic webs, and providing nursery grounds for many marine fish and shrimp species • Improved knowledge of the effects of human activities on the nearshore ecosystems • Creation of reserves to protect ecologically sensitive coastal ecosystems (e.g. mangroves) 	<ul style="list-style-type: none"> • Restoration of degraded ecosystems and protection of healthy ones • Establishment of MPAs and biodiversity corridors in the region • Establishment of multiple use areas • Reduction of threats from both marine and land-based sources • Adoption of integrated watershed and coastal area management • Implementation and enforcement of national legislation, as well as regional and global MEAs

Table 6. Proposed Options to Address Pollution in the Three Sub-regions of the CLME Project Area

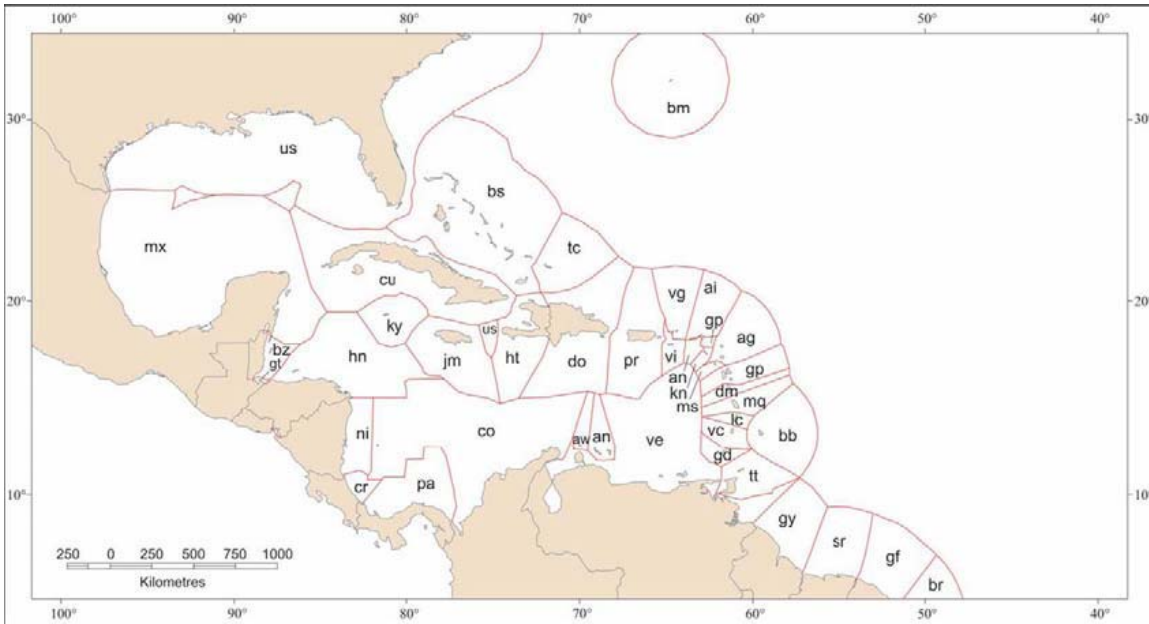
Central-South America Sub-region	Guianas-Brazil Sub-region	Insular Caribbean Sub-region
<ul style="list-style-type: none"> • Development of mechanisms for improved stakeholder participation in the management process • Development of binding short, medium and long term plan to address transboundary impacts that affect marine resources • Development of a regional, intersectoral plan to stop dumping of contaminating substances and other practices that result in the degradation of the coastal zone 	<ul style="list-style-type: none"> • Strengthening of the institutional framework for integrated coastal management • Improved land use and mining policies • Determination of the level of poverty in the mining areas • Identification of alternative livelihood programmes • Development and implementation of adult education and public awareness programmes • Strengthening of the institutional mechanisms for monitoring and enforcement in the mining industry • Improved knowledge of the effects of agro-chemicals and heavy metals on coastal ecosystems 	<ul style="list-style-type: none"> • Greater focus on improved implementation of existing policies, strategies, and action plans • Development of strategic planning and financing strategy • Development of environmental standards • Enforcement of the ‘polluter pays’ principle at national and regional levels • Development of appropriate legal and institutional frameworks • Increased knowledge of the economic and social costs of habitat degradation and loss from pollution • Integrated Watershed and Coastal Area Management • Implementation of ecosystem approaches to LMR management at the regional and sub-regional scale

Figures

Figure 1. Map of the Wider Caribbean showing the Large Marine Ecosystems



Figure 2. Maritime Boundaries in the Exclusive Economic Zone of the Coastal states in the Wider Caribbean



Source: Carpenter 2002

Figure 3. The Caribbean Current as represented by the Mariano Global Surface Velocity Analysis (MGSVA)

(Source: Joanna Gyory, Arthur J. Mariano, Edward H. Ryan. "The Caribbean Current." Ocean Surface Currents. <http://oceancurrents.rsmas.miami.edu/caribbean/caribbean.html>)

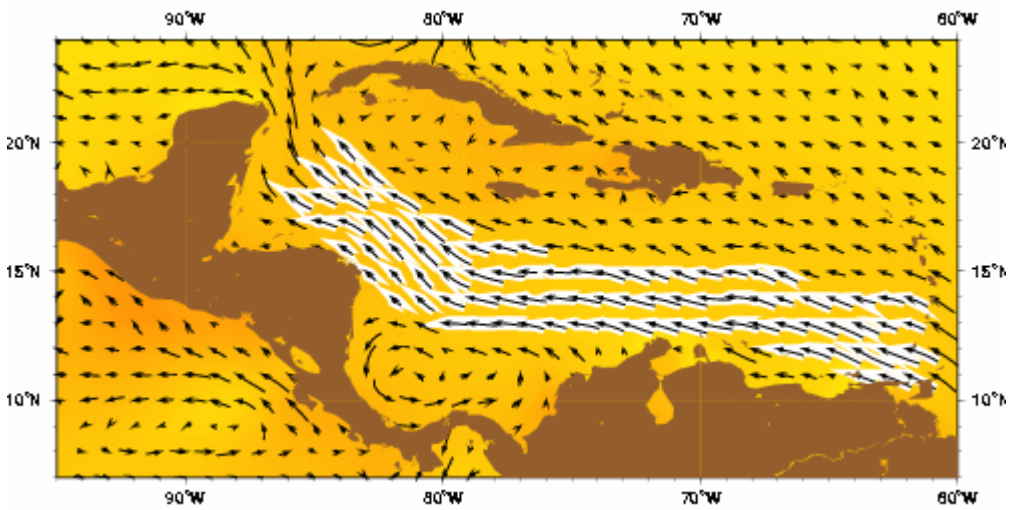


Figure 4. Fish Landings in the Caribbean Region

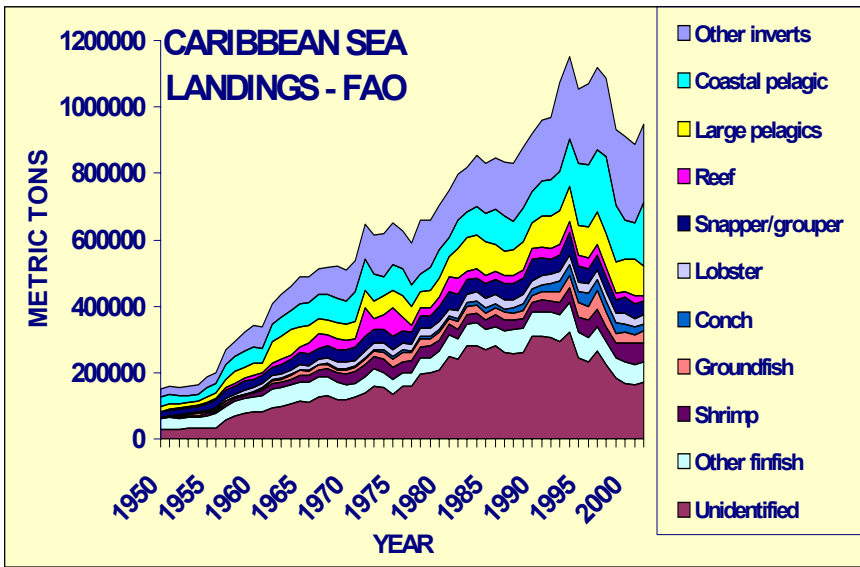
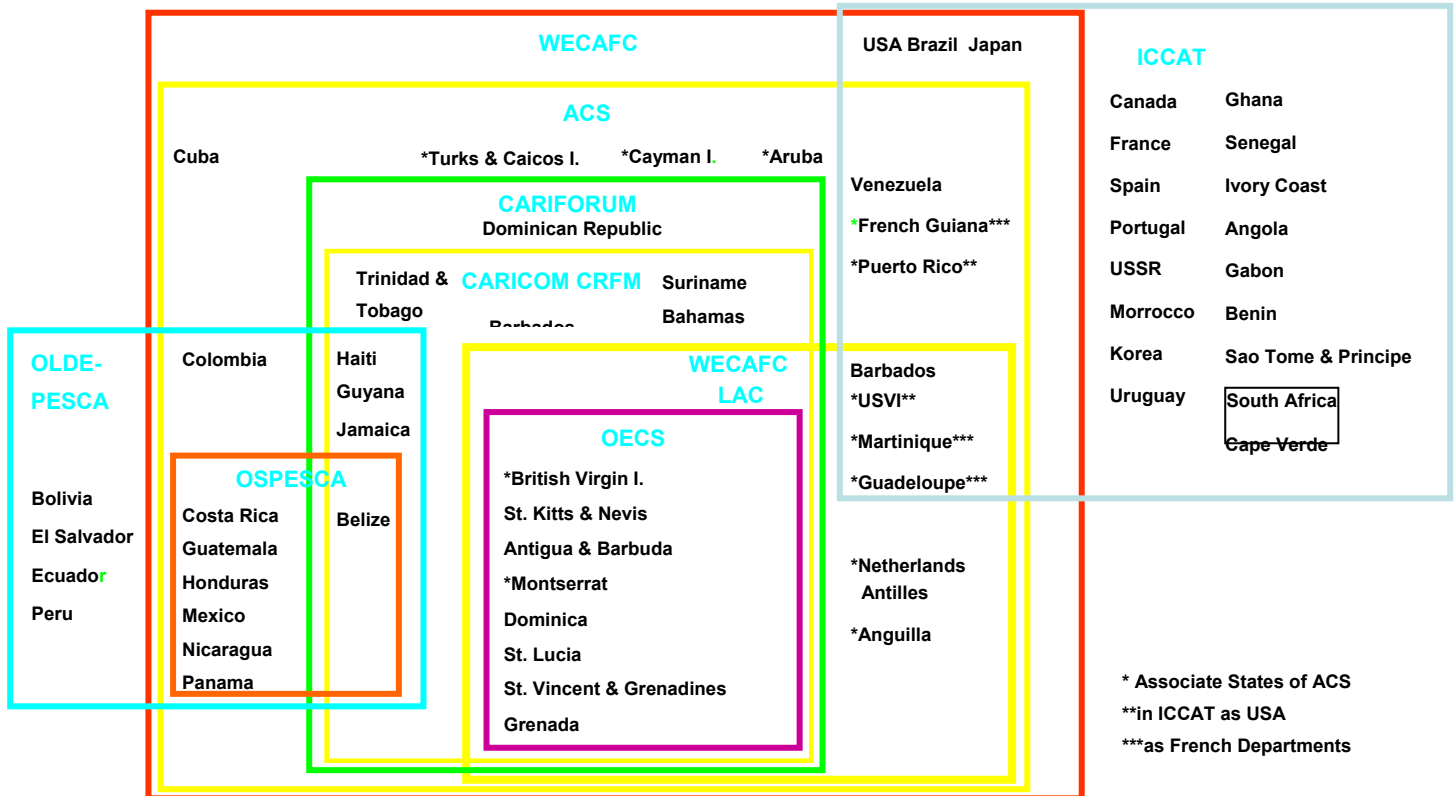


Figure 5. Institutional Fisheries Management Arrangements in the Caribbean Region



Annex 1 Countries and Territories of the CLME Project Area

Countries

Antigua and Barbuda
Barbados
Bahamas
Belize
Brazil
Colombia
Costa Rica
Cuba
Dominica
Dominican Republic
Guatemala
Grenada
Guyana
Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama
St. Kitts and Nevis
St. Lucia
St. Vincent and the Grenadines
Suriname
Trinidad & Tobago
United States of America
Venezuela

Territories

Anguilla (UK)
Aruba (NL)
Bermuda (UK)
Bonaire (NL)
British Virgin Islands (UK)
Cayman Islands (UK)
Curcao (NL)
French Guiana (FR)
Guadeloupe (FR)
Martinique (FR)
Montserrat (UK)
Puerto Rico (US)
Saba (NL)
St. Bartholemy (FR)
St. Eustatius (NL)
St. Marten (NL)
St. Martin (FR)
Turks and Caicos Islands (UK)
US Virgin Islands (US)

Annex 2 – Country-Specific Information Request Template

Sustainable Management of the Shared Marine Resources of the Caribbean Large Marine Ecosystem (CLME) and Adjacent Regions REQUEST FOR INFORMATION FROM MEMBER COUNTRIES AND OTHER PROJECT PARTNERS

Caribbean Large Marine Ecosystem (CLME) Project

CLME Project Coordinating Office
Centre for Resource Management and Environmental Studies
The University of the West Indies
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Brief Project Description

The overall objective of the CLME project is the sustainable management of the shared living marine resources of the Caribbean LME and adjacent areas through an integrated management approach that will meet the WSSD target for sustainable fisheries. The expected outputs include an analysis of the transboundary living marine resource issues (Transboundary Diagnostic Analysis - TDA) and an agreed preliminary Strategic Action Programme (SAP) for Caribbean LME shared living marine resources during PDF-B. The project will also fill knowledge gaps, implement sustainable legal, policy and institutional reforms and put in place LME level monitoring, evaluation and reporting processes for shared LMR ecosystem management.

Request for Country-Specific Information

In order to assist with the development of an integrated TDA from the entire LME and its adjacent region, the Project Unit is requesting all CLME member countries and other project partners to provide the information requested in the attached template. In order to have a country-consensus position, it is recommended that the requested information be discussed by your Inter-Ministerial/Inter-Sectoral Committee so that the views from the different sectors and levels of participation within your country, as represented on the Committee, may be considered prior to filling out the template. Other partners are requested to provide a response that reflects their understanding of their constituencies. Your assistance in providing your response to the template by **December 29, 2006** is essential so that your input can be instrumental in shaping the development of the integrated TDA and CLME Project Concept Paper.

CLME Project Template: Please return to CLME Project Unit by December 29, 2006

1. General information.

- a) Name of Country or Organization:

- b) Composition of CLME Inter-Ministerial/Intersectoral Committee:
 - i) Identify National Government Ministries:

 - ii) Identify any other levels of government:

 - iii) Identify any non-government members:

 - iv) Identify Chairmanship the Committee:

- c) Total # of members on the Committee _____

- d) Does the Committee deal with matters other than the CLME Project? Matters related to the CLME project? List.

2. Major areas of concern

The following areas of concern have been identified as affecting the sustainability of transboundary living marine resources in a number of regions: *Over-Fishing; Pollution and Contamination; Habitat Degradation.*

What are your country's perceived **major** areas of concern regarding your **transboundary living marine resources**? Please rank in order of importance where 1 is greatest:

- 1 _____

- 2 _____

- 3 _____

- 4 _____

- 5 _____

3. Origin and Causes

For your top three areas of concern, please identify where, in your opinion, the concern originated and the causes for the concern:

Origin of Area of Concern #1:

Causes for Area of Concern #1:

Origin of Area of Concern #2:

Causes for Area of Concern #2:

Origin of Area of Concern #3:

Causes for Area of Concern #3:

4. **Maritime Neighbours:**

- a) How many neighbouring countries share **transboundary living marine resources** with your country? _____
- b) Please identify countries _____

5. **With respect to area of concern #1 identified in question 2 above,**

- i) Are any of your neighbouring countries contributing to this area of concern? Yes _____; No _____

If yes, please provide a brief explanation? For instance, if the concern is pollution, it would be useful to know what kind of pollution, e.g. sediments, oils.....If overfishing, useful to know the species.

If yes, please indicate the severity of impact on the environment, the economy and on society on a scale of 0 to 3, where 0 means no impact, 1 means minor impact, 2 means major impact and 3 means severe impact. Please check 9 for “don’t know”:

- Environmental impacts: 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- Economic impacts: 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- Social impacts: 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)

- ii) Is your country having an impact on any of your neighbouring countries? Yes _____; No _____

If yes, please provide a brief explanation? For instance, if the concern is pollution, it would be useful to know what kind of pollution, e.g. sediments, oils.....If overfishing, useful to know the species.

If yes, please indicate the severity of impact on the environment, the economy and on society on a scale of 0 to 3, where 0 means no impact, 1 means minor impact, 2 means major impact and 3 means severe impact. Please check 9 for “don’t know”:

- Environmental impacts: 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- Economic impacts: 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- Social impacts: 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)

iii) Using the template provided at the back of this questionnaire, please identify any actions being taken by your country to address the area of concern?

- Key Ongoing Projects/Activities, including joint projects with neighbouring/other countries
- Resources committed
- Stakeholders involved (primary; secondary)
- Beneficiaries
- Effectiveness of actions

iv) Using the template provided at the back of this questionnaire, please identify any known additional activities planned to be undertaken by your country

- Resources (financial, technical, human)
- Timescale
- Stakeholders involved (primary; secondary)
- Beneficiaries
- Likely outputs

v) Please identify any additional potential solutions that can assist with addressing the area of concern.

vi) Please identify types of information (scientific, economic and/or social) **most** needed to assist with addressing the area of concern.

vii) Please indicate where you think interventions would be most successful in addressing the area of concern, using a scale of 0 to 3, where 0 means not important, 1 means somewhat important, 2 means very important and 3 means absolutely necessary. Please check 9 for “don’t know”:

- More data and information 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- More monitoring and enforcement 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- More laws 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- More inter-ministerial level decision-making 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- More private and NGO involvement 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- Better implementation of decisions 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- Collaborative effort with neighbouring/other countries 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- Other (please explain)

6. With respect to area of concern #2 identified in question 2 above,

i) Are any of your neighbouring countries contributing to this area of concern? Yes _____; No _____

If yes, please provide a brief explanation? For instance, if the concern is pollution, it would be useful to know what kind of pollution, e.g. sediments, oils.....If overfishing, useful to know the species.

If yes, please indicate the severity of impact on the environment, the economy and on society on a scale of 0 to 3, where 0 means no impact, 1 means minor impact, 2 means major impact and 3 means severe impact. Please check 9 for “don’t know”:

- Environmental impacts: 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- Economic impacts: 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- Social impacts: 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)

ii) Is your country having an impact on any of your neighbouring countries? Yes ___; No ___

If yes, please provide a brief explanation? For instance, if the concern is pollution, it would be useful to know what kind of pollution, e.g. sediments, oils.....If overfishing, useful to know the species.

If yes, please indicate the severity of impact on the environment, the economy and on society on a scale of 0 to 3, where 0 means no impact, 1 means minor impact, 2 means major impact and 3 means severe impact. Please check 9 for “don’t know”:

- Environmental impacts: 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- Economic impacts: 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)
- Social impacts: 0 ___ 1 ___ 2 ___ 3 ___ 9 ___ (Don’t know)

iii) Using the template provided at the back of this questionnaire, please identify any actions being taken by your country to address the area of concern?

- Key Ongoing Projects/Activities, including joint projects with neighbouring/other countries
- Resources committed
- Stakeholders involved (primary; secondary)
- Beneficiaries
- Effectiveness of actions

iv) Using the template provided at the back of this questionnaire, please identify any known additional activities planned to be undertaken by your country

- Resources (financial, technical, human)
- Timescale
- Stakeholders involved (primary; secondary)
- Beneficiaries
- Likely outputs

v) Please identify any additional potential solutions that can assist with addressing the area of concern.

vi) Please identify type of information (scientific, economic and/or social) **most** needed to assist with addressing the area of concern.

vii) Please indicate where you think interventions would be most successful in addressing the area of concern, using a scale of 0 to 3, where 0 means not important, 1 means somewhat important, 2 means very important and 3 means absolutely necessary. Please check 9 for “don’t know”:

- More data and information 0 ___ 1___ 2___ 3___ 9___ (Don't know)
- More monitoring and enforcement 0 ___ 1___ 2___ 3___ 9___ (Don't know)
- More laws 0 ___ 1___ 2___ 3___ 9___ (Don't know)
- More inter-ministerial level decision-making 0 ___ 1___ 2___ 3___ 9___ (Don't know)
- More private and NGO involvement 0 ___ 1___ 2___ 3___ 9___ (Don't know)
- Better implementation of decisions 0 ___ 1___ 2___ 3___ 9___ (Don't know)
- Collaborative effort with neighbouring/other countries 0 ___ 1___ 2___ 3___ 9___ (Don't know)
- Other (please explain)

7. With respect to area of concern #3 identified in question 2 above,

i) Are any of your neighbouring countries contributing to this area of concern? Yes ___; No ___

If yes, please provide a brief explanation? For instance, if the concern is pollution, it would be useful to know what kind of pollution, e.g. sediments, oils.....If overfishing, useful to know the species.

If yes, please indicate the severity of impact on the environment, the economy and on society on a scale of 0 to 3, where 0 means no impact, 1 means minor impact, 2 means major impact and 3 means severe impact. Please check 9 for "don't know":

- Environmental impacts: 0 ___ 1___ 2___ 3___ 9___ (Don't know)
- Economic impacts: 0 ___ 1___ 2___ 3___ 9___ (Don't know)
- Social impacts: 0 ___ 1___ 2___ 3___ 9___ (Don't know)

ii) Is your country having an impact on any of your neighbouring countries? Yes ___; No ___

If yes, please provide a brief explanation? For instance, if the concern is pollution, it would be useful to know what kind of pollution, e.g. sediments, oils.....If overfishing, useful to know the species.

If yes, please indicate the severity of impact on the environment, the economy and on society on a scale of 0 to 3, where 0 means no impact, 1 means minor impact, 2 means major impact and 3 means severe impact. Please check 9 for "don't know":

- Environmental impacts: 0 ___ 1___ 2___ 3___ 9___ (Don't know)
- Economic impacts: 0 ___ 1___ 2___ 3___ 9___ (Don't know)
- Social impacts: 0 ___ 1___ 2___ 3___ 9___ (Don't know)

- iii) Using the template provided at the back of this questionnaire, please identify any actions being taken by your country to address the area of concern?
- Key Ongoing Projects/Activities, including joint projects with neighbouring/other countries
 - Resources committed
 - Stakeholders involved (primary; secondary)
 - Beneficiaries
 - Effectiveness of actions
- iv) Using the template provided at the back of this questionnaire, please identify any known additional activities planned to be undertaken by your country
- Resources (financial, technical, human)
 - Timescale
 - Stakeholders involved (primary; secondary)
 - Beneficiaries
 - Likely outputs
- v) Please identify any additional potential solutions that can assist with addressing the area of concern.
- vi) Please identify type of information (scientific, economic and/or social) **most** needed to assist with addressing the area of concern.
- vii) Please indicate where you think interventions would be most successful in addressing the area of concern, using a scale of 0 to 3, where 0 means not important, 1 means somewhat important, 2 means very important and 3 means absolutely necessary. Please check 9 for “don’t know”:
- More data and information 0 __ 1__ 2__ 3__ 9__ (Don’t know)
 - More monitoring and enforcement 0 __ 1__ 2__ 3__ 9__ (Don’t know)
 - More laws 0 __ 1__ 2__ 3__ 9__ (Don’t know)
 - More inter-ministerial level decision-making 0 __ 1__ 2__ 3__ 9__ (Don’t know)
 - More private and NGO involvement 0 __ 1__ 2__ 3__ 9__ (Don’t know)
 - Better implementation of decisions 0 __ 1__ 2__ 3__ 9__ (Don’t know)
 - Collaborative effort with neighbouring/other countries 0 __ 1__ 2__ 3__ 9__ (Don’t know)
 - Other (please explain)

8. Please indicate below any relevant documents, including national development plans, sectoral plans and policies, country-specific information, etc. you think the CLME Project Task Team should be aware of when developing the Transboundary Diagnostic Analysis and Project Concept Paper for the member countries of the CLME Project.

Current Activities to Address Area of Concern

Area of Concern	Activity/Project	Resources Committed	Projected Timescale	Key Beneficiaries	Possible Evaluation of Effectiveness of actions

Planned Activities to Address Area of Concern

Area of Concern	Activity/Project and Projected Timescale	Resources Committed	Partners Involved	Key Beneficiaries	Likely Outputs