## Chapter 6: Factors Influencing the Sustainability of Resource Use and Management Within Multiple Use Marine Protected Areas

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Multiple Use Marine Protected Areas (MPAs) have emerged as an important mechanism in the conservation and sustainable use of marine resources. This study investigates whether there are common factors that enhance or constrain the sustainability of resource use and management within the MPAs.

A comparative analysis of resource use patterns and associated socio-economic, socio-political, and institutional factors was carried out in four MPAs: Hikkaduwa Nature Reserve (Sri Lanka), Mafia Island Marine Park (Tanzania), Hon Mun Marine Protected Area (Vietnam), and the Great Barrier Reef Marine Park (Australia).

In this investigation a simple analytic framework was used. This was broadly based on a framework developed by the Sustainable Use Specialist Group (SUSG) Technical Advisory Committee (TAC) of the IUCN Species Survival Commission (Annex 1), and on a matrix developed by Ticco (1995) to analyse MPAs. The modified framework used provided a means of inter-regional comparison of marine protected areas and the resource use activities taking place within their boundaries.

### Lessons Learned:

1. The following factors affect sustainability of resource use and management within MPAs, irrespective of differences in their location or size, or in the cultural and political dissimilarities present in the nations involved.

    - Empowerment of the local community – the local community's direct involvement in the establishment and management of the MPA.
    - Strong commitment by the different user groups in the MPA to the long-term sustainability of resource use.
    - An institutional framework that incorporates all relevant stakeholders that are dependent on the resources located in the MPA, and a decision-making process that takes their interests into account.
    - Strong government commitment to marine resource management in the context of MPAs.
    - A comprehensive management plan for the MPA that ensures that resource use will take place in a sustainable manner and user conflicts will be minimised.
    - An adaptive management approach with a strong monitoring component that operates during the implementation of the MPA management plan.
    - An independent governing body at the national level that is responsible for the overall management of the marine protected area.
    - The presence of strong national policies and legislation in relation to MPAs.
    - Economic stability – which will ensure that the necessary financial commitment to technical expertise, equipment, trained personnel, *etc*., for the management of MPAs will be available.
    - Political stability – the country's political climate would affect the government's commitment to marine resource management.
    - Geographic location – low population densities adjacent to an MPA contribute to less anthropogenic stress on the system, less resource use conflicts, and higher levels of sustainable resource use.

2. Certain socio-political, socio-economic and institutional factors appear to be of greater importance than others in enhancing the sustainability of resource use in the four selected MPAs.

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3. External factors such as natural disasters or war can have an overriding influence on the sustainability of resource use and management at MPA sites.

4. Different combinations of the above factors and different interactions between these factors were noted in the four MPAs examined. The study illustrated that while some MPAs play a role in enhancing sustainability of resource use, others do not. This was attributed to the specific combination of factors present at each MPA site.

5. The specific combination of factors that enhances sustainability of resource use in one MPA is unlikely to be identical to the factors that influence another MPA set in a different country or socio-economic environment. In other words, what works for one MPA can rarely be transposed unmodified to another MPA and expected to produce the same results.

It is hoped that the lessons learned in this paper about the factors influencing the sustainability of resource use in MPAs will be used as a practical tool to:

- Understand the nature of the socio-political, socio-economic and institutional factors that could increase the probability that a marine or coastal protected area will be implemented successfully.
- Determine the probability that a particular coastal system under management will enhance the sustainability of resource use within that area.
- Carry out comparative analyses of different MPA sites or different coastal areas that are under management and determine why some are successful while others are not.

In this particular study, the modified analytic framework has been used to make an inter-regional comparison of MPAs. By utilising this framework in different scenarios it is hoped that the analytic framework itself can be improved upon and developed further to give a better understanding of the factors influencing the sustainability of resource use in marine and coastal systems.

## 1. Introduction

The sustainable use of resources can be described as the use of resources today, without compromising such use for future generations (Brundtland 1988). Our broad understanding of the concept of sustainable use has evolved considerably over the last two decades. A use could be sustainable under a variety of biological, social and economic configurations. To use natural resources sustainably and optimise the benefits to people through time requires a better understanding of the factors that enhance (or constrain) the sustainability of those uses (SUI[2] 1999).

According to IUCN's Sustainable Use Initiative, there are a number of such factors that increase (or decrease) the likelihood that natural resource use will be sustainable, depending on local conditions. Based on these observations it is recognised that:

> *"Sustainable use is not determinate. There is a multitude of configurations of biological, social and economic conditions at which sustainability of a use might be achieved. However, only certain conditions may work"* (SUI 1999).

The multiple uses of the coastal zone are not always compatible with sustainable resource management and often result in a wide array of conflicts among resource users and decision-makers (Andersson and Ngazi 1995). Marine Protected Areas (MPAs) have emerged as an important practical tool in the conservation and sustainable use of marine biodiversity. Well-planned MPAs seek to preserve ecosystem integrity and productivity while accommodating user groups to the maximum extent possible. The term 'Marine Protected Area' is defined as *"Any area of intertidal and/or subtidal terrain, together with its overlaying water and associated flora, fauna, historical and cultural features, which have been reserved by law or other effective means to protect part or all of the enclosed environment"* (McNeely *et al*. 1994). There is a growing emergence of MPAs that encompass integrated management plans and allow for different resource use in separate zones, *i.e.*, multiple use marine protected areas.

This paper attempts to illustrate that even for multiple use MPAs with very different settings, there are some common factors that enhance (or constrain) the sustainability of resource use within the MPA. The four sites selected in this study are diverse: They are located in four different countries and the settings are very different in each case. For example, Australia's Great Barrier Reef Marine Park is the largest MPA in the world and unique in its size and setting. The Mafia Island Marine Park comprises a group of islands that are located off the Tanzanian mainland, about 120km southeast of Dar es Salaam. The proposed Hon Mun Marine Protected Area in Vietnam also consists of a group of islands, but in this case, they are located closer to the mainland. The Hikkaduwa Nature Reserve in Sri Lanka comprises a near-shore fringing reef and a shallow reef lagoon, adjacent to the coastline.

[2] The IUCN Sustainable Use Initiative was established in 1995 to improve understanding about the factors that affect sustainability. Since that time, sustainable use has evolved from being a somewhat controversial notion to being successfully incorporated into mainstream thinking about conservation. In keeping with this conceptual shift, IUCN has re-organized its work, moving away from a special, stand-alone Initiative towards an integrated approach. SUI was disbanded in 2001, but a Sustainable Use Team (SUT) was formed to carry on this work, synthesizing information and findings across IUCN's diverse programmes. SUT's goal is to disseminate information and knowledge about sustainable use, facilitate analytic and policy contributions from IUCN programmes and members, and develop tools and build capacity for understanding sustainability. A key actor in this effort is the IUCN SSC Sustainable Use Specialist Group (SUSG, http://iucn.org/themes/ssc/susg/), an international network of experts operating in 17 different regions. SUT acts as the secretariat for the SUSG.

### 1.1. Aim

The general aim of this paper is to test the following hypothesis:

The sustainability of resource use within multiple use marine protected areas is dependent on certain critical socio-political, institutional and socio-economic conditions. These conditions are broadly applicable and common to different marine protected areas, irrespective of the cultural and political setting, the individual nation or the particular site under investigation.

### 1.2. Objectives

The specific objectives of this study are:

1. To carry out a comparative analysis of both extractive and non-extractive resource uses at four marine protected areas.
2. To determine which socio-political, institutional and economic conditions appear to enhance (or constrain) the sustainability of resource use within marine protected areas.
3. To identify broadly what is necessary at the policy level to support the sustainability of resource use within marine protected areas.

## 2. Methodology

The present study carries out a comparative analysis of the sustainability of resource use (both extractive and non-extractive) and management within four tropical multiple use marine protected areas containing coral reefs and associated habitats.

### 2.1. Analytic Framework Analysis

The analytic framework used in the present study (see Table 1) is broadly based on a framework developed by the Sustainable Use Specialist Group (SUSG) Technical Advisory Committee (TAC) of the IUCN Species Survival Commission (Annex 1), and a matrix developed by Ticco (1995) to analyse MPAs. The goal of the analytic framework is to improve the understanding of the factors that favour or restrict sustainability in the use of natural resources. The framework will provide global coherence, and facilitate analysis of cross-sectoral themes. The modified framework used in the present study incorporates components of both the TAC and Ticco analyses and provides a means of inter-regional comparison of marine protected areas and the different management regimes and resource use activities taking place within their boundaries. The modified framework includes biological, socio-economic, institutional, and socio-political factors, as well as other external factors that may influence the sustainability of resource use within marine protected areas. Comparisons are drawn between the four study sites in relation to these factors.

### 2.2. Limitations of the Study

- The study is mainly based on qualitative data from secondary sources available at the time the study was conducted. As a consequence, the analysis is mainly descriptive, and does not include any statistical analysis.
- In the qualitative data used, there were gaps in the information on biological and economic factors in relation to the study sites.
- As a result of time constraints, it was not possible to validate the reliability of all the secondary sources of data used during this study.
- No quantitative data could be gathered due to the short duration of the study (fieldwork was carried out over only a 6-week period).

- The underlying assumption made in this study is that if the uses of the resource and the ecosystem are sustained, then the MPA management regime will also be sustained. This may not always be the case.
- The four MPAs in this study are all located in tropical areas; this therefore places a limitation on extending the lessons learned to MPAs found in other climatic regions.

## 2.3. Examples of Future Research

It is hoped that the factors identified in this paper that influence the sustainability of resource use in MPAs will be used as a practical tool and guide by policy-makers and MPA managers to:

- Determine the probability that a particular MPA will enhance the sustainability of resource use within that area.
- Understand the nature of the socio-political, socio-economic and institutional factors that could increase the probability of the MPA being implemented successfully, when establishing new MPAs.
- Carry out comparative analyses of different MPA sites to determine why some are successful while others are not.

Based upon the findings of this study, there are some related issues that could be explored further. For instance, in the present study, an analytic framework was utilised to test the combination of socio-political, socio-economic and institutional factors that enhance the sustainability of resource use within multiple use MPAs found in different regions of the world. That is, the framework facilitated an inter-regional comparison. It would be interesting to test whether a similar analytic framework could be adopted at a regional level to determine factors that enhance sustainable resource use within marine protected areas located in a single region, such as South Asia or Southeast Asia. Would new factors of importance emerge in each region? It would also be useful to determine whether the four factors highlighted as being a crucial subset in the case of the four MPA sites examined would be reinforced as being of greater importance at other sites as well. In addition, this analytic framework could also be used at a national level to do a comparative analysis of a national MPA system or perhaps of coastal or marine ecosystems that have a management plan. Yet another line of assessment that may prove useful would be to determine the sustainability of resource use in a particular marine or coastal area that has not been designated as an MPA, but where the factors that enhance sustainability (as identified in this study) are present. By utilising this analytic framework in these different scenarios it is hoped that the analytic framework itself can be improved upon and developed further to give a better understanding of the factors influencing the sustainability of resource use in marine and coastal systems.

## 2.4. Terminology

### *2.4.1. Resource Uses*

In this paper, resource uses are broadly classified as extractive and non-extractive. Extractive uses are those where resources are harvested or taken out of the natural system (for example, in fisheries). As noted by the analytic framework (Annex 1), extractive use may be made of several species simultaneously at the same location and from the same ecosystem. Non-extractive uses occur when resources remain in their original habitat and are utilised while in this system, as is the case when observing coral reefs or reef fish in their natural environment while snorkeling and diving.

### *2.4.2. Modifiable and Non-modifiable Factors*

In this study, external factors affecting the sustainability of natural resource use are broadly categorized as modifiable and non-modifiable. Modifiable factors are those within the control of human society, such as poverty, political instability, economic instability and war. Non-modifiable factors are those beyond the control of humans, such as natural disasters affecting marine protected areas, which include natural events like cyclones, *etc*.

**Table 1: Analytic Framework to Assess the Sustainability of Resource Use and Management within Multiple Use Marine Protected Areas** Adapted from the first draft of the TAC Analytic Framework for Understanding the Factors that Affect the Sustainable use of Living Natural Resources (1999); and An Analysis of the Use of Marine Protected Areas to Preserve and Enhance Marine Biological Diversity; P. C. Ticco (August 1995).

| Factors | Questions | Indicators of Degree of Sustainability Attained | Externalities |
|---|---|---|---|
| 1. General. | Marine park profiles:<br>• Location.<br>• Size.<br>• Date of establishment.<br>• Historical background.<br>• Main reason for establishment.<br>• Primary goal of the MPA. | • Degree of commitment to establish MPA by local resource users and the government.<br>• Degree of achievement of MPA's overall goal. | Non-modifiable variables:<br>• Natural disasters (floods, hurricanes, bleaching events, *etc*.).<br><br>Modifiable variables:<br>• Social, political, and economic conflict; global environmental problems; structural poverty; foreign debt. |
| 2. Living Natural Resources. | Resource uses and issues<br>• What are the main natural resources found within the MPA?<br>• What are the resource use activities taking place in the MPA?<br>• What are the main threats facing the resources within the MPA?<br>• What is the conservation status of the resources found within the MPA? | • Degree of extractive resource uses in MPA.<br>• Degree of non-extractive resource uses in MPA.<br>• Degree of threat to resources in MPA.<br>• Degree of protection awarded to the marine resources found within the MPA. | As above. |
| 3. Institutional. | Institutional framework for MPA:<br>• Management system – multiple use zoning.<br>• Nature of regulatory framework<br>- Legal authority.<br>- Legislative authority.<br>- Different stakeholder groups involved.<br><br>Implementation of MPA:<br>• Are management provisions actually being implemented?<br>• Is there an inventory of results?<br>• What is the success of enforcement of the management plan? | • Existence of efficient regulatory framework that incorporates all stakeholders in the management of the MPA.<br>• Degree of compliance of zoning plans.<br>• Degree of local community empowerment in resource management.<br>• Efficient implementation of management plan for MPA.<br>• Presence of an adaptive management regime in the implementation of the MPA. | As above. |
| 4. Socio-political. | • What are the international agreements and conventions that the country is party to?<br>• What are the national policies that exist in relation to natural resource management and Integrated Coastal Zone Management (ICZM)?<br>• Is there national legislation in regard to marine resource management and MPAs?<br>• Is there an institutional framework at the national level for marine resource management and MPAs? | • Number of international agreements and conventions the country is party to.<br>• Existence of policies regarding marine resource management and MPAs.<br>• Existence of legislation regarding marine resource management and MPAs.<br>• Presence of a strong institutional framework for marine resource management at the national level. | As above. |
| 5. Socio-economic. | • GNP per capita.<br>• Total debt outstanding.<br>• Total population.<br>• Population growth rate.<br>• Life expectancy.<br>• Literacy rate.<br>• Government status and policy.<br>• Government support to MPAs. | • Human development index indicators.<br>• Degree of government commitment to marine resource management in the context of MPAs. | As above. |

## 3. Profiles of the Marine Protected Areas

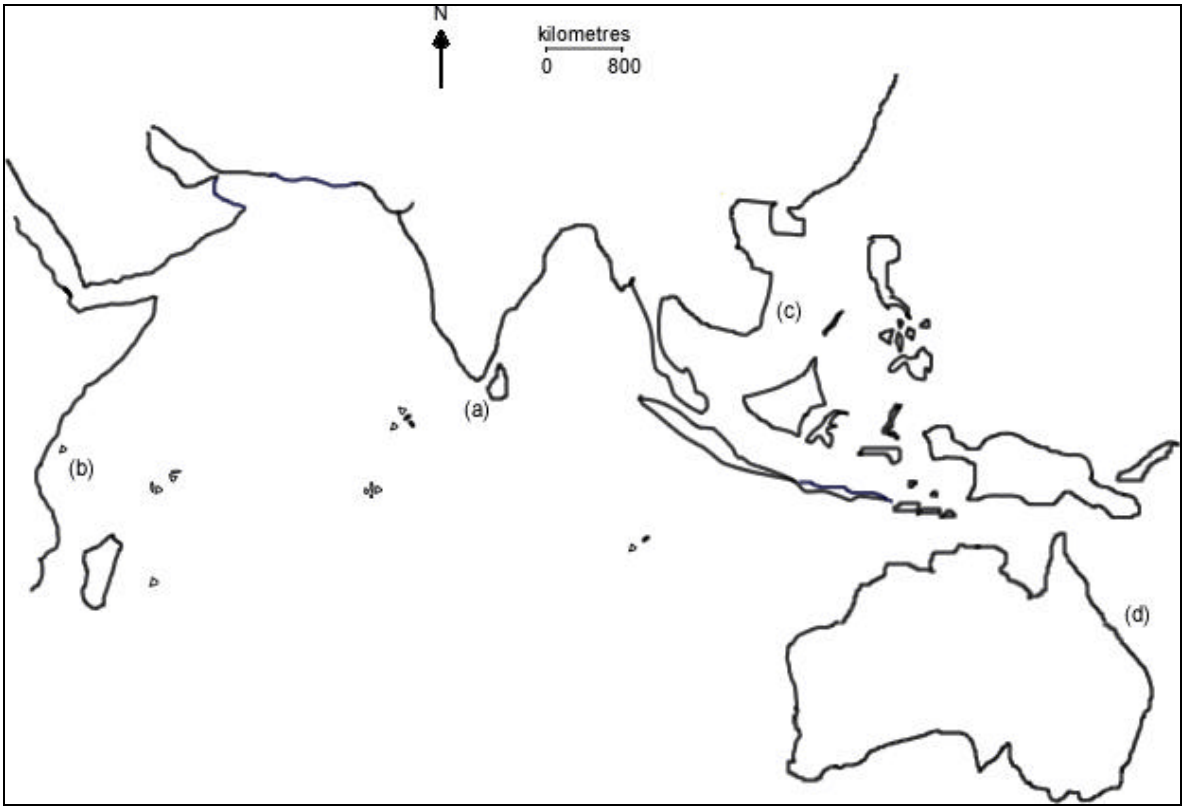
The four sites (see Figure 1) were selected using the following criteria:

- They are designated as multiple use protected areas, where several activities (both extractive and non-extractive) are legally permitted within their boundaries.
- Secondary sources of information were already available for the four sites.
- The four sites provide good examples of MPAs in very different settings.
- Three of the sites were situated in 'developing countries' and therefore could be considered to belong to the same 'group'. As a contrast or 'out-group', one site was chosen from a 'developed country'. The aim of this was to help identify what factors could either enhance (or constrain) the sustainability of resource use depending on whether the MPA was situated in a developed or developing country.

Information on these four marine protected areas was gathered from published literature, personal interviews and other secondary sources. Although time restrictions necessitated that this study be based mainly on data already available, the four sites were visited for about a week each, to gather some information first-hand and also to acquire some familiarity with site-specific issues and the different management regimes. The study tour of the four selected marine protected areas was conducted from 6 September to 13 October 1999.

**Figure 1: Selected MPA sites.**

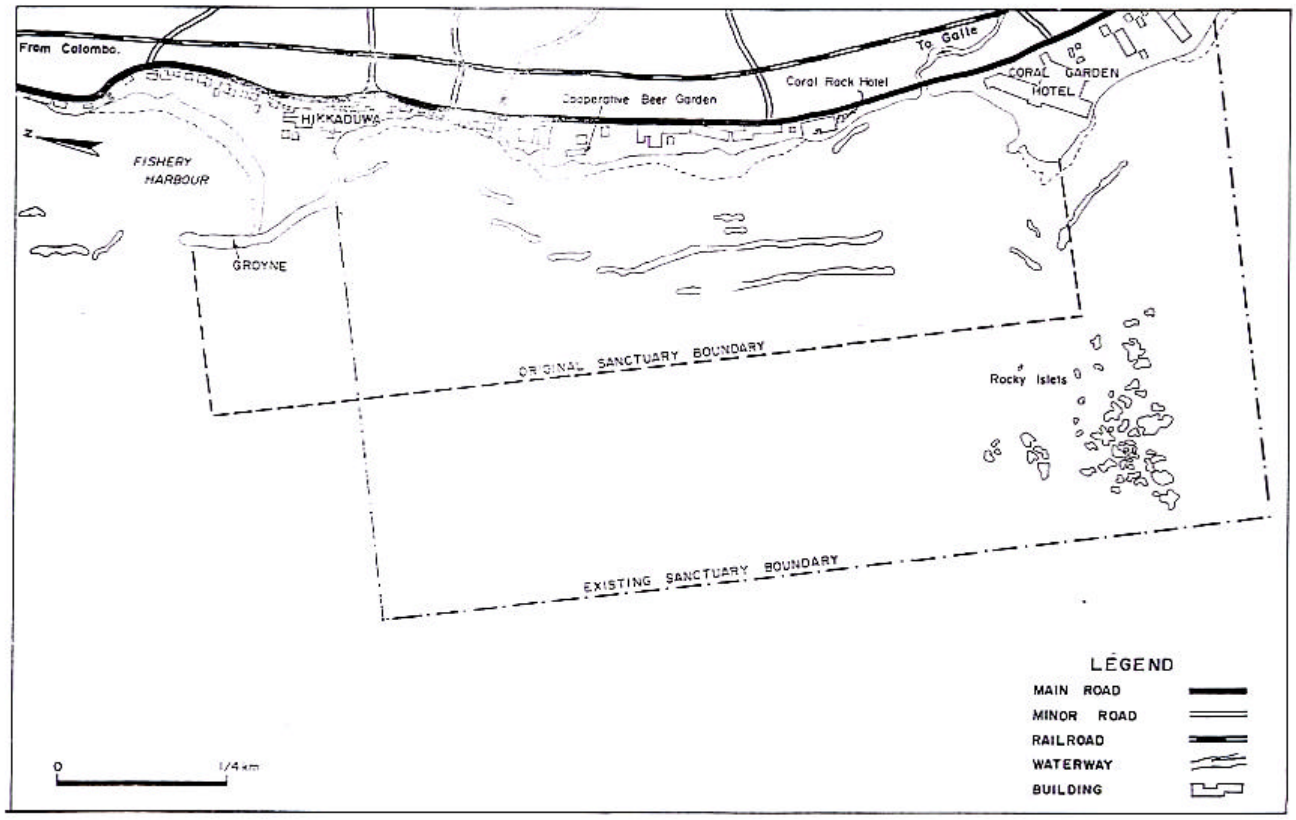
a) Hikkaduwa Marine Nature Reserve (Sri Lanka).
b) Mafia Island Marine Park (Tanzania).
c) Proposed Hon Mun MPA (Vietnam).
d) Great Barrier Reef Marine Park (Australia).



## 3.1. Hikkaduwa Nature Reserve

The Hikkaduwa Nature Reserve is located on the southwest coast of Sri Lanka, approximately 100km south of the capital, Colombo. Sri Lanka, an island in the Indian Ocean, is close to the Indian peninsula. The Hikkaduwa marine protected area constitutes an area of 110 acres that includes a fringing coral reef and a shallow reef lagoon adjacent to the shore. It is the country's first MPA and was established in 1979. The main goal of the protected area was to safeguard the high diversity of corals, coral reef fish and other reef-associated species found in Hikkaduwa and to ensure that the thriving tourist industry centered around these rich marine resources developed in a sustainable manner (Hikkaduwa Special Area Management and Marine Sanctuary Coordination Committee 1996, De Silva 1997).

**Figure 2: Hikkaduwa Marine Nature Reserve (Sri Lanka). From Special Area Management Plan for Hikkaduwa Sanctuary and its Environs, Sri Lanka (1996). Coast Conservation Department, National Aquatic Agency, Sri Lanka.**

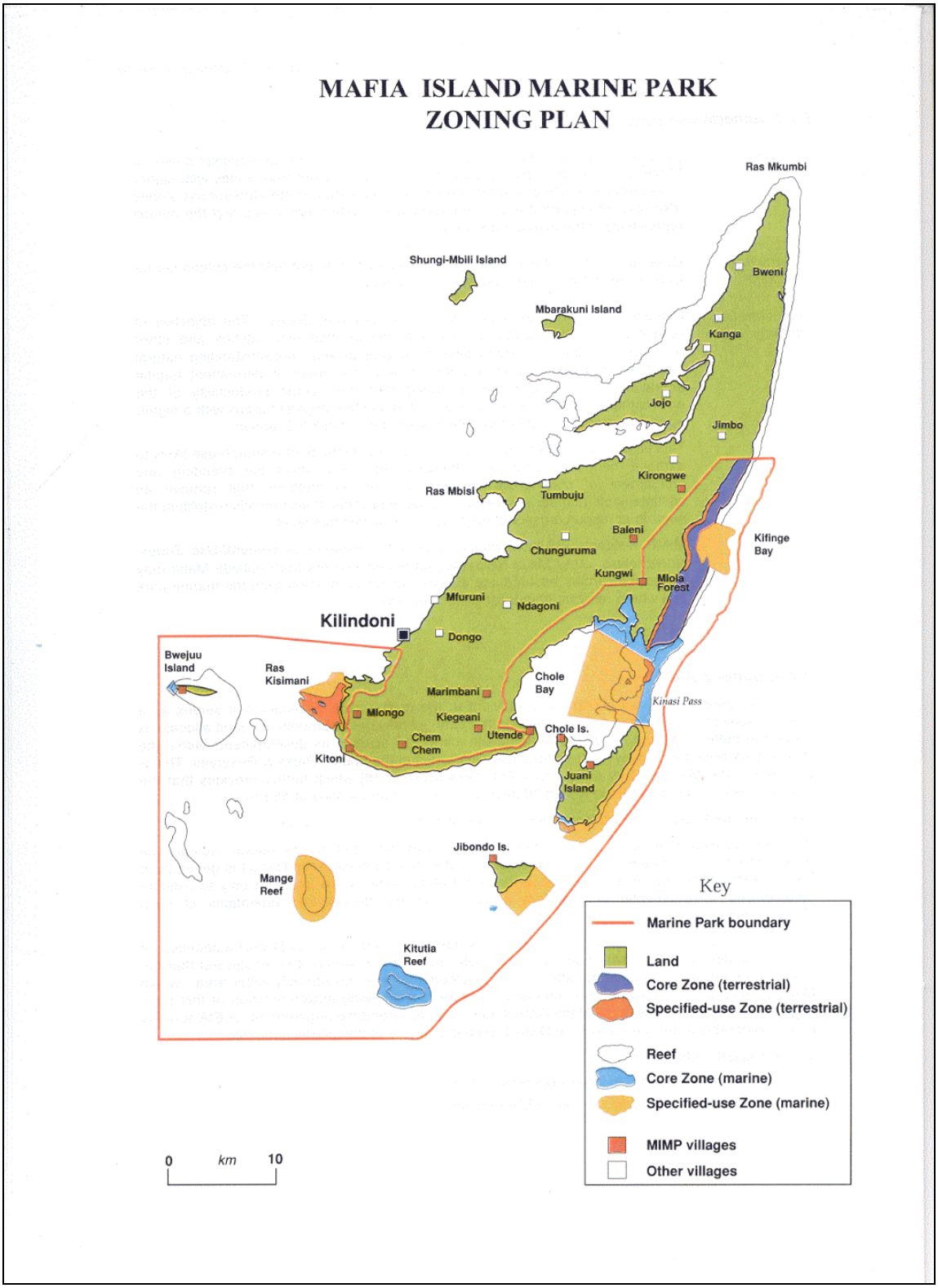



## 3.2. Mafia Island Marine Park

The Mafia Island Marine Park is located in the western Indian Ocean, south of the Island of Zanzibar, and about 120km southeast of Dar es Salaam, the capital of Tanzania (Agardy 1997, Ngoile *et al.* 1998). Tanzania is on the east African coast, between Kenya (north) and Mozambique (south). The Mafia Island Marine Park covers approximately 822km$^2$, making it the largest marine protected area in the western Indian Ocean (Board of Trustees 1999, Ngoile *et al.* 1998). The park boundaries encompass only part of the coastal ecosystem within the Government District of Mafia: The southern coast and waters of Mafia, and four neighbouring islands – Chole, Juani, Jibondo and Bwejuu (Andersson and Ngazi 1995, Agardy 1997). A shallow channel (Mafia Channel) that is approximately 21km wide at its narrowest point separates Mafia District from the Tanzanian mainland (Andersson and Ngazi 1995). The marine park was established in 1995 and is Tanzania's first marine protected area. The area is a notable 'hot spot' for biodiversity–fringing coral reefs, mangroves, sea grass beds and soft bottom communities support a high number of coral reef species, invertebrates and other reef-associated

organisms (Agardy 1997, Board of Trustees 1999). The primary goal of the MPA was to incorporate protection, conservation, sustainable resource use, and economic development into the area, with emphasis on the participation of local communities in the process (Agardy 1997).

**Figure 3: Mafia Island Marine Park (Tanzania). From WWF (1998). WWF-UK and WWF TPO support to Mafia Island Marine Park, Tanzania. Source WWF Camris GIS Mafia**



## 3.3. The Proposed Hon Mun Marine Protected Area

The proposed Hon Mun Marine Protected Area (see Figure 4) is located off the coast of Nha Trang in Khanh Hoa Province, south central Vietnam. Vietnam lies on the eastern seaboard of the Indo-China Peninsula, bordered to the north by China, to the west by Cambodia and Laos and to the east by the South China Sea (Foster *et al.* 1998). The proposed MPA includes a group of eight islands – one large island, Hon Tre, and several small islands – Hon Mun, Hon Mot, Hon Tam, Hon Mieu, Hon Mat, Hon Cau and Hon Vung (Foster *et al*. 1998, Nguyen 1998). The distance between the islands and the mainland ranges from several kilometers to about 15 kilometres, in the case of the furthermost islands. The Government of Vietnam has identified Hon Mun as a prospective MPA site mainly because its rich coral reefs systems have high biodiversity. The marine resources associated with these coral reefs are at present being utilised by a number of different stakeholder groups. It is therefore crucial to ensure that these resources are managed in a sustainable manner. There are no legally declared MPAs in existence at present in Vietnam – although the government has proposed to establish a system of MPAs in the country and several preliminary activities are already underway. The Hon Mun site will be the first official marine protected area to be established in Vietnam (GEF Project Brief 1999). Although Implementation of the Hon Mun MPA was scheduled to take place in 2000, it was successfully launched only on 8 June 2001 at a workshop in Nha Trang. The Chief Technical Advisor for the project has also been appointed.

## 3.4. Great Barrier Reef Marine Park

Australia's Great Barrier Reef Marine Park (GBRMP; Figure 5) that lies off the tropical east coast of Queensland, is the largest MPA in the world, covering an area of approximately 339,750km$^2$. It encompasses the Great Barrier Reef – the largest coral reef system, which includes some of the most biologically diverse marine ecosystems. The park does not actually incorporate the entire reef, but includes about 2,100km of the approximately 2,300km-long reef (measured along its eastern edge). The park includes about 2,820 reefs, of which approximately 890 are fringing reefs. There are also submerged reefs, patch reefs and shelf reef platforms to be found within the MPA. The GBRMP was established in 1976 through an act of the Australian Parliament. The park's primary goal is to provide for the protection, wise use, understanding and enjoyment of the GBR in perpetuity through the care and development of the GBRMP (GBRMPA 1999a). The GBRMP has very comprehensive management and zoning plans and is often described as the most successfully managed multiple use marine protected area today. The Great Barrier Reef World Heritage Area is the largest in the world and was included on the World Heritage List[3] in 1981. It covers an area of 347,800km$^2$. The Heritage Area is made up of the continental slope, the Great Barrier Reef lagoon, and the 'inter-reefal' areas. It includes some 3000 reefs, 900 islands and thousands of species of animals and plants (GBRMPA 1999b(f); Wachenfield *et al*. 1998).

A variety of living marine resources are found in the four marine protected areas studied. High levels of biodiversity are therefore found in some of the selected sites. The main natural resources found at each site are listed in Table 2.

[3] World Heritage List – a mechanism used to provide protection to outstanding examples of important marine ecosystems and habitats. World Heritage status can provide significant impetus to conservation measures and places an obligation on signatory nations to provide effective management (McNeely *et al.* 1994).

**Figure 4: Proposed Hon Mun MPA (Vietnam). Vietnam Marine Protected Area Pilot Project. Global Environmental Facility (GEF) Project Brief (1999). IUCN Vietnam.**

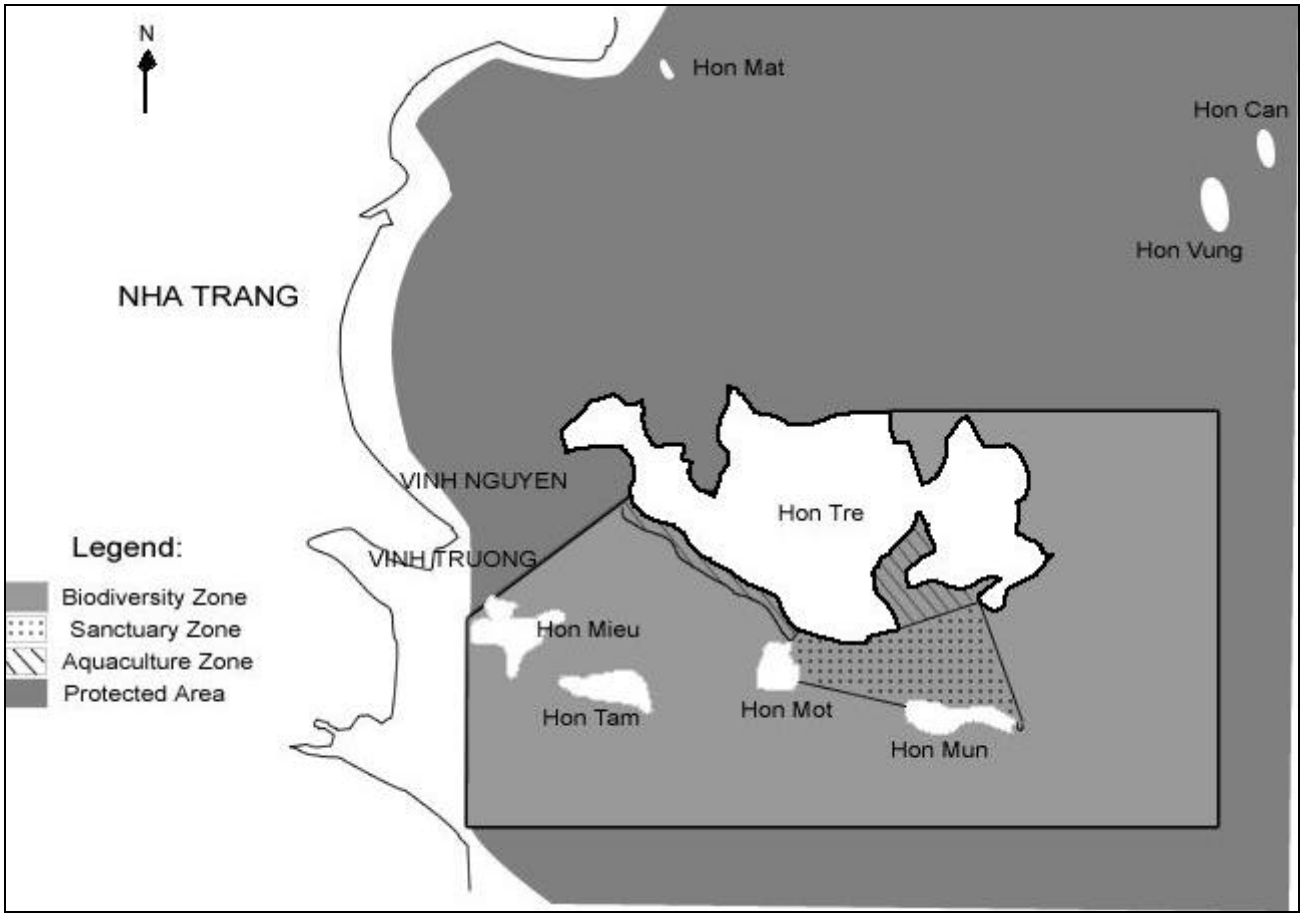


**Figure 5: Great Barrier Reef Marine Park (Australia). Source: Great Barrier Reef Marine Park Authority (1999). Townsville, Australia.**

**Table 2: Main natural resources found within the selected MPAs.**

| Hikkaduwa | Mafia Island | Hon Mun | GBRMP |
|---|---|---|---|
| Fringing coral reef ecosystems and associated reef organisms including reef fish, invertebrates, sea turtles and algal species (Hikkaduwa Special Area Management and Marine Sanctuary Coordinating Committee 1996). | Fringing coral reefs, mangroves and sea grass beds which support over 380 fish species, 45 genera of scelractinian corals, 12 sea grass species, 7 mangrove species, over 134 algal species, about 140 species of sponge, and marine turtles (2 species). In addition, a number of bird species and fruit bats also inhabit the area (Agardy 1997, Board of Trustees 1999). | Coral reefs, mangroves and sea grass beds are found. High diversity of coral with 155 species from 44 genera. Reef-associated organisms, reef fish, invertebrates and sea turtles (Foster *et al*. 1998). | Coral reef ecosystems (2,800 separate reefs, which include barrier, patch, platform and fringing reefs and a total of 350 species of coral), mangroves, sea grass beds, coral reef-associated organisms (both flora and fauna), marine turtles and marine mammals such as dugong, dolphin and whale species (Wilkinson 1998, GBRMPA 1999b(f). |

## 4. Findings

### 4.1. Resource Use Activities

In all four MPA sites examined, extractive as well as non-extractive marine resource use activities take place. Although a majority of the resource uses, such as tourism and fisheries-related activities, are common to all four sites, there are a few exceptions. Certain resource use patterns may be observed only at a particular site, for example, the harvesting of swiftlet bird nests in the Hon Mun area. In addition, in the case of similar resource use activities, the scale and degree of resource use also vary in the four sites. For instance, in GBRMP, resource uses are on a large scale and are fairly complex, reflecting the vast area the MPA covers, as opposed to the other three sites, which are all much smaller protected areas by comparison and have smaller-scale, less complex uses. A simple ordinal ranking system has been used to indicate the degree of use taking place, for all the major extractive and non-extractive use activities in the four MPAs (see Table 3). A scoring system of 1 to 5 has been used in this case, with 5 indicating the highest use and 1 the lowest use activity.

#### *4.1.1. Hikkaduwa Nature Reserve*

In the Hikkaduwa Nature Reserve, the main extractive resource use is traditional line fishing, permitted within the MPA boundaries. In addition, some illegal collecting of coral reef fish for the aquarium industry, as well as shell collecting, has been reported (Rajasuriya *et al*. 1995). Although coral is not mined within the park boundary, mining is reported in areas adjacent to the park.

Most non-extractive resource use activities in Hikkaduwa are linked to the tourist industry. This includes operating glass-bottom boats for tourists to observe the coral reefs and associated organisms, snorkeling, skin diving, swimming and sunbathing. Coral reef research and surveys are also carried out within the MPA by the leading state research institution (National Aquatic Resources and Research Development Agency, NARA) and national universities such as the University of Colombo (Rajasuriya and White 1995, Hikkaduwa Special Area Management and Marine Sanctuary Coordination Committee 1996).

#### *4.1.2. Mafia Island Marine Park*

In the Mafia Island Marine Park, a number of extractive resource uses take place. Extraction for food purposes includes: Fishing for fin fish, sharks, rays, lobster, and octopus; sea cucumber harvesting; shell and coral collecting; and seaweed farming and collecting. Tourism-related sport fishing also takes place within the park.

The most destructive activity could be considered the mining of coral for the lime industry, which, although an illegal activity, has been difficult to halt completely. Other marine habitats associated with reefs (such as mangroves) that are located within the MPA are also harvested and provide wood for building houses, boats, *etc*. The women on some of the islands such as Chole utilise varieties of grasses for weaving traditional handicrafts (Andersson and Ngazi 1995, pers. comm. J Rubens 1999).

Non-extractive resource use activities on Mafia Island include tourism-related activities such as swimming, snorkeling, scuba diving, and 'nature walks' organised on Chole Island, as well as research activities and survey work carried out in relation to the fringing coral reefs found within the MPA boundaries. Studies have been carried out by a non-governmental organisation, Frontier Tanzania, and the University of Dar es Salaam, through the Institute of Marine Sciences (WWF 1998).

### *4.1.3. The Proposed Hon Mun Marine Protected Area*

In the proposed Hon Mun MPA, the major extractive resource use activity occurring at present is fishing, for both subsistence and commercial purposes. Commercial species such as pacific mackerel, shark, *etc*., are harvested. Islanders with slightly larger boats engage in night fishing for squid, octopus and anchovy. Other species such as sea cucumber and sea urchin are also harvested. Tourism-related sport fishing has become popular recently. In addition, live fish collection for the aquarium industry and the live fish food trade is also carried out within the proposed MPA site. Two aquariums, located on the island of Hon Mieu and at the Oceanographic Institute in Nha Trang, extract coral reef fish and other species from within the proposed MPA. According to some sources, both aquariums also supply fish to the aquarium fish export trade. Another activity that is taking place within the proposed MPA boundaries is fish farming. There are two companies, one from Saigon and the other from Taiwan that are operating fish farms off the islands. Islanders are paid for supplying fish species from within the MPA to the fish farms. The harvesting of the edible swiftlet birds' nests is yet another extractive activity taking place within the Hon Mun area (pers. comm. K. Foster 1999, Byron *et al*. 1998). This is an extremely lucrative international export industry. The swiftlet birds inhabit caves found on some of the islands in Nha Trang. Their nests are constructed from the birds' saliva. Traditional techniques are utilised for nest collection within the proposed MPA and include simple harvesting tools such as forks to remove nests and bamboo poles to reach nests. Harvesting in the artisanal manner ensures that the birds can build replacement nests in the same location (Casellini *et al*. 1999).

As in the previous cases, most of the non-extractive resource uses taking place within the site are linked to tourism and research activities. Tourism-related snorkeling, scuba diving and swimming occur at several popular sites within the proposed MPA boundaries. A state owned tourist venture has an operation on the Island of Hon Tam, where tourist day excursions are organised. For national security reasons, tourists are not permitted to stay overnight on any of the islands. The Oceanographic Institute has carried out coral reef related research and survey work in the Hon Mun area (Tuan 1999).

### *4.1.4. Great Barrier Reef Marine Park*

In the Great Barrier Reef Marine Park the primary extractive resource use activity is fisheries. There are four major fisheries in the park and these are the trawl fishery, the reef fish line fishery, the inshore mesh net fishery and the harvest fishery. The trawl fishery includes inshore tiger prawn and banana prawn fisheries and offshore king prawn and scallops fisheries. The inshore mesh net fishery includes beach seining that targets fish species such as mullet, and set netting that targets species such as salmon and barramundi. The harvest fishery includes marine aquarium fishes, the trochus mollusk, sea cucumbers, coral, and specimen shells. The reef fish line fishery supports recreational as well as commercial operations and targets snapper, cod and emperor fish (Wachenfeld *et al*. 1998). In certain areas of the park, regulated dugong and marine turtle hunting by indigenous communities is permitted (Hunter and Williams 1997, pers. comm. J. Day 1999). Fishing is the largest harvesting activity in the World Heritage Area. The direct economic value of the commercial fishery in the Great Barrier Reef Region in 1996 was estimated at Australian dollars (AUD) $143,000,000 (Wachenfeld *et al*. 1998).

Non-extractive uses of marine resources in this MPA are centred round a booming tourist industry in addition to research and conservation-related activities. Tourism use within the park has increased markedly over the past 20 years. The park tourism industry constitutes a range of diverse operations including day trip vessel operations to island and reef destinations, dive and fishing charter boat operations, dolphin and whale watching expeditions, and international cruise ship operations. In addition, there are a number of pontoon-based operations at fixed reef sites for snorkeling and diving. Resort-based tourism is also very popular. Approximately 95% of marine tourism use occurs in the offshore Cairns and Whitsunday areas, which make up just 5% of the entire marine park. Tourism is the main commercial use of the Marine Park. It contributes over AUD $1 billion to the Australian economy annually and brings 1.6 million visitors to the Great Barrier Reef (Wachenfeld *et al*. 1998, GBRMPA 1999b(a).

Other non-extractive activities taking place within the MPA are ongoing programmes for the conservation of threatened species, including the dugong, some whales and dolphins, marine turtles, and a number of bird species and island plants. Extensive scientific research and survey work has been carried out in several regions of the MPA on coral reefs as well as on reef-associated species such as fish, marine turtles and marine mammals. The major research institutions that have worked in the MPA include the Great Barrier Reef Marine Park Authority, the Australian Institute of Marine Science (AIMS), and universities such as the University of Queensland (Wachenfeld *et al*. 1998, GBRMPA 1999b(c).

**Table 3: Extractive and non-extractive activities taking place at MPA sites. Highest use at MPA site - 5; lowest use at MPA site – 1 (NB: Scoring system indicates order of main uses versus secondary uses in a specific site, not between the different sites).**

| Extractive Uses | Hikkaduwa | Mafia Island | Hon Mun | GBRMP |
|---|---|---|---|---|
| Fisheries – Consumptive | 3 | 4 | 4 | 2 |
| Fisheries – Commercial | - | 4 | 5 | 5 |
| Coral mining | 1 | 4 | - | - |
| Live fish trade – Aquarium industry | 1 | - | 4 | 3 |
| Live fish trade – Food industry | - | - | 4 | 2 |
| Harvesting for indigenous reasons | - | ? | - | 2 |
| Swiftlet bird nest harvesting | - | - | 4 | - |
| Non-extractive Uses | | | | |
| Tourism-related: | | | | |
| Snorkeling | 5 | 4 | 4 | 5 |
| Scuba diving | 1 | 4 | 4 | 5 |
| Glass-bottom boats | 5 | - | - | 4 |
| Swimming | 4 | 2 | 2/3 | 4 |
| Research | 5 | 3 | 3 | 5 |
| Conservation Programmes | 2 | 2 | ? | 4 |

'?': Question marks in Table 3 indicate that adequate information was unavailable during the study.

From the above matrix it is clear that in the case of Hikkaduwa, extractive uses within the park are minimal and therefore could be considered sustainable in general. But non-extractive uses, such as those related to the tourist industry (*e.g.*, glass-bottom boat operations), are taking place in an unsustainable manner (see section 4.2.1.). At Mafia, extractive uses, such as coral mining and fishing for certain species such as octopus and shellfish, may be considered to be taking place at unsustainable levels. Non-extractive activities such as those related to tourism are for the moment taking place at relatively low intensities. In regard to Hon Mun, extractive uses such

as commercial fishing ventures and collection of aquarium fish are at present taking place at fairly unsustainable levels. In the GBRMP, most extractive as well as non-extractive activities are spread over such a vast expanse that they occur at relatively sustainable levels. However, extensive research is being carried out on the different fisheries as well as on tourism-related activities, to ensure that they are being managed in a sustainable manner.

## 4.2. Threats to Resources

A general assumption made in the present study is that the greater the threats facing the MPA, the higher the probability that the sustainability of resource use will be constrained or lowered. Threats facing each of the MPA sites can be broadly divided into:

1. Local, site-related influences.
2. Macro-level processes, such as economic or political instability in the country.
3. External non-modifiable factors such as natural disasters.

An ordinal ranking system has been used to indicate the degree of threat facing the four MPAs by different use patterns at the site level and also by macro level and external factors (see Table 4). A scoring system of 1 to 5 has been used, with 5 indicating the highest threat and 1 the lowest threat.

### *4.2.1. Hikkaduwa Nature Reserve*

In the case of the Hikkaduwa Nature Reserve, there are number of threats that face the MPA on-site as a result of several resource use patterns and activities that take place. It is interesting to note that prior to the coral bleaching event that took place in 1998 as a result of a rise in sea temperatures, it was unsustainable human activities such as unregulated tourist development that posed the greatest threat to the MPA. For example, a large number of glass-bottom boats operate within the sanctuary. Although boat operators work on a rotational system, there are still too many of them to make this a sustainable operation. Glass-bottom boats banging against the reef or anchoring on live coral, and tourists walking on the reef, are all causes for concern. Even non-extractive resource use activities such as snorkeling can cause threats to the reef when inexperienced swimmers snorkeling too close to the reef outcrop accidentally bang against it, causing damage. Another threat has been the collection by glass-bottom boat operators of live corals to be sold as souvenirs, which was a common occurrence in the past. This activity is uncommon today, however, although local visitors sometimes remove coral (Rajasuriya and White 1995). Yet another threat comes from the large number of hotels that border the marine reserve and discharge effluents directly into the MPA, which has resulted in water pollution.

Fishery-related threats to the MPA are mainly a result of boats dumping waste oil and bilge water overboard into the reef lagoon. Spear fishing is still carried out by locals near the southern end of the sanctuary. Collection of spiny lobsters continues, although lobsters have become a very scarce resource (Rajasuriya and White 1995). Boat anchoring on live coral within the reef lagoon and damage caused by anchor chains are yet other causes for concern. Ornamental fish collection was reported in the past, but there is no evidence that this is taking place currently within the park boundaries.

A major threat facing the Hikkaduwa Marine Reserve more recently is sedimentation due to coastal construction, erosion, and river runoff (Rajasuriya and White 1995). This sedimentation has caused sand levels within the reef lagoon to increase noticeably. The coral bleaching event that occurred in the Indian Ocean in 1998 has also had a serious impact on the fringing reefs within the reserve and arguably is the biggest threat Hikkaduwa faces at present. The main attraction for hundreds of domestic and international tourists that visit Hikkaduwa is the coral reefs found within the sanctuary. If these natural resources are destroyed, most tourists will not stop over in Hikkaduwa. Surveys carried out in Hikkaduwa in August 1998 under the Reef Check Programme revealed that about 90% of the reefs had been bleached and are dead. Butterfly fish and other coral-dependent species have also decreased drastically in the damaged areas (Wilkinson 1998). Surveys in 1999 and early 2000 showed that coral cover at Hikkaduwa Nature Reserve was reduced to only 7% (Wilkinson 2000). At the macro level, political instability in the country has also indirectly affected the management of the MPA.

### *4.2.2. Mafia Island Marine Park*

The main threats facing the Mafia Island Marine Park are in relation to destructive fishing practices and over-exploitation of certain species. In the past, dynamite fishing was one of the biggest threats facing the park. It must be noted, however, that it was mainly fishermen from the mainland who carried out dynamite fishing, not resident fishermen on Mafia. Today, this highly destructive fishing method has been almost completely eradicated in the area, at least within the park boundaries. Other destructive fishing methods include the use of small net sizes. This practice, too, has been banned in the park, which has posed a problem to the fishermen on the islands of Bwejuu and Jibondo who fish for subsistence purposes. A majority of these fishermen are too poor to afford alternative gear and this is their only means of providing food for their families. Beach seine fishing is another destructive fishing method that, although banned within the park, has not been stopped completely. An overexploitation of certain reef-associated species has been reported; for example, octopus, shellfish, and sea cucumber (pers. comm. G. Mtsumi 1999). The encroachment of non-resident fisherfolk and fishmongers (including commercial companies) within the MPA could be one reason that certain species have been over-harvested (Ngoile *et al*. 1998, WWF 1998).

Another major factor that poses a threat to the marine park is the mining of coral to use as building material, especially on the smaller islands of Jibondo, Bwejuu, Juani and Chole. Although this activity has been banned, the islanders find it very difficult to comply with this regulation, in the absence of suitable alternatives to use for building. The cutting of mangroves–mainly for the building of houses–poses a similar threat because in this case, too, suitable alternatives are often not available to the islanders. For instance, on Bwejuu no other material is available to use for building purposes (Agardy 1997, Ngoile *et al*. 1998, WWF 1998).

Unregulated tourist developments along the coastal strip pose a problem both environmentally and socio-economically, and there is also concern over potential cultural erosion by tourists and non-resident fisherfolk. Unregulated commercial activities, especially fish processing factories, are also posing a threat to the integrity of the park. The communities have a very narrow income-generating base. They are wholly dependent on marine resources (WWF 1998).

The coral bleaching event that took place in the Indian Ocean in 1998 also severely affected some of the reefs within the Mafia Island MPA. One such reef was Kitutia (or Tutia) Reef on the southern tip of the marine park (Ohman *et al*. 1998).

### *4.2.3. The Proposed Hon Mun Marine Protected Area*

In the Hon Mun area, one of the major threats facing the coral reefs and associated marine resources is the use of destructive fishing techniques. Dynamite fishing has seriously impacted the corals and marine life around the islands. Many dive and tour guides expressed their concern for the safety of visiting tourists (Byron *et al*. 1998). Other illegal fishing techniques such as cyanide fishing are also common. The demand for live fish caught by cyanide poisoning is two-fold: Adult fish are sought for the ornamental fish trade, and the juvenile fish (especially grouper) for fish farms (Tuan 1999). Much of the ornamental fish trade business can be traced to a single business based in Ho Chi Minh City, which exports internationally to Russia, Sweden, the USA, France, Japan and other countries (Byron *et al*. 1999). Over-exploitation of marine resources is yet another threat–fish, squids and lobsters in the Hon Mun area all show clear signs of heavy fishing pressure and over-exploitation (Foster *et al*. 1998).

Uncontrolled and poorly planned tourism is also a problem facing the area. Access to the Hon Mun site is currently unmanaged. Boats carrying tourists anchor directly on the reef, damaging corals, and dump wastes directly into the water (Foster *et al*. 1998, GEF Project Brief 1999). During the peak tourist season, up to 66 boats visit the MPA site each day (Byron *et al*. 1998, K. Foster, pers. comm. 1999). Careless divers also cause damage to the coral reefs. The purchase of corals and turtles as souvenirs in Nha Trang (pers. observation) is

another problem related to unmanaged tourism (Tuan 1999). Pollution is not a serious issue at present but there is a possibility of it becoming a threat with increasing development and tourism.

### *4.2.4. Great Barrier Reef Marine Park*

In the Great Barrier Reef Marine Park, some of the main threats are caused by uncontrolled tourism due to the large number of visitors to the park. Corals can be damaged during activities associated with the construction of tourist facilities such as marinas and breakwaters, and the installation of poles for jetties. Although quite substantial areas have been affected in the past, most facilities are now located away from good coral cover. Divers, snorkelers and reef walkers can break off or damage corals through intentional or unintentional contact. Recent studies have indicated, however, that while diver and snorkeler damage can be detected in high-use sites, the level of impact is generally low and the area of reef affected is small in proportion to the surrounding reef. Anchoring by boats in coral reef areas is another cause of potentially major coral reef damage in heavily used areas. Reports from local divers in the Whitsunday region have suggested that some popular anchorages have been severely affected already (Wachenfeld *et al*. 1998).

Overexploitation of certain species by the commercial fisheries is a potential problem. Also, the harvesting of threatened species over the recommended quota by indigenous communities does not occur at high levels, but still needs to be monitored (Wilkinson 1998).

Shipping can impact corals through direct grounding of ships and the loss of fuel. Whilst there have been no major oil spills in the Great Barrier Reef World Heritage Area, 25 groundings and 19 collisions of ships have occurred in the last 22 years (Wachenfeld *et al*. 1998). Although most of the reefs of the GBR are a fair distance from the shore, sedimentation and nutrient pollution are the major threats to the inner reefs. The greatest amount of sedimentation is caused by river run-off (Wilkinson 1998).

Natural events such as cyclones, floods and bleaching events have also impacted the Great Barrier Reef. A recent compilation of cyclone data indicates that over the last 28 years there have been 135 cyclones in Queensland waters, and that all areas of the Great Barrier Reef have been affected by at least one cyclone in this period. During the monsoonal wet season, major rainfall can lead to extensive flooding of rivers and the discharge of sediment-laden fresh water into the coastal area. This can extend for many kilometres offshore and impact nearshore and mid-shelf reefs (Wachenfeld *et al*. 1998). Human use of the mainland adjacent to the MPA for development and agriculture has caused an increase in sediment and pollutants entering the Great Barrier Reef (Agardy 1997, Wachenfeld *et al*. 1998). Coral bleaching has been formally reported on six separate occasions in the Great Barrier Reef with the earliest report in 1980 and the most recent in 1998. During the 1998 event, 88% of the inshore reefs exhibited some coral bleaching with 25% of all inshore reefs having more than half of the corals affected (Wachenfeld *et al*. 1998). Bleaching was relatively minor on outer-shelf reefs, with about 28% of the offshore reefs affected (Wilkinson 2000).

## 4.3. Institutional Factors Enhancing/Constraining Sustainable Use

Multiple use MPAs include integrated management plans and permit different resource uses in separate zones. Multiple use zoning is a technique that MPA planners use to resolve real or prospective use conflicts, allowing for both the protection of sensitive or critical areas, and utilization of marine resources that is sustainable over the long-term. In this manner, resource use within MPAs can be regulated and use conflicts are minimised, at least theoretically (Agardy 1997, Kelleher and Kenchington 1992). The number of zones and the criteria used to demarcate the different zones vary from site to site and can range from fairly simple (for example, in the Hikkaduwa Nature Reserve) to highly complex systems, such as that adopted by the Great Barrier Reef Marine Park. A consultative, participatory approach involving all stakeholders is generally, and ideally, adopted in the planning process for MPAs with such multiple use zones. The four sites under investigation have all adopted such a consultative approach during their planning phase.

**Table 4: Threats that occur at the MPA sites.**

Score of 1 to 5
1 – low impact and 5 – high impact

NB: This indicates a relative scale, *i.e.*, scores are based on relative impact of different threats at each site. For example, in Hikkaduwa, tourism-related threats (scored 4) are greater than threats due to coral mining (scored 1).

| Threat | Hikkaduwa | Mafia Island | Hon Mun | GBRMP |
|---|---|---|---|---|
| Over-exploitation of species. | 2 | 4 | 4 | 1 |
| Destructive fishing methods. | - | Dynamite fishing, pole-netting, seine netting. 3 | Dynamite fishing, standing nets, cyanide fishing. 3 | Commercial trawl fishing. 1 |
| Tourism-related resource uses – snorkeling, scuba diving, swimming, glass-bottom boats, sport fishing. | 4 | 1 | 3 | 2 |
| Coral mining. | 1 | 4 | - | - |
| Pollution: Land-based. | 3 | 1 | 2 | 3 |
| Pollution: Marine-based. | 2 | 1 | 2 | 2 |
| Sedimentation. | 4 | 1 | - | 3 |
| Unplanned development activities – both tourism-related (hotels, resorts, restaurants, marinas) and others (construction of harbours, jetties, fish processing operations). | Hotels, restaurants. 3 | Hotels. 2 | New harbour, tourist resorts. 2 | - |
| External factors (modifiable and non-modifiable). | Coral bleaching, sedimentation of the reef lagoon, poor economic conditions, political instability leading to lack of government support. 5 | Coral bleaching, poor economic conditions. 3 | Poor economic conditions. 3 | Coral bleaching, cyclones. 1 |

### *4.3.1. Hikkaduwa Nature Reserve*

In the case of Hikkaduwa, the initial investigations geared towards the management of coral reefs were carried out in 1985 by the lead state research institution, the National Aquatic Resources Research and Development Agency (NARA). After a one-year intensive study by NARA, which included both ecological and socio-economical surveys, it was proposed that the sanctuary be organised into a multiple use MPA, demarcating three different use zones (Rajasuriya and White 1995, De Silva 1997).

These were:

a) General Use Zone A. Mainly non-extractive uses related to the tourist industry to be permitted in this zone, where activities other than the following would be allowed: The use of anchors and anchor chains, and stepping and walking on corals. It was recommended that the number of glass-bottom boats operating in this zone be limited to no more than five at any time, and that rafts and mooring buoys be placed at strategic locations to prevent damage to corals by stepping and walking and by anchoring of boats. Extractive use in the form of traditional line fishing is allowed with a permit. In addition, the removal of corals and other marine organisms for research purposes also requires a permit.
b) General Use Zone B. General uses, both extractive and non-extractive, to be permitted where activities other than the following would be allowed: Removal of fish and other reef organisms without a permit issued by the Department of Wildlife Conservation; stepping or walking on corals and coral reefs; anchoring of boats on corals and coral reefs; and entry into the Rocky Islets Sanctuary without a permit. It was also recommended that mooring buoys be provided for boats near the Rocky Islets.
c) Research Zone. This area has some relatively undisturbed coral and has been subjected to low visitor pressure. This zone therefore would be given the highest degree of protection. Only research related non-extractive resource uses would be permitted within this zone. The following activities were not recommended: The entry of boats into the lagoon reef area of this zone; the use of diving and snorkeling gear by unauthorised persons; and the removal or disturbance of organisms unless for research by authorised persons. (Rajasuriya and White 1995, Hikkaduwa Special Area Management and Marine Sanctuary Coordination Committee 1996).

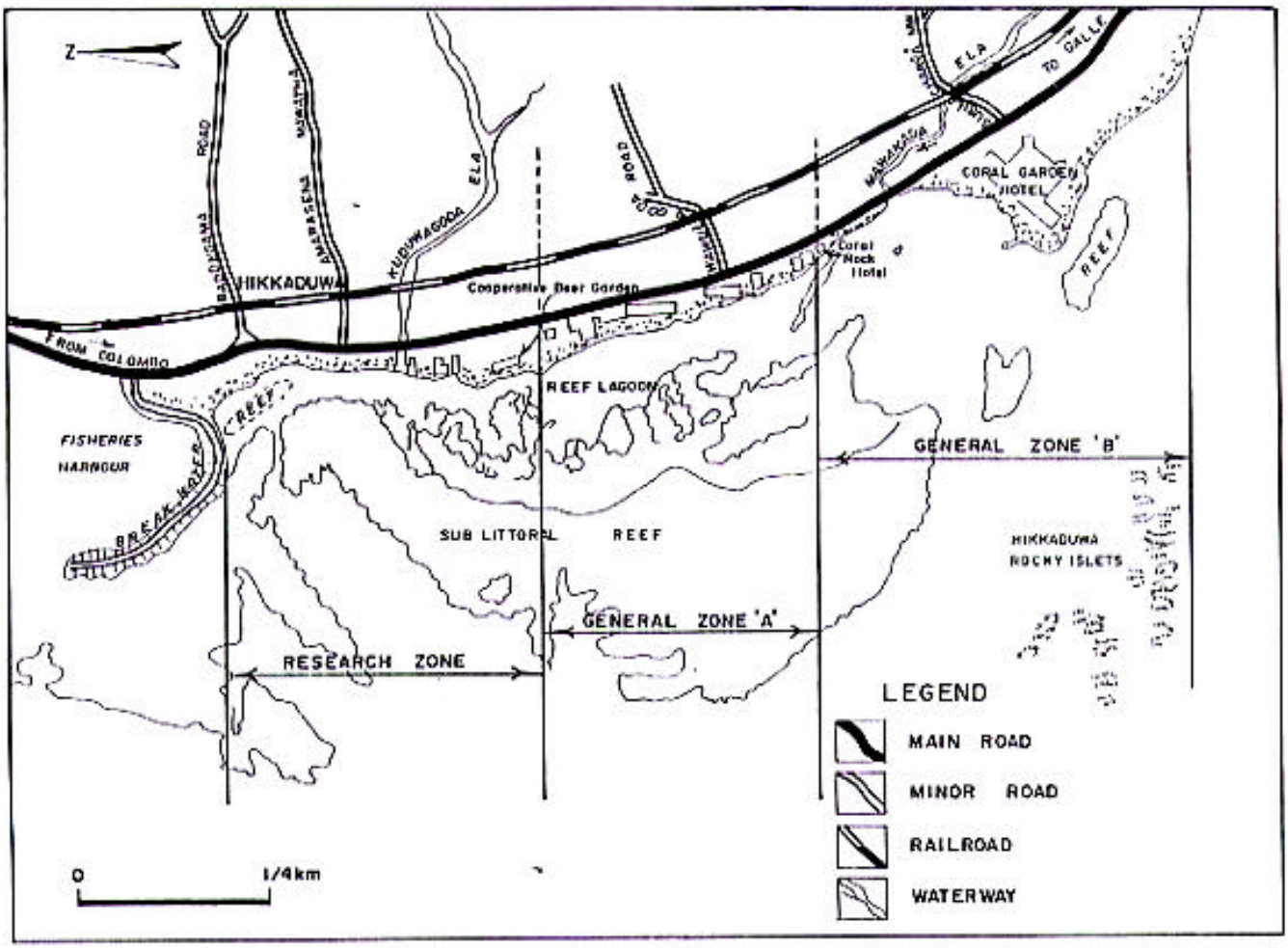
At Hikkaduwa, the initial proposal to make it a multiple use MPA originated from the state research agency. It was during the Special Area Management (SAM) planning process for Hikkaduwa that was carried out between 1992-1995, that the local community and resource user groups were included in a participatory consultative process in the preparation of the management plan for the area (De Cosse and Jayawickrama 1996). Under the SAM plan, an environmental profile was prepared for Hikkaduwa that included the MPA. This environmental profile contained all the background information on the project area required for management planning, including information on the hydrology, physical geography, socio-economics, and institutional and legal frameworks applicable in the project area (Hikkaduwa Special Area Management and Marine Sanctuary Coordination Committee 1996). At the same time, extensive investigations that included studies on reef quality and user patterns were carried out and a zonation and management plan was proposed for the sanctuary. This reconfirmed the zonation proposed previously by NARA (Rajasuriya and White 1995).

At present, zoning at Hikkaduwa is not being implemented properly: The buoys that were used to demarcate the zones are not maintained (personal observation 1999). The Department of Wildlife and Conservation is responsible for the overall management of the protected area, including the maintenance of these buoy markers.

### *4.3.2. Mafia Island Marine Park*

In the case of Mafia Island, it was in 1988 that the Tanzanian Government, the local residents of Mafia and the adjacent islands, and key conservation organisations met to discuss the creation of a multiple use marine protected area, which would help conserve marine resources in Mafia. A series of workshops were held between 1988 and 1991 to enable islanders to frame objectives and express their expectations and opinions. Technical experts consulted with island residents and together they came up with a multiple use zoning plan (Agardy 1997). Zonation was undertaken with the aim to promote the sustainability of the MPA and to minimise conflicts between villagers and marine park authorities (Ngoile *et al*. 1998).

**Figure 6: Hikkaduwa Multiple Use Zoning Plan. After zonation of MPA proposed by De Silva and Rajasurlya in 1985. From Special Area Management Plan for Hikkaduwa Sanctuary and its Environs, Sri Lanka (1996). Coast Conservation Department, National Aquatic Agency, Sri Lanka.**



Three resource use categories for application within the park were developed:

a) Strict protection and regulation preventing the removal of any natural resources. Certain non-extractive resource use activities such as sightseeing, swimming, snorkeling and diving would be allowed with a resident permit.
b) Regulations restricting the amount and type of fishing. Non-extractive activities such as swimming and snorkeling would be permitted. Certain extractive fishing activities would be permissible for residents with a license, for example, line fishing, box trapping, octopus harvesting, lobster harvesting and sea cucumber collecting.
c) Permitting general use with a minimum of controls. Both non-extractive and extractive resource use activities related to tourism, fisheries, and research would be permissible in this zone with appropriate permits (Agardy 1997).

The provisional zoning plans were reviewed in 1998 and have been designated as park buffer zone, regulated use zone, specified use zone, and nature reserve. The demarcation of the zones will be carried out once the General Management Plan for the marine park is finalised and approved by the stakeholders. The marine boundaries will be demarcated with marker buoys and the terrestrial boundaries by cement beacons (Ministry of Tourism, Natural Resources and Environment 1991, WWF 1998).

### *4.3.3. The Proposed Hon Mun Marine Protected Area*

For the proposed Hon Mun MPA, a draft multiple use zoning system has been prepared (see Figure 4). This plan will be further refined during the set-up phase of the MPA in the year 2000. The MPA has been divided into four provisional resource use zones. They are:

a) General Use Zone. General use will be permitted in this zone, under the condition that the MPA principles are complied with. The purpose of this zone is to provide a buffer for the Biodiversity, Sanctuary and Aquaculture Zones, which it surrounds.
b) Biodiversity Zone. Within this zone, there will be no collection of fish or other organisms for ornamental purposes and no collection of grouper, lobster or other species for aquaculture purposes. In addition, large vessels utilising the Nha Trang port area will not be permitted to anchor. The main purpose of this zone is to maximise the conservation of marine biodiversity.
c) Aquaculture Zone. Activities linked to aquaculture will be permitted in this zone. Infrastructure in this area will be limited to equipment required for the installation and operation of aquaculture ventures. Vessels cannot anchor within a distance of 100 metres of any sea cage or pond system. Only locally-derived species and genetic stock will be introduced to minimise the risk of local marine habitats being invaded by alien species. The purpose of this zone is to provide the opportunity for aquaculture ventures to take place under suitable conditions.
d) Sanctuary Zone. This zone has the highest protection to maintain the marine habitats in a pristine state and ensure the maximum conservation of biodiversity within the MPA (Byron 1998, Foster *et al*. 1998, Nguyen 1998).

In addition to the above, the following general rules will apply throughout the MPA:

- Sustainable fisheries practices will be promoted within the MPA; destructive methods (such as push net trawling, bottom net trawling) will be banned in the MPA. Enforcement of rules prohibiting illegal methods (*e.g.*, dynamite and cyanide fishing) will be strict.
- Future infrastructure and development activity will be undertaken only with the approval of the Marine Area Management Committee and in partnership with residents of the adjacent village in the locality.
- All vessels are required to anchor over sand, and not on coral areas.
- No further permission will be given for dam-dang (standing net) fisheries within the MPA. Only those currently licensed to do so would be allowed to continue.
- Bilge or ballast water is not to be pumped out of any vessel within the MPA (Foster *et al*. 1998).

It has been proposed to develop several alternative income-generating activities that can be carried out within the MPA. Possible projects include aquaculture and ecotourism. Under aquaculture, the rearing of oysters for the pearl industry and the edible oyster trade are being looked into in partnership with two international companies – an Australian company for the pearl oysters and an American venture for the edible oysters. Both companies will provide villagers with oyster spat to grow. The villagers will grow the spat until, in the case of the restaurant industry, they are ready for consumption, and in the case of the pearl oyster industry, they are ready to be implanted to grow pearls. The villagers within the MPA will be targeted for involvement in these ventures. The edible oyster industry is more labour intensive than the pearl oyster industry. In order to assist villages, a micro credit programme will be set up. Seaweed aquaculture is another activity that will be further investigated (GEF Project Brief 1999, Byron *et al*. 1998, K. Foster, pers. comm. 1999).

### *4.3.4. Great Barrier Reef Marine Park*

The Great Barrier Reef Marine Park is one of the most comprehensively planned multiple use marine protected areas in the world. A spectrum of zones has been applied in the Great Barrier Reef with progressively increasing restrictions. The principal objectives of zoning in the GBRMP are:

- To protect the natural and cultural values of the area while allowing a spectrum of reasonable human uses.
- To separate conflicting uses.
- To provide protection for critical or representative habitats and ecological processes.
- To preserve some areas in their natural states, undisturbed by humans (Agardy 1997, Day 1998).

The park is broadly divided into five sections: Far Northern Section, Cairns Section, Central Section, Mackay/Capricorn Section and the Gumoo Woojabuddee Section. Zoning plans, which provide a strategic framework for management, cover four of the five Marine Park Sections. Each zoning plan provides for protection and sustainable use of natural resources and ecosystems and thus meets the criteria of a Category VI 'Protected Area' under the IUCN Guidelines for Protected Area Management Categories[4] (IUCN 1994, Wachenfeld *et al*. 1998).

Within the zoning plans there are strictly protected areas that meet the criteria of IUCN Category I. There are also National Park Zones – equivalent to IUCN Category II. Other zones including habitat protection, general use, and buffer zones provide for a range of conservation measures consistent with sustainable use and addressing the rest of the spectrum of the IUCN protected area categories (IUCN 1994, Wachenfeld *et al*. 1998).

While zoning plans provide for spatial separation into zones, seasonal closure and other temporary closure measures provide for temporary separation of activities, particularly where such separation or closure protects animals or plants at sensitive times in their reproductive cycle (J. Day, pers. comm. 1999, Wachenfeld *et al*. 1998). Permits specify which activities are permitted, the locations in which they may be conducted, and any conditions that may apply. The Great Barrier Reef Marine Park Authority and the Queensland Department of Environment and Heritage jointly assess permits. The following activities require a permit:

- Most commercial activities including tourist operations.
- Installation and operation of structures such as jetties, marinas, pontoons and mariculture facilities.
- Any works such as repairs to structures, dredging and dumping.
- Placement and operation of moorings.
- Anchoring and mooring for an extended period.
- Waste discharge from a fixed structure.
- Research.
- Educational programmes.

[4] There are six IUCN protected area management categories: I Strict Nature Reserve/Wilderness Area; II National Park; III Natural Monument; IV Habitat/Species Management Area; V Protected Landscape/Seascape; VI Managed Resource Protected Area (IUCN 1994).

- Traditional hunting.

(Wachenfeld *et al*. 1998).

At present the zoning system in operation in the Great Barrier Reef Marine Park includes the following:

a) General Use Zone: Provides areas for a diverse range of recreational and commercial activities, consistent with the region's long-term conservation. Shipping and trawling permitted.
b) Marine National Park A Zone: Provides for appreciation and recreational use, including limited line fishing.
c) Marine National Park B Zone: 'Look but do not take' zone. Fishing and all other activities that extract natural resources are prohibited.
d) Habitat Protection Zone: Free from trawling but allows a diverse range of recreational and commercial activities.
e) Estuarine Conservation Zone: Provides for conservation of estuarine areas while maintaining opportunities for commercial and recreational activities.
f) Conservation Park Zone: Limited extractive uses permitted such as recreational fishing.
g) Marine National Park Buffer Zone: Provides for trolling for pelagic species around reefs.
h) Buffer Zone: Permits mackerel trolling in areas adjacent to reefs zoned as National Parks.
i) Scientific Research Zone: Set aside exclusively for scientific research. Entry and use for other activities is prohibited.
j) Preservation Zone: Provides for the preservation of the area in an undisturbed state. Entry is prohibited except in the case of scientific research that cannot be conducted elsewhere.

It is apparent from the above classification that a highly complex zoning system exists in the Great Barrier Reef Park. The Authority is at present reviewing the existing zoning system and hopes to make the zoning criteria less complicated and more comprehensible for the different user groups. This is taking place under the 'representative areas' programme (GBRMPA 1999b(h), pers. comm. J. Day 1999).

## 4.4. Regulatory Frameworks

An overview of the regulatory frameworks that govern each of the selected marine protected areas is given in Table 5.

### *4.4.1. Hikkaduwa Nature Reserve*

At present, implementation of the Hikkaduwa MPA is minimal. The underlying cause for this lies at an institutional level. The main state agency in charge of enforcing the legislation that protects the natural resources within the MPA (*i.e.*, the Flora and Fauna Ordinance) is the Department of Wildlife Conservation. Managing the MPA is just one of the numerous responsibilities of the Department, which is also in charge of all terrestrial wildlife parks in the country. Management of Hikkaduwa is therefore of fairly low priority and it does not have the funding or personnel necessary to carry out even the day-to-day management functions. Often park staff are relocated (even after they have received specialised training in activities such as scuba diving and boat operating). There is therefore no continuity in the training or the personnel at the site. In August 1998 the Hikkaduwa Marine Sanctuary was upgraded to a Nature Reserve, which signifies a higher degree of protection. Technically this means that a permit is required for anyone to enter the protected area. In reality, however, there has been no noticeable change in the status of the MPA, except perhaps in the presence of more DWLC staff. The sustainability of resource use within the MPA appears therefore to have not been affected (either positively or negatively) by this upgraded status. Most of the glass-bottom boat operators and fishermen interviewed during this study were in fact unaware of the change in status of the MPA, quite likely because there have been no real changes made at the site level. This clearly illustrates the point that the presence of strong national policy and legislation alone is inadequate to ensure that the management and sustainability of resource use within an MPA takes place successfully.

The same applies to the presence of a comprehensive management plan for the MPA – it is worthless if implementation cannot be carried out. The government's commitment is essential and the ability to enforce the existing legislation is of utmost importance. As the Hikkaduwa SAM plan is based on the collaboration of the different user groups including the local community, it is crucial that these user groups be empowered by the state agencies to manage the resources they are dependent upon. It is also important that the needs of the local communities be incorporated into the MPA management plan. During this study, it was noted that there were a high number of unemployed youth in the Hikkaduwa area, in spite of the booming tourist industry. This group complained that people from outside the area were given preference in employment opportunities, and therefore certain members of the local community do not get the opportunity to derive direct benefits from the resources. A complete change in the attitude of the agency bureaucracies at the implementation stage is critical to make this collaborative effort at Hikkaduwa a truly workable partnership. The Hikkaduwa Special Area Management and Marine Sanctuary Coordination Committee, comprised of all the stakeholders, was established under the SAM planning process. This committee included the local user groups, such as the Glassbottom Boat Association, the Fisheries Co-operative Society, the Hikkaduwa Hoteliers Association, Hikkaduwa Youth League, the Tourist Guides Association, as well as local government bodies. It was intended that the Committee meet regularly (Lowry *et al*. 1997), but in practice this has not been the case.

### *4.4.2. Mafia Island Marine Park*

The Mafia Island Marine Park is administered under the Tanzania Marine Parks and Reserves Board of Trustees. The Board of Trustees guides development programmes within the marine park. In addition, it also has the role of advising the Minister of Natural Resources and Tourism on policy and managerial matters related to the MPA. Both the Board of Trustees for Marine Parks and Reserves and the Technical Advisory Committee for the Mafia Island Marine Park were appointed in 1996. Village Committees on Conservation were elected in 1997. These committees act as executive arms of the Village Councils on conservation issues. The District Council is another key partner in the marine park system (Ngoile *et al*. 1998, G. Mtsumi, pers. comm. 1999).

To control the utilisation of marine resources within the park, a system of licenses and permits already exists. This system is implemented at the village level. Anyone wishing to fish within the MPA boundaries requires a special permit, in addition to the fishing license that is issued at the District level. In order to obtain a special permit, the application must be processed by the relevant Village Conservation Committee in the area where the applicant wishes to fish, before endorsement by the Village Council and the Marine Park Warden. This system was introduced in January 1998 (WWF 1998).

### *4.4.3. The Proposed Hon Mun Marine Protected Area*

In the case of the proposed Hon Mun MPA, a considerable amount of effort will be put into establishing an institutional framework that ensures that all users of the MPA, particularly those residing within the area, are involved in the implementation of the MPA. It is proposed that an MPA Authority be established under the Provincial People's Committee (which is the highest decision-making body in the Khanh Hoa Province) to oversee the development of the Hon Mun Project and to provide input to the management framework. The MPA Authority will answer to a Provincial Steering Committee, which will include all the major MPA stakeholders. Some of the local user groups that will form part of the steering committee are: The head of each village, the women's union, the fisheries association and the tourism association. In addition, government agencies such as the Institute of Oceanography, the Department of Fisheries, the Department of Science and Technology and the Department of Cultural Affairs and Tourism will also have important roles to play. Activities in relation to establishing MPAs are already being carried out by some government agencies, such as the Institute of Oceanography in Nha Trang, and some offices of the local and central governments. The Institute of Oceanography carried out surveys on biodiversity, resource utilisation and conservation potential of certain areas from 1992-1994. The Institute proposed seven priority sites as MPAs including the Hon Mun group of Islands in Nha Trang (Tuan 1999).

**Table 5: Regulatory frameworks in the MPA sites.**

| Feature | Hikkaduwa | Mafia Island | Hon Mun | GBRMP |
|---|---|---|---|---|
| Multiple use zones included in a management framework. | Yes. | Yes. | Yes. | Yes. |
| How are the main resource use activities separated? | General use zone; Research zone . | General use zone; Regulation zone; Strict protection zone | General use zone; Biodiversity zone; Aquaculture zone; Sanctuary zone. | General use zone; National park zone; National park buffer zone; Estuarine conservation zone; Buffer zone; Habitat conservation zone; Preservation zone; Research zone. |
| Implementation of the zoning system. | Not successful. | At preliminary stages. | Will take place during project implementation. | Successful. |
| Were local resource user groups consulted during demarcation of the different zones? | Yes. | Yes. | Yes. | Yes. |
| Are the local resource user groups empowered to manage the resource they are dependent on in the MPA? | No. The main regulatory agency, the Department of Wildlife Conservation, is in overall charge of protecting the natural resources within MPA. | To a certain degree. Village Councils are involved in issuing fishing licenses for non-residents to fish within park boundaries, and in controlling dynamite fishing within the park. | Provisions for empowering local resource user groups have been included in the project management plan. | Indigenous groups have been entrusted with a certain degree of control over indigenous hunting quotas. |
| At the national policy level, is there recognition of the need to involve local communities? | Yes. | Yes. | No. | Yes. |

### *4.4.4. Great Barrier Reef Marine Park*

The Great Barrier Reef Marine Park Authority (GBRMPA) is the governing body for the park and was established under the Great Barrier Reef Marine Park Act as a Commonwealth statutory body. The management of Australia's Great Barrier Reef Marine Park demonstrates a collaborative federal/state arrangement. The federal government maintains overriding power in the marine part of the region, while involving the state of Queensland cooperatively in all aspects of the establishment and management of the marine park. Queensland government agencies (for instance, the Queensland National Parks and Wildlife Service) are responsible for day-to-day management of the park, and are fully responsible for most of the islands found within the park boundaries (Ticco 1995, Wachenfeld *et al*. 1998). In addition, there is emphasis placed on involving the people whose use and activities that relate to the reef: Formal and informal means are used to achieve community input and involvement in the work of the Great Barrier Reef Marine Park Authority (Wachenfeld *et al*. 1998).

The GBR Ministerial Council was established in 1979 to coordinate Commonwealth and Queensland Government policy for the management of the GBR. The Ministerial Council is made up of two Ministers from each of the Commonwealth and Queensland Governments. The Ministerial Council meets approximately once

every year to discuss the broad strategic issues involved in managing the GBRMP, including fisheries, coastal development, tourism, and conservation (GBRMPA 1999(a).

It is important to note that, although the national and global significance of the Great Barrier Reef is well recognised, the institutional framework for the management of the MPA is planned and conducted in a context which presupposes that the coastal communities of Queensland and the governments that represent them are essential participants in any effective management of the Great Barrier Reef ecosystem (Wachenfeld *et al*. 1998).

## 4.5. Socio-political Factors

Socio-political factors include national level policy, legislation and institutional frameworks that are applicable to the management of the selected marine protected areas (see Table 6).

**Table 6: Socio-political framework affecting the MPA sites.**

| Feature | Hikkaduwa | Mafia Island | Hon Mun | GBRMP |
|---|---|---|---|---|
| Is there specific national legislation in relation to MPAs? | No. | Yes. Marine Parks and Reserves Act, 1994. | No. | Yes. Great Barrier Reef Marine Park Act, 1975. |
| Is there enforcement of legislation? | Weak. | Weak. | Weak. | Strong. |
| Is there national policy related to MPAs? | Related policy issues (Biodiversity Conservation: A framework for action). | ? | No. | Yes. |

'?': Question mark in Table 6 indicates that adequate information was unavailable during the study

### *4.5.1. Sri Lanka*

#### *4.5.1.1. National Policy*

Relatively strong policy exists in Sri Lanka in relation to natural resource management and integrated coastal zone management. Policy documents such as the Revised Coastal Zone Management Plan (1997), the National Environmental Action Plan (1994), the National Conservation Strategy (1988) and Biodiversity Conservation: A framework for action in Sri Lanka (1999) all identify the need for the conservation of marine ecosystems such as coral reefs, and also the importance of community participation in natural resource management (Jayatilake, *et al*. 1998, Wilkinson 1998). Protection of the marine environment for sustainable development has been a stated national policy and priority since the creation of the national marine research agency (NARA) and the Coast Conservation Department in the early 1980s (Senaratna and Berner 1998). However, there is no separate national policy document dealing specifically with marine protected areas.

#### *4.5.1.2. National Legislation*

At a national level, strong legislation exists in Sri Lanka in relation to the management of coastal and marine resources. The Coast Conservation Act of 1981, administered by the Coast Conservation Department (CCD), regulates development in the coastal zone. The amendment in 1998 to the Act strictly prohibits the mining, collecting, storing, burning, or transporting of coral within the coastal zone. The Fisheries Ordinance prohibits the use of dynamite, poisons and stupefying substances for fishing and prohibits the possession of fish killed by dynamite or poison. The revised Fisheries and Aquatic Resources Act of 1996 provides for integrated management, regulation, conservation and development of fisheries and aquatic resources, and the declaration of fisheries reserves. The Flora and Fauna Protection Ordinance regulates and provides for the protection of flora and fauna. The ordinance provides varying levels of protection for designated protected areas, including marine

reserves. Threatened species such as marine turtles, marine mammals, birds and fish are afforded protection by this ordinance. The law is administered by the Department of Wildlife Conservation (DWLC). The Forest Ordinance (enacted in 1907 and subjected to revisions thereafter) is administered by the Forest Department and has been amended through the years to reflect conservation concerns. It provides a framework for the management and protection of forests in Sri Lanka, including the protection of coastal mangrove habitats (Senaratna and Berner 1998). However, no legislation specifically related to MPAs exists at present.

#### *4.5.1.3. Institutional Framework*

In Sri Lanka, numerous government departments, agencies, and authorities function under different ministries that control activities in the coastal area, including in MPAs such as Hikkaduwa. At the national level, there are policy-making bodies such as the Ministry of Fisheries and Aquatic Resources Development and the Ministry of Forestry and Environment. There are regulatory agencies such as the Department of Fisheries, the Coast Conservation Department, the Department of Wildlife Conservation, the Forest Department, the Central Environmental Authority, and the Urban Development Authority that are entrusted with the implementation of laws governing the activities related to marine resource exploitation. The main technical agency is the National Aquatic Resources Research and Development Agency; it is responsible for research and management of coral reef resources (Rajasuriya and White 1995, Wilkinson 1998). At the provincial level, the Provincial Councils possess legislative and executive powers over the management of marine and coastal resources. At the local government level in Hikkaduwa, the Divisional Secretariat[5] and Pradeshiya Sabha[6] are major stakeholders. As each of these state agencies has different objectives and mandates, this sometimes leads to poor coordination between the different authorities (Jayatilake *et al*. 1998). In addition, there is a lack of coordination at different levels of the government, particularly at the provincial level where authorities often do not have the required understanding to manage natural resources. Also, political considerations at provincial level on occasion undermine the efforts of the centrally based government departments and as a result, there may be very little or no implementation of the existing laws in relation to the Hikkaduwa MPA (Rajasuriya and White 1995).

### *4.5.2. Tanzania*

#### *4.5.2.1. National Policy*

In Tanzania, the leading policy body for the coastal zone is the Ministry of Natural Resources and Tourism. Under this Ministry, the Division of Fisheries, the Division of Forestry and Bee Keeping, the Division of Tourism, and the Division of Wildlife are the major stakeholders in the management of coastal resources (WWF 1998). The Division of Environment, also involved in coastal zone management, operates under the Vice President's Office (pers. comm. I. Bryceson 2001).

In 1997, the government adopted the Fisheries Sector Policy. This policy was put in place to develop, conserve and sustainably utilise marine resources to provide food, employment, income and foreign exchange (through the export of surplus fish and other fisheries produce). The policy document is community-oriented and outlines a clear strategy for the involvement of fishing communities in the planning, development and management of fisheries resources (WWF 1998). At the national policy level, therefore, there is recognition of the importance of involving local communities in the management of natural marine resources.

#### *4.5.2.2. National Legislation*

The legal framework relating to coastal resources consists of a variety of legislation of different origins and backgrounds (Muguresi 1995 in WWF 1998). There is, however, legislation in Tanzania specifically related to marine protected areas. The Marine Parks and Reserves Act of 1994 provides for the declaration of marine

[5] Divisional Secretariat – the central government unit that implements the development projects of the Hikkaduwa Division and provides basic services to the inhabitants. The Divisional Secretary serves as the chairman for the Hikkaduwa SAM Coordinating Committee (Hikkaduwa Special Area Management and Marine Sanctuary Coordinating Committee 1996).

[6] Pradeshiya Sabha – a body of locally elected officials who oversee the provision of local government services such as licensing and waste disposal (Hikkaduwa Special Area Management and Marine Sanctuary Coordinating Committee 1996).

parks and reserves and the preparation of management plans for the conservation and sustainable utilisation of marine and coastal resources. The Marine Parks and Reserves Act differentiates marine protected areas from terrestrial wildlife parks and reserves in Tanzania. The major difference is based on the fact that marine parks and reserves do allow the use of natural resources in the gazetted (protected) areas, *i.e.*, there is provision for multiple uses (WWF 1998). But according to Ngoile *et al*. (1998), the Act needs to be revised, as certain parts of it are unclear and as a result, there is overlap and mix-up of the functions and roles of the Board of Trustees, the Marine Parks and Reserves Unit, and the Director of Fisheries. This is affecting smooth management of the park (Ngoile *et al*. 1998).

In addition, the Marine Parks and Reserves Act is not backed with regulations. This has stalled operational and planning processes for MIMP. The absence of regulations has caused the enforcement and effective control of diving and fishing activities within the various zones of the park to be non-effective, and in fact, almost non-existent. There is also a lack of guidance on environmental impact assessments (EIAs) required for development projects within the MPA (Ngoile *et al*. 1998).

#### *4.5.2.3. Institutional Framework*

In Tanzania there is no single unified coastal resource management regime that controls all activities related to the coastal zone. Management of coastal resources has therefore proved to be very complicated, due to the variety of user priorities and the lack of agreed-upon roles and responsibilities. In addition, the government lacks the capacity to monitor and manage use of resources. Various laws administered by different institutions govern the development and management of marine and coastal resources and are sometimes implemented with conflicting objectives (Muguresi 1995 in WWF 1998).

### *4.5.3. Vietnam*

#### *4.5.3.1. National Policy*

At present, Vietnam suffers from a lack of national policy on marine protected areas. The management of marine protected areas falls under the Ministry of Fisheries and Forestry, which has designated the Research Institute of Marine Products as the counterpart organization for the Hon Mun Project (GEF Project Brief 1999). At the national level, however, MPAs presently receive fairly low attention. The knowledge of conservation practices is relatively weak and not standardized. Often the main incentive for MPA establishment is economic benefit, and hence little focus is placed on protection/conservation of marine and coastal resources. Marine conservation and sustainable resource use is not integrated into development projects and is often in conflict with economic goals (Tuan 1999).

#### *4.5.3.2. National Legislation*

Guidelines for the sustainable use of marine products are described in the Regulations for the Protection of Aquatic Resources, published by the Ministry of Fisheries. Restrictions in fishing seasons and minimum catch size of many reef animals (such as sea cucumber, lobster, pearl oysters and turtles) have been specified. The Law on Marine Environmental Protection emphasizes the conservation of marine ecosystems including coral reefs. It prohibits all activities causing negative influences to marine environments. Severe punishments are applied for dynamite and poison fishing. Effectiveness of the legislation, however, is very low and marine resources are seriously decreasing as coastal ecosystems continue to be damaged (Tuan 1999). At present, separate legislation specific to the management of MPAs does not exist in Vietnam.

#### *4.5.3.3. Institutional Framework*

Under Vietnamese law, ownership of marine resources is vested in the State, although substantial management authority is devolved to the Provincial level. A number of agencies with sectoral responsibilities are found in the Khanh Hoa Province. This includes the Department of Fisheries, the Department of Tourism, the

Department of Science, Technology and Environment, and the Department of Transport. These departments are answerable to the Provincial People's Committee (GEF Project Brief 1999).

### *4.5.4. Australia*

#### *4.5.4.1. National Policy*

Australia's Oceans Policy addresses both the issue of conserving the country's unique coastal and marine ecosystems as well as the wise management of marine-based industries that generate an enormous source of income for the nation. To ensure that maximum protection is given to Australia's marine ecosystems, state governments are working together to set up a National Representative System of Marine Protected Areas. At a national level, therefore, strong policy exists in relation to the MPAs and marine resource management. In the case of the Great Barrier Reef Marine Park, the political commitment for the protection and wise management of the park is solid at both the national and local levels. In fact, the Reef's protection is a policy of all the major political parties within Australia, and therefore no government can afford to leave itself open to criticism by not lending its full support to it (Ticco 1995).

#### *4.5.4.2. National Legislation*

Strong legislation exists in Australia in relation to marine resource conservation and management of marine protected areas. The legislative mandate for the Great Barrier Reef Marine Park, for instance, is decisive, well supported, and comprehensive. Following widespread public concern in the late 1960s and early 1970s about possible limestone mining and oil drilling on the Barrier Reef, the Federal Government in 1975 passed the Great Barrier Reef Marine Park Act, with the support of all political parties (Ticco 1995). The Great Barrier Reef Marine Park Act was among the first in the world to deal comprehensively with the management of a marine ecosystem. The Act provides the framework for managing the Great Barrier Reef as a large ecosystem. Under the Park Act, zoning plans were developed with inputs from all stakeholders including scientists, user and interest groups, indigenous communities, and government agencies (Wachenfeld *et al*. 1998).

The primary goal of the Act is the *"protection, wise use, understanding and the enjoyment of the Great Barrier Reef in perpetuity through the development and care of the Great Barrier Reef Marine Park"* (GBRMP Act, 1975). The Act also provided the legal basis for the management of the park by the Authority. Through the Act's provisions, the Authority is a management entity that is not captive to a single sector of interest. Additionally, the Act is unique because it specifically delineates the management of the overall marine environment and includes extensive intergovernmental arrangements between the Commonwealth Government and Queensland State Government. The Act prevails over conflicting provisions in other legislation and this has played a crucial role in the smooth management of the Great Barrier Reef (Ticco 1995, Wachenfeld *et al*. 1998).

Another important piece of legislation that plays a role in the management of the park is the Fisheries Act of 1994, which describes the legislative arrangements that apply to fisheries in Queensland, including the Great Barrier Reef Marine Park. The Act describes the arrangements for developing, implementing and repealing fisheries management plans, and controlling fishing effort for both commercial and recreational fisheries (Wachenfeld *et al*. 1998).

## 4.6. Socio-economic Factors

A majority of the factors associated with sound MPA management and the enhanced sustainability of resource use within MPAs can be shown to be either directly or indirectly linked to the country's overall economic status. The main socio-economic parameters that influence the sustainability of natural resource use and management in the four selected multiple use marine protected areas are given in Table 7. Three of the countries – Sri Lanka, Vietnam and Tanzania – are classified as 'developing countries'. According to World Bank indices, both Vietnam and Tanzania are listed as 'low income' countries and Sri Lanka is listed as a 'lower middle income' country. The fourth country used in the analysis, Australia, is a 'developed' nation and is classified by the

World Bank as a 'high income' country (World Fact Book 1999, World Bank Country Data Sheet 1999). According to Ticco (1995), the GNP per capita[7] can broadly reflect a nation's ability to establish environmental policies and develop programmes for the management of natural resources. A high GNP per capita usually means that the country has both stronger national policies in relation to marine resource management, and the finances to incorporate into related programmes. This holds true in the case of the four selected case studies. Australia has the highest GNP per capita of the four countries, at US$20,300. Sri Lanka, Tanzania and Vietnam have a GNP per capita of US$810, $210 and $330 respectively.

Australia has a prosperous western-style capitalist economy with a high GNP per capita as stated above. The country therefore has the financial capacity to support marine protected areas such as the GBRMP, the technical expertise necessary for the park's management, and the personnel necessary to enforce regulations within a marine protected area. This is one of the major factors that contribute to enhanced sustainability of resource use within MPAs such as the GBRMP. Conversely, in countries where economic stability is not found and GNP per capita is low, financial commitment to MPA management is limited, and this in turn could lead to the sustainability of resource use within the MPAs being compromised or constrained. This is the scenario in most developing countries and is clearly illustrated in the cases of Sri Lanka and Tanzania, where poor economic environments have meant that management of marine protected areas is of relatively low priority at the national level. In these cases, the MPAs have had to rely on international donor assistance to carry out management activities. Tanzania at present is receiving financial assistance from NORAD[8] and WWF[9] for management of the Mafia Island Marine Park. Sri Lanka received funding from USAID[10] for the preparation of the Hikkaduwa Special Area Management Plan, which incorporates the MPA. However, USAID did not provide funding for the implementation phase of the project, and this lack of continued funding has been one of the major contributing factors to the slow progress made in implementing the management plan. The proposed Hon Mun MPA in Vietnam will be receiving financial assistance from GEF[11] and DANIDA[12]. It is too early to predict whether the Hon Mun MPA will be self-sustainable after the duration of the funding cycle.

This highlights another important trend: Poor economic conditions generally lead to developing countries having to rely on external donor aid. Historically, it has been demonstrated that there is a high probability that these donor-driven projects will not be self-sustainable once financial assistance is stopped. In the context of the present study, this means that the sustainability of resource use within multiple use MPAs will be constrained under these circumstances.

Strong political will or government commitment is yet another factor or condition that contributes to a successful MPA and enhances the sustainability of resource use within the MPA. For example, in Australia, there is strong political commitment to the wise management of the GBRMP, and this has greatly contributed to its success as a multiple use MPA (it is possibly the most successful in the world). In Sri Lanka, Tanzania and Vietnam, the political will for marine resource management is not as strong as in Australia. The national policies and legislation that exist in these countries in relation to MPAs and marine resource management substantiate this point. It is important to note, however, that strong government commitment does not necessarily have to go hand-in-hand with a nation's economic or development status.

There are external factors such as political instability and war that also affect the sustainability of resource use within a marine protected area. This is clearly illustrated in the case of the Hikkaduwa MPA in Sri Lanka: The ongoing ethnic conflict has meant that even with the presence of relatively strong national policy and legislation, government commitment to MPA management is low at present, as its primary focus is on the separatist war.

[7] GNP per capita – the gross national income divided by midyear population (World Bank).

[8] NORAD – Norwegian Agency for Development Cooperation.
[9] WWF – World Wildlife Fund for Nature.
[10] USAID – United States Agency for International Development.
[11] GEF – Global Environmental Facility.
[12] DANIDA – Danish International Development Agency.

**Table 7: Socio-economic profile of the countries in which the MPAs are based: *(Information extracted from the World Bank Country Data Sheets 1999 and the World Fact Book 1999. Additional data incorporated here is based on information obtained from the literature cited).***

| Condition | Sri Lanka | Tanzania | Vietnam | Australia |
|---|---|---|---|---|
| Country's economic status | Developing country. Lower middle income. | Developing country. Low income. | Developing country. Low income. | Developed country. High income. |
| GNP per capita (Atlas method, US$) *i.e.*, Gross National Product (GNP) in current US$ terms as divided by the mid-year population. | 810 | 210 | 330 | 20,300 |
| Total debt outstanding and disbursed (US$ millions). | 8,551 | 7,077 | 22,437 | - |
| Total population. | 19.1 million (July 1999). | 31.2 million (July 1999). | 77.3 million (July 1999). | 18.7 million (July 1999). |
| Population growth rate. | 1.1 % | 2.14% | 1.37% | 0.9% |
| Life expectancy rate. | 72.67 years | 46.17 years | 68.1 years | 80.14 years |
| Literacy rate. | 90.2% | 67.8% | 93.7% | 100% |
| Government. | Social Democratic Republic. | Democratic Republic. Tanzania has just emerged from a socialist system into a market economy with multiparty elections. | Socialist Republic Communist State. | Democratic Common-wealth State. |
| Geography in relation to the importance of marine resources and MPAs. | An island state. High population density in coastal zone. High pressure on marine resources. Marine resources provide 30% of the population's dietary protein and 80% of the annual fish production. Therefore high importance is placed on marine resources. | Fisheries are an important industry to the country. Fish contributes to a high percentage of the country's dietary protein (WWF 1998). High population densities in coastal regions (about 25% of the population or 8 million people). | Nearly 70% of population lives near coastal and delta areas. There is a high pressure on marine resources (Tuan 1999). | An island continent. World's sixth largest country. Australia's vast coastal waters contain among the greatest array of marine biodiversity globally. The fisheries and tourism industries are nationally of very high economic value. Marine resources are therefore of high political importance and the country has a comprehensive ocean policy that looks into the management and sustainable utilisation of these resources. |
| Government Support for MPAs. | Moderate. | Moderate. | Moderate. | Strong. |
| National legislation in regard to MPAs. | Moderate. | Moderate. | Weak/ Moderate. | Strong. |
| National policies in regard to MPAs. | Strong. | Moderate. | Weak/ Moderate. | Strong. |
| Implementation/ enforcement of legislation and policy. | Weak. | Weak. | Weak | Strong. |
| Other factors. | Ongoing civil disturbances have undermined development efforts throughout the country. A certain faction of the Tamil ethnic minority is fighting for a separate state. | Poor communication and transport services and infrastructure; lack of social services and lack of non-resource dependent jobs. | Poor country that is still recovering from the ravages of war, the loss of financial support from the old Soviet Union, and the rigidities of a centrally planned economy. | The GBR is threatened by land-based activities. |

## 5. Conclusions – Lessons Learned

### 5.1. Lesson 1

The study confirmed that a combination of socio-political, economic and institutional factors can enhance the sustainability of resource use within multiple use MPAs. Commonalities in factors were recognised in the four selected MPAs, irrespective of differences in their location or size, or in the cultural and political dissimilarities present in the nations involved.

According to this study, some of these 'universally applicable factors' that influence the sustainability of resource use in MPAs are:

- Empowerment of the local community – the local community's direct involvement in the establishment and management of the MPA.
- Strong commitment by the different user groups in the locality of the MPA to the long-term sustainability of resource use.
- An institutional framework that incorporates all relevant stakeholders that are both directly and indirectly dependent on the resources located within the MPA, including the local community; and a decision-making process that takes into account the needs of these different user groups.
- Strong government commitment to marine resource management in the context of MPAs.
- A comprehensive management plan for the MPA that ensures that resource use will take place in a sustainable manner and user conflicts will be minimised.
- An adaptive management regime and the presence of a strong monitoring component that operates during the implementation of the MPA management plan.
- An independent governing body at the national level that is responsible for the overall management of the marine protected area.
- The presence of strong national policies and legislation in relation to MPAs.
- Economic stability – which will ensure the necessary financial commitment to technical expertise, equipment, trained personnel, *etc*., for the management of MPAs will be available.
- Political stability – the country's political climate can affect the government's commitment to marine resource management.
- Geographic location – low population densities adjacent to an MPA contribute to less anthropogenic stress on the system, less resource use conflicts and higher levels of sustainable resource use.

### 5.2. Lesson 2

Although all of the above factors play a role in enhancing the sustainability of resource use in MPAs, in the four cases this study examined, a subset of these factors consistently emerged as being central to sustainability in the selected MPAs. These factors are:

- Empowerment of the local community.
- Strong commitment by the different user groups in the locality of the MPA.

- An institutional framework that incorporates all relevant stakeholders.
- Strong government commitment.

In regard to the four sites studied, therefore, these four factors appeared to be of higher importance and to have a greater influence over the process of enhancing the sustainability of these MPAs than the other factors. Several conclusions pertaining to these four factors therefore deserve to be highlighted here.

### 5.2.1. Empowerment of the Local Community

In the four case studies, the most important factor that emerged is undoubtedly the involvement of local communities in the decision-making process and management of marine resources in the MPA. Especially in the case where local user groups are heavily dependent on the marine resources, it makes economic and administrative sense to empower these local groups in the management of issues that concern them directly. It is also critical that the local community is not just involved in the preliminary discussions and decision-making processes, but is given some responsibility in actual hands-on management activities. The four MPA sites in this study have all clearly illustrated the importance of this factor.

In the case of the Great Barrier Reef Marine Park, for example, local indigenous groups have been made responsible for issuing permits for the indigenous turtle and dugong hunting quotas. A local indigenous steering committee decides, on a case-by-case basis, to which groups/individuals the hunting permits should be issued. This indigenous committee has a better understanding of the traditional rights of the different user groups than the Great Barrier Reef Marine Park Authority does, and therefore, from an administrative standpoint, this is the better management option.

In the Mafia Island Marine Park, island communities engaged in fishing activities are actively involved in the campaign against dynamite fishing, which is mainly carried out by 'outsiders', who in this case are mainland fishermen. The islanders have been provided with a high frequency radio system and they use this link to inform the park warden and staff of any incidents of dynamite fishing within the park boundaries. The Village Councils are also involved in the process of issuing licenses to outsiders requesting to fish within the MPA. As these local communities are largely dependent on the park's marine resources for food and their livelihood, they understand the importance of sustainable resource management within the MPA. In fact, Mafia Islanders advocated heavily for the establishment of the marine protected area in the late eighties, as they believed it was a necessary step for the conservation of the area's rich biological diversity.

In the proposed Hon Mun MPA, the importance of involving the local communities has been recognised and is incorporated into the management plan. It is envisaged that during implementation, these local user groups will take part in the management process.

Hikkaduwa in Sri Lanka serves as a good example of an MPA that involved the different local user groups in the preparation of the management plan, but not in the actual implementation of it. As a result the user groups do not feel a sense of ownership for the plan and this is a critical factor that has weakened the plan's implementation. Circumstances have made certain community user groups feel marginalised as they were part of the preparation phase but have not been given any role to play in the implementation phase. These user groups now therefore find it difficult to give their full support to the Hikkaduwa MPA since they do not perceive any direct benefits.

### 5.2.2. Strong Commitment by the Different User Groups in the Locality of the MPA

Another important factor that influences the sustainability of resource use within MPAs is strong commitment by the different user groups in the locality of the MPA for the long-term sustainability of resource use, rather than for short-term financial gain. In the case of developing countries, MPAs are often designated and established by external agencies, with financial assistance generally provided by international donor groups. This is the case for the Hikkaduwa Nature Reserve, Mafia Island Marine Park and the proposed Hon Mun MPA.

Local communities are only brought into the decision-making process once the stage has been set by the donor agencies – for example, in the Hikkaduwa SAM project. Under these circumstances, the local groups usually have high expectations of gaining some short-term financial benefit from getting involved in the MPA's management. But if the local community is only interested in short-term benefits, and there is no strong commitment for the long-term sustainability of resource use in the MPA, then once the donor-driven funding cycle is completed, the MPA will not be self-sustainable and will cease to function successfully.

Under ideal conditions, local resource user groups should initiate activities that will ensure the MPA is self-sustainable in the long-term. In the proposed Hon Mun MPA, for instance, local user groups are expected to engage in aquaculture ventures (for the pearl industry and the edible oyster industry) as well as ecotourism. In the Mafia Island Marine Park, to lower the pressure on the marine resources within the park, some villages have taken up alternative livelihoods such as bee-keeping, and weaving traditional handicrafts to sell to tourists. Although these activities are currently taking place only on a small scale, it does illustrate that the local community at Mafia is committed to the long-term sustainability of resource use in the area. In relation to the Great Barrier Reef Marine Park, there are extensive formal and informal means that are used to achieve user group and community involvement in the work of the Great Barrier Reef Marine Park Authority, which is the governing body for the park. Most user groups here do show commitment to long-term sustainability of resources since there is a lot of investment made within the park in relation to tourism and fisheries. In the case of the Hikkaduwa Nature Reserve, there is some conflict between different user groups. For example, the glass-bottom boat operators and traditional fishermen in general are aware of the need for commitment to the long-term sustainability of resources within the MPA, since their livelihood wholly depends on this. But some glass-bottom operators disregard the rotational scheme and operate even at times when the number of boats within the MPA is very high, identifying with short-term profits from the tourists and not long-term sustainability of the coral reefs. Likewise, some hotel owners and managers often appear to think of short-term financial gain rather than of long-term sustainability of resources and by association, the health of their own business. For instance, there is the threat that some hotels' dumping of sewage effluent into the MPA will negatively impact the coral reefs in the long-term. This in turn will affect the tourist industry. For local user groups to show strong commitment, they need to be educated on and understand fully the relationships and linkages between different use patterns and how these impact the long-term sustainability and conservation of the natural living resources.

### 5.2.3. An Institutional Framework that Incorporates All Relevant Stakeholders

Yet another important factor that can greatly increase the probability of enhanced sustainability of an MPA is the presence of an institutional framework that incorporates all relevant stakeholders that are both directly and indirectly dependent on the resources located within the MPA, including the local community. In addition, a decision-making process that takes into account the needs of these different user groups is also critical. In this study, all four MPA sites did possess an institutional framework that accommodated the different user groups.

In Sri Lanka, Hikkaduwa was selected in 1992 as a site for Special Area Management (SAM) under a project funded by USAID. Under this project, an institutional structure was set up for the management of the Hikkaduwa MPA. This included policy-making bodies such as the Ministry of Fisheries and Aquatic Resources Development, as well as regulatory agencies such as the Department of Wildlife Conservation, the Department of Fisheries, and the Coast Conservation Department, which are responsible for the implementation of the laws that govern the sustainable use of marine resources within the MPA. In this context, the lead government agency at the site is the Department of Wildlife Conservation, which under the Flora and Fauna Protection Ordinance is in charge of overall management of the MPA. Separate legislation was not developed in regard to MPAs specifically, however. The Divisional Secretary and the Pradeshiya Sabha are major stakeholders at the local government level. The different user groups are also part of the institutional framework and have formed formal associations to represent themselves in different management activities. The Hikkaduwa Special Area Management and Marine Sanctuary Coordinating Committee set up under the SAM project incorporated all these different stakeholder associations.

In Tanzania, the Marine Parks and Reserves Act of 1994 created the institutional framework that oversees the management of the Mafia Island Marine Park. At the national level, the marine park is administered under the Tanzania Marine Parks and Reserves Board of Trustees, which acts in an advisory capacity to the Minister of Natural Resources and Tourism on development programmes and management matters in regard to the MPA. The Technical Advisory Committee for the Mafia Island Marine Park oversees the day-to-day management, while the Park Warden and the park staff together with the WWF Technical Advisor implement management activities in relation to the park. Village Liaison Committees, set up under the park's institutional structure, report to the Park Warden on matters relating to the community resource user groups within the park. Under the Village Councils, Village Committees on Conservation have been set up and act as executive arms of the Village Councils on conservation issues. The Mafia District Council is another key partner in the MPA's institutional framework. To control the utilisation of marine resources within the park, a system of licenses and permits exists; these are issued at the district level as well as by the relevant Village Conservation Committee (and are endorsed thereafter by the Village Council and the Marine Park Warden). The park's institutional setup therefore delegates powers to Village Council level in regard to certain management issues.

Although legislation specific to management of MPAs does not exist at present in Vietnam, in the proposed Hon Mun MPA an institutional framework will be established that ensures that all users of the MPA, particularly those at the site-level, will be involved in the implementation of the MPA. An MPA Authority will be established under the Provincial People's Committee (the highest decision-making body in the Khanh Hoa Province) to oversee the Hon Mun Project and to provide input into the management framework. The MPA Authority will report to a Provincial Steering Committee that includes representatives of all the major MPA stakeholders from both the community and local government agencies, such as the Head of each Village, the Women's Union, the Fisheries Association, the Tourism Association, the Institute of Oceanography, the Department of Fisheries, the Department of Science and Technology and the Department of Cultural Affairs and Tourism.

The Great Barrier Reef Marine Park Act (1975) provides the legal basis for the management of the park, which is carried out by the Great Barrier Reef Marine Park Authority. Through the Act's provisions, the Authority is an independent management entity that is not captive to a single sector of interest. Management of the park takes place under a collaborative federal/state government arrangement. The federal government of Australia maintains overriding power in the marine component of the MPA, while involving the state of Queensland cooperatively in all aspects of the management of the marine park. Queensland government agencies are responsible for day-to-day management of the park, and hold total responsibility for most of the islands found within the park boundaries. In addition, there are provisions in the institutional structure of the park for achieving user group and community input and involvement in the park management.

### 5.2.4. Strong Government Commitment

Strong government commitment to marine resource management and conservation in the context of MPAs is also considered to be one of the more influential factors in enhancing the probability of sustainability at the four sites examined. Today, in most cases, the government has legal ownership over coastal and marine resources and is therefore accountable for their management and conservation. Although factors such as strong legislation and policy in this context help enhance the sustainability of MPAs, in the absence of the government's commitment to MPAs, such factors do not hold much weight as illustrated by the case studies used in the present investigation.

Strong government commitment in the context of a 'developed' country could mean that the government invests finances and technical expertise into the MPA to ensure its smooth management; an example of this is the Great Barrier Reef Marine Park, where both the Commonwealth government and the Queensland government have invested heavily in the park. In the context of a 'developing' country, strong commitment by the government could mean that it simply accepts the fact that central government authorities are often far removed from the MPA site and have insufficient capacity to manage the MPA on their own, and hence it empowers local user groups to carry out certain management activities. This is the situation in Mafia Island: The Tanzanian

government has given over the responsibility of certain management issues to the island fishing communities, for instance, the issuing of licenses for fishing within the park, and assisting the park staff with policing destructive fishing methods (*e.g.*, the use of dynamite). In the case of the proposed Hon Mun MPA, although legislation and policy in relation to MPAs is relatively weak in Vietnam, the government has shown strong commitment in the preparatory phase of the Hon Mun management plan and has pledged to fully involve local user groups. In Sri Lanka, although relatively strong legislation and policy exist in relation to marine resource conservation, and the Hikkaduwa MPA management plan includes a strong component of community-based collaborative management, government authorities have not fully supported this step. The government's commitment to involving local user groups in hands-on management activities at this site is still low. This clearly illustrates the point that the presence of strong national policy and legislation alone is inadequate to ensure that the management and sustainability of resource use within an MPA takes place successfully.

### 5.2.5. Other Factors

In addition to these four factors, there are other factors that affect the sustainability of marine protected areas. While they appeared to be of secondary importance in the four case studies used in this analysis, they are worth mentioning here because they could be of primary importance in the case of other selected MPAs. For example, a comprehensive management plan is important in ensuring sustainability of a marine protected area; the management plan helps set the stage and lists actions that need to be taken for the conservation and sustainable management of marine resources within the MPA. All four sites included in this study have comprehensive management plans, but it must be noted that the presence of a management plan is worthless if implementation cannot be carried out – the MPAs simply become 'paper parks'. This is reflected in the case of Hikkaduwa Nature Reserve.

Another important factor is an adaptive management strategy, where a strong monitoring component ensures that activities are implemented at the MPA as planned, for instance in the case of the Great Barrier Reef Marine Park. As an MPA is a dynamic system and circumstances can change without warning, it is crucial that management strategies be able to adapt to new scenarios. An independent governing body at the national level that is responsible for the overall management of the marine protected area is another factor that can increase the probability of the sustainability of an MPA. The Great Barrier Reef Marine Park Authority is such a statutory body. An independent body ensures the least amount of conflict between the different state agencies and stakeholder groups operating within the MPA. The presence of strong national policies and legislation in relation to MPAs will ensure that a strong institutional framework can be set up for the management of the protected area. Economic and political stability are two other factors that enhance the sustainability of an MPA. These increase the probability that the necessary financial commitment and a suitable political climate conducive to good MPA management will be made available. The geographic location of an MPA may also play a role in either enhancing (or constraining) the probability of the sustainability of resource use within the protected area. If the MPA is established next to low population densities, then there are less resource use conflicts and higher levels of sustainable resource use. For example, the Hikkaduwa MPA is adjacent to a bustling tourist centre and therefore there are high levels of resource conflict, whereas the Great Barrier Reef Marine Park has low population densities adjacent to it and thus lower anthropogenic stress on the system.

## 5.3. Lesson 3

External factors such as natural disasters, war, and poverty, can have an overriding influence on the sustainability of resource use. For example, in Tanzania, the coral bleaching event that took place in 1998 severely affected some of the reefs within the Mafia Island MPA. In Sri Lanka, too, the bleaching event seriously affected the coral reefs found within the Hikkaduwa MPA. In addition, in Sri Lanka, the ongoing ethnic war has indirectly had a negative effect on the management of the Hikkaduwa MPA. The government's main focus at present is on the war, and much of its financial resources are tied up in this process. Marine resource conservation and MPA management is of lower priority in this context.

## 5.4. Lesson 4

Different combinations of the above factors and different interactions between these factors were noted in the four selected MPAs. The study revealed that while some marine protected areas do play a role in enhancing sustainability of resource use, others do not. This was attributed to the specific combination and interaction of factors present at each MPA site. As stated in the analytic framework (Annex 1), by simply producing a list of factors that affect sustainability, it is not possible to predict sustainability of resource use within an MPA. *"One cannot assure that if 'X' or 'Y' factors are present or not at specific levels sustainability is guaranteed."* As in other systems, sustainability in a marine protected area is a dynamic process that evolves with time, and it is the specific combinations and interactions between factors that ultimately determine sustainability.

The Great Barrier Reef Marine Park, for example, has clearly played a positive role in enhancing sustainable resource use in the Great Barrier Reef. Possibly the most important factor contributing to this is the strong governmental commitment that exists, in addition to the strong national policy and legislation that are found in Australia in relation to marine resource management and marine protected areas. Moreover, the presence of an independent statutory body at the national level – the Great Barrier Reef Marine Park Authority, which is responsible for the overall management of the marine protected area – has also greatly enhanced the sustainability of resource use within the park. Governance of the MPA by an independent body, as opposed to management of it by several state agencies with different objectives and mandates, has ensured that there is less confusion and conflicts of interest between the various stakeholders and agencies linked to resource use and management within the MPA. Australia also has economic and political stability and these, too, are critical factors that indirectly play a role in enhancing sustainable resource use. A complex, detailed management plan has been developed for the different sections of the GBRMP, which is yet another factor that has contributed to increasing the sustainability of resource use. In addition, low population densities adjacent to the MPA result in less anthropogenic stress on the system, less resource use conflicts, and higher levels of sustainable use.

The Mafia Island Marine Park has also played a fairly significant role in the enhancement of sustainable marine resource use at that site. Some of the factors that have helped achieve this sustainability have been the presence of an institutional framework that incorporates all relevant stakeholders that are both directly and indirectly dependent on the resources located within the MPA, including the local community groups; a decision-making process that takes into account the needs of these different user groups; strong commitment by the different user groups in the locality of the MPA for the long-term sustainability of resource use, as well as strong commitment by the government; and a comprehensive management plan for the MPA that ensures that resource use will take place in a sustainable manner and that user conflicts will be minimised. In addition, the MPA's distance from the Tanzanian mainland has meant less human-induced pressure on the natural resources around Mafia Island. Nevertheless, the absence of economic stability in Tanzania and the general poverty in the country, as well as the lack of an independent agency that is responsible for the overall management of the marine protected area, are factors that have constrained sustainable resource use within the park. National policy and legislation in relation to marine resource management also need to be revised and strengthened.

In the Hikkaduwa Nature Reserve, the MPA is at present not playing a very significant role in enhancing sustainability of resource use in the area. This is due to several factors, namely, the absence of strong government commitment to the implementation phase of the MPA management plan, and economic and

political instability in Sri Lanka. The ethnic war raging in Sri Lanka at present has taken a huge toll on the economic development of the country. As stated in the analytic framework, external factors such as political instability can have a strong negative influence on the sustainability of resource use in a system. Although relatively strong national policy and legislation exist in the country in relation to marine resource management, as does an institutional framework that incorporates all relevant stakeholders in the MPA, and a comprehensive management plan for the MPA, these factors alone are clearly inadequate to ensure that resource use takes place in a sustainable manner. In this case, external factors have had an overriding negative impact.

At the proposed Hon Mun MPA site, there is potential for the MPA to enhance the sustainability of resource use in the area. Of course, this is dependent on whether all the activities set out in the comprehensive management plan for the site are implemented as proposed. Factors that could contribute to sustainable use patterns include the proposed formulation of an institutional framework that incorporates all relevant stakeholders, and strong commitment by the different user groups in the locality of the MPA for the long-term sustainability of resource use. External factors at the macro level such as economic instability and poverty in the country may, however, influence resource use patterns and constrain the sustainability of such use.

**Table 8: Combination of factors enhancing sustainability.**

| GBRMP | Mafia Island |
|---|---|
| ✓ Strong government commitment.<br>✓ Strong national policy and legislation.<br>✓ Independent governing body.<br>✓ Economic and political stability.<br>✓ Comprehensive management plans.<br>✓ Strong institutional framework.<br>✓ Empowerment of local users.<br>✓ Low population pressure. | ✓ Empowerment of local users.<br>✓ Strong commitment by local user groups.<br>✓ Strong government commitment.<br>✓ Strong institutional framework. |
| **Hikkaduwa** | **Hon Mun** |
| ✓ Strong national policy and legislation.<br>✓ Comprehensive management plan for MPA.<br>✓ Strong institutional framework. | ✓ Comprehensive management plan.<br>✓ Strong commitment by local user groups for long-term sustainability. |

**Table 9: Combination of factors constraining sustainability.**

| GBRMP | Mafia Island |
|---|---|
| ✓ Externalities such as land-based activities not regulated appropriately.<br>✓ Natural disasters (*e.g.*, cyclones). | ✓ Low GNP per capita.<br>✓ Economic instability.<br>✓ Donor-driven project (financially dependent).<br>✓ Natural disasters (*e.g.*, bleaching event). |
| **Hikkaduwa** | **Hon Mun** |
| ✓ Local user groups not empowered.<br>✓ High population pressure.<br>✓ Economic instability.<br>✓ Political instability.<br>✓ Enforcement of regulations weak.<br>✓ Natural disasters (*e.g.*, bleaching event). | ✓ Economic instability.<br>✓ Donor-driven project (financially dependent).<br>✓ National policy and legislation only moderate.<br>✓ Enforcement of regulations weak. |

### 5.5. Lesson 5

It is important to note that the combination of factors that enhances sustainability of resource use in one marine protected area is unlikely to be identical to the factors that influence another MPA set in a different nation and socio-economic environment. In other words, what works for one MPA can rarely be transposed unmodified to another MPA and expected to produce similar results. As suggested by Ticco (1995), countries should therefore not directly attempt to copy MPA experiences from other countries, but should tailor management efforts to their specific circumstances. By adopting an adaptive management strategy, countries can strive to achieve a suitable combination of socio-political, socio-economic and institutional factors in order to increase the probability of enhancing the sustainability of resource use within any given multiple use MPA.

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