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**A PROPOSAL FRAMEWORK FOR THE SUSTANABLE  
MANAGEMENT OF THE MESOAMERICA BARRIER REEF SYSTEM  
(MBRS)**

A thesis presented in partial fulfilment of the requirements for the  
Master of Resource and Environmental Planning  
at Massey University, Palmerston North, New Zealand.

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## ABSTRACT

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The Mesoamerican Barrier Reefs System (MBRS) a relatively isolated area, crosses four countries, Mexico, Belize, Guatemala, and Honduras. It is approximately 625 miles long and is considered to be the second longest barrier reef in the world.

As a Large Marine Ecosystem (LME) requires an equitable framework for the sustainable management that will include an intergovernmental instrument to induce an appropriate use of the natural resources and functional mechanisms for international cooperation. Other issues in the analysis that have been considered include coastal development, fisheries management, tourism and recreation, and conservation of the natural resources.

The focus of the research has been the examination of possible management approaches that can be taken as guidelines to the sustainable management of the MBRS. Taking into consideration scientific values, landscape, and community values. However the countries involved are developing and agricultural based economies and marine economic activities are not considered to be a priority for the national economies. Other concerns are the different values that each country is giving to the area of the MBRS.

Some recommendations are made in the area of professional training for Marine Protected Areas managers, the need of a wider legal framework including coastal areas as well as marine areas, strengthening communication mechanism across government agencies, industrial

sectors, and the community groups providing coherence and continuity. It will also be necessary to develop a set of criteria to assess and monitoring activities along the MBRS.

While countries such as Belize, Guatemala and Honduras are far behind in the establishment of a complete regional strategy. The suggestion is that Mexico can lead the project of the establishment of a regional cooperation system for the sustainable management of the MBRS.

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*I dedicate my thesis to G. and my son Alejandro.*

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## GLOSSARY

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**Approach** Planning technique for the management of natural resources.

**Area** A set of natural resources under a planning and management technique.

**BC** Biogeographic and Regional Ecosystem Classification System

**BEMAMCOOR** Agreement between Mexico and Belize in the management of natural resources and natural protected areas

**Biodiversity** A term used for the degree of nature's variety and encompassed all species of plants, animals, micro-organism and the ecosystems and ecological processes of which they are part.

**CAS** Country Assistance Strategy

**CBD** Convention on Biological Diversity

**CBM** Community Based Management

**CCAD** Central American Commission for the Environment and Development

**CCAMLR** Conservation and Antarctic Marine Living Resources

**CCRE** The Caribbean Coral Reef Ecosystem Program

**Central America** Geographical Region located between North and South America.

**Central American Countries** Belize Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica and Panama.

**CEP** Caribbean Environmental Program

**Coastal Management** The protection, conservation, rehabilitation, management and ecologically sustainable development of the coastal zone

**Coastal Zone** Coastal waters and all areas to the landward site of coastal waters in which the are physical features, ecological or natural processes or human activities that affect, or potentially affect the coast or coastal resources in the MBRS

**CONABIO** National Commission for the knowledge and use of biodiversity

**CONANP** National council of natural protected areas in Mexico

**Conservation** The protection and maintenance of nature while allowing for its ecologically sustainable use

**Costa Maya** south coast of Quintana Roo from Punta Herro to Xcalak

**ECOSUR** Southern Border Mexican College

**Ecosystem** A community of organisms interacting with one another and the environment in which they live.

**Ecotourism** Nature dash based tourism that involves education and interpretation of the natural environment and is managed to be ecologically sustainable

**EEZ** Exclusive Economic Zones

**FIDECARIBE** Bank trust of the Caribbean

**FMCN** Mexican Nature Conservation Fund

**FONATUR** National fund for the tourism development

**GBRMP** Great Barrier Reef Marine Park

**GBRMPA** Great Barrier Reef Marine park Authority

**GEF** Global Environmental Facility

**ICMZ** Integrated Coastal Zone Management

**INI** National Institute for Indigenous People

**Intersecretarial** Communications and policy mechanisms used between government agencies.

**IUCN** World Conservation Union

**Legal statutes** Laws and regulations that organise human activities

**LGEEPA** General law of ecological balance and environmental protection

**LME** Large Marine Ecosystem concept

**Manatee** Marine mammal that lives in shallow waters, is considered to be an endangered species

**MBC** Mesoamerican Biological Corridor

**MBRS** Mesoamerican Barrier Reef System

**MPA** Marine Protected Areas

**National law of the sea** Legal framework that regulates the water uses in Mexico

**NPA** National Protected Area

**OCB** Overall co-ordinating body concept

**OECD** Organisation for Economic Co-Operation and Development

**OMGA** Overall Management Agency Concept

**PESCA** Ministry of Fisheries in Mexico

**Planning process** A process which involves the different stages related to manage and develop a given situation with community participation defining responsibilities and commitments in a region.

**Planning regulations** The Acts, laws and bylaws related with planning in the federal, state and municipalities.

**Political unit** A free and autonomous territory capable to sign agreements with other similar units at the national or international level.

**PROFEPA** The office of the federal attorney for environmental protection in Mexico

**Questionnaire** Research instrument implemented for data collection within government agencies.

**Riviera Maya** north coast of Quintana Roo from Cancun to Cobá

**RM** Regional Management

**Scientific data** Information collected with a rigorous technical method

**SCT** Ministry of Communications and Transport of Mexico

**SE** Ministry of Economy of Mexico

**SECTUR** Ministry of Tourism in Mexico

**SEDUMA** State Ministry of the Environment and Urban Development in Quintana Roo Mexico  
**SEMAR** The Navy of Mexico  
**SEMARNAP** Ministry of the Environment, Natural Resources and Fisheries in Mexico.  
**SEMARNAT** Ministry in the Environment and Natural Resources. In Mexico  
**SOICE** Sector Operated Independently with Agreed Common Ends Concept  
**SP** Strategic Planning Concept  
**SRE** Ministry of Foreign affairs  
**UNCED** United nation Conference on the Environment and Development  
**UNEP** United Nations Environmental Program  
**VO** Virtual Organisation Concept  
**WB** World Bank  
**WWF** World Wildlife Foundation



# INTRODUCTION

## CHAPTER 1

---

### 1 Background

This chapter provides the background context for the Mesoamerican Barrier Reef System (MBRS) management. The aim is to introduce to the reader the main characteristics of the second largest barrier reef in the world. The MBRS crosses four countries of North and Central America with different population characteristics, types of government, different culture, and different values.

Chapter one (1) will help the reader understand some of the constraints concerning the proposed framework for the sustainable management of the MBRS. It will also present a general view of the natural resources of the reef system.

#### 1.1 What is a Reef?

Even though Charles Darwin defined a reef as 'as corals, which greatly differ in kind on different parts of it, are probably all adapted to the station they occupy, and hold their places, like other organic beings, struggle one with another and with external nature' (Charles Darwin, 1872, as cited by Wood, 1999, p.3). For the purpose of this research the following definition of a tropical coral reef will be used: " a reef consists of a rigid, wave-resistant framework constructed by large skeletal organisms (mainly corals and coralline algae) whose growth is driven by photosynthesis" (Wood, 1999 p.5). The cavernous structures of the

coral reefs provide habitat for thousands of species many of which are unique to these ecosystems. Reef communities are associations of species with similar ecological and environmental requirements. Cicin-San (1998) refers to reefs as the world's most valuable ecosystems in terms of their biological diversity and their productivity and a source of livelihood for many coastal communities.

The Caribbean Environmental Program (CEP) has conducted a study in the Caribbean Sea, Gulf of Mexico, the Bahamas, and the northeast coast of South America (1993), about the implication of climate change and human activities on the whole reef system. In this study, seven socio-economic issues were also studied among the impact of climate change in coral reefs. Activities such as deforestation, coastal development, runoff, overfishing and tourism are expected to cause extreme stress to coral reefs (UNEP, 1993).

## **1.2. Characteristics of Marine Ecosystems**

The MBRS may be characterised as a Large Marine Ecosystem (LME). Marine ecosystems are complex, ecologically sensitive and exceedingly valuable places that are under enormous, and in most cases largely ignored threats. Ocean natural resources were recognised in 1992 thanks to the United National Conference on the Environment and Development (UNCED). Before that time there were few concerns for the marine environment and the increasing impacts of human induced change.

According to Sherman, (1999) the UNCED issued a declaration on the oceans, recommending that nations must:

1. Prevent, reduce and control degradation of the marine environment;
2. Develop the potential of marine living resources to meet human nutritional needs, as well as social, economic, and development goals; and
3. Promote the integrated management and sustainable development of coastal areas and the marine environment.

The UNCED declaration represents an important milestone because 170 national leaders endorsed it. Since 1992 many international agreements, treaties, declarations, and conventions for conserving natural marine resources have been designed. (Wallace, 1993 in Sherman, 1999). But today no single international institution has been empowered to reconcile the needs of individual nations with those of the global community in taking management action to ensure the long-term sustainability of marine resources and ecosystems (Myers, 1990 in Sherman, 1999).

In response, the Global Environmental Facility (GEF) has emerged as the facilitator and funding mechanism for integrating global environment concerns into a process for achieving the goals of several international conventions identified by UNCED for global action. The GEF established within the World Bank, is supporting and assisting developing countries in overcoming threats to the marine environment such as pollution, fisheries, habitats, coastal zone management, shipping, transport, and drainage basin effluents. This agency is supporting programs aimed at improving assessment and

management of shared marine resources in international waters that cross national boundaries (Sherman, 1999).

The IUCN recommended that a strategy for sustainable development of marine resources be developed in partnerships between governments, business, NGOs and indigenous people because conservation of marine resources is a societal concern not just a scientific problem. Sustainable management of marine ecosystems is critical to the natural and cultural heritage of the world because they support a great diversity of animals and plants and they also play an important role in the climatic cycles (World Bank, 1995). Examples include fisheries as a food resource, mangroves that provide places for nourishment of multiple organisms, and reefs as food resource for marine species (IUCN, WWF, and UNEP, 1991).

*"The oceans are becoming despoiled and every processes on which most life depends are put at risk."  
(Cherfas, 1990, in Agardy, 1997).*

Issues that have generated changes in the marine habitat composition include human activities, such as tourism and recreation, transportation and oil industry (GBRPA, IUCN, and WB, 1995). Activities such as agriculture, forestry, livestock, construction of human settlements and roads, and recreation contribute in generating environmental change to reef environments and inland in river catchments also.

### 1.3. Management of the Marine Rim

Done (2000) defines the concept of marine protected areas as a management tool which can be used to achieve the long term goal of passing on a worthwhile marine ecosystem to coming generations. The World Conservation Union (IUCN), the United Nations Environmental Program (UNEP), and the World Wide Life Foundation strategy (WWF) define marine protected areas as "any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment". Marine reserves were first created in 1930 (Bjorklund, 1974; Allen, 1976; Powell, n.d.; Davis, 1981 in Silva and Desilvestre, 1986) and the marine protected areas were created at leisurely places. Between the 1960 and the 1970's this leisurely concept started to change and marine reserves commenced to apply protection policies in marine and coastal resources (Silva et.al. 1986). In the case of Latin America, the objective of marine reserves is mostly to create a space for tourism and recreation (Silva, 1986 p.324).

The establishment of Marine Protected Areas (MPA) has enhanced protection of the marine environment. Management efforts have also been successful in preventing depletion of marine resources. Marine Protected Areas are specially managed to protect species; the habitats that support them and ecosystems that they comprise are key tools in saving the earth's seas from over-utilization to meet people's needs. According to Agardy (1997) the ultimate goal of any MPA is marine conservation. Fifteen (15) objectives can be recognized in MPAs:

1. Maintain genetic/species diversity;
2. Promote research;
3. Allow creation of education and training areas;
4. Conserve habitat and biota;
5. Allow for baseline monitoring;
6. Protect rare/important species;
7. Promote tourism and recreation,
8. Promote sustainable development;
9. Recolonize exploited areas;
10. Protect coastlines;
11. Allow for alternative economic development;
12. Preserve aesthetic value;
13. Protect historic/cultural sites;
14. Exert political influence or assert jurisdiction; and
15. Protect intrinsic and/or absolute value of an area.

#### **1.4 Types of Marine Protected Areas**

Agardy (1997) recognized seven types of MPAs :

1. *Closed areas*: are areas that certain class of use is restricted for the sustainability of the resources; often they are temporary or seasonal;
2. *Research and monitoring areas*: these areas are designed either as control in experimental science or sites for monitoring environmental conditions;
3. *Sensitive sea areas*: areas that need special protection because of their ecological or socio-economic significance;
4. *Marine sanctuaries and marine parks*: areas that are established to accommodate a set of particular uses

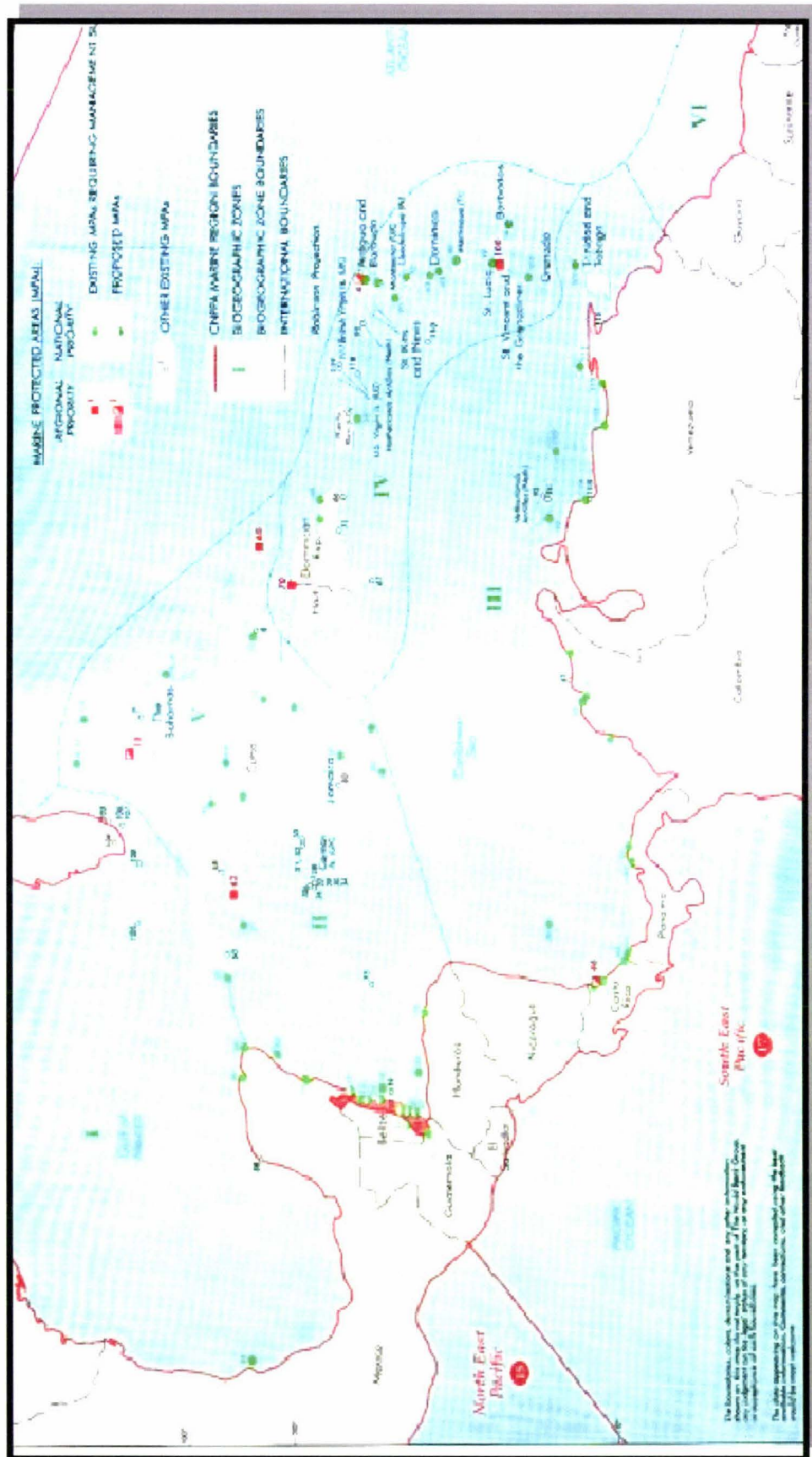
while conserving the coastal or marine ecosystem and its processes;

5. *Regional seas and large marine ecosystem areas*; recognized by the United Nations Environmental Program (UNEP) as enclosed or semi enclosed seas that fall under the jurisdiction of more than one nation;
6. *Integrated Management areas*: these areas include state-administered coastal zone planning areas and Exclusive Economic Zones (EEZ) managed by federal authorities;
7. *High seas under the U.N. law of the sea*: areas that are under the international treaty and codified customary law which create a cooperative management regime for those states that sign and ratify these agreements.

Large Marine Ecosystems (LME) according to Alexander (1993) are extensive aggregates of fish populations which are linked together in predator-prey relationship. The minimum size of LME units may be approximately 200,000 kms<sup>2</sup>. However, Sherman and Tang, (1999) states that 'the large marine ecosystems are relatively large regions of ocean space, characterized by distinct bathymetry, hydrogeography, productivity and tropically dependent populations. They extend from the near shore areas, including river basins and estuaries, out to the seaward boundary of the continental shelf or the seaward margin of coastal current systems (Sherman, 1999). The author considers that there are forty nine (49) LMEs around the margins of the Atlantic, Pacific and Indian Ocean. Among them are the US Northeast Continental Shelf, the East and West Greenland Shelves (Alexander, 1993).

The MBRS concept is relatively new and has also been used only in documents from international agencies such as the Central American commission for the Development (CCAD), The World Bank, the GEF, few international literature and some local documents. Other consulted authors refer to the Wider Caribbean without specifying any particular region. Authors such as Alexander (1993), Sherman (1999), and Agardy, (1997) consider the area "The Wider Caribbean" as a Large Marine Ecosystem, located bordering up north with the State of Florida, to the east surrounding Cuba, the Antilles and then in the south part with the coasts of Venezuela and Colombia, and to the west with Central America (Panama, Costa Rica, Nicaragua, Honduras Guatemala, and Belize) and Mexico (Agardy, 1997, and Alexander, 1993) (see map 1).





Map 1.1. "The Wider Caribbean" as a Large Marine Ecosystem (Kelleher et al., 1995).