

# 1. INTRODUCTION

## 1.1 Contextual Setting

The Mangroves for the Future National Strategy and Action Plan (NSAP) will support the development vision of the Government of Maldives (GOM) and associated policies as they relate to sustainable use and management of coastal ecosystems, and adaptation to climate change in the context of integrated coastal management (*Box 1*). As a coral island nation ranked one of the most beautiful places on earth, that already earns a third of its national income from tourism and aspires to increase it twofold during the coming decades, integrated management of its foundation natural assets constitutes sustainable wisdom. An appropriate plan is necessary to strategically guide the process.

### ***Box 1: Development Vision of the Government***

The development vision embodies equitable social development through good governance. The administrative mechanism consists of regionalized and decentralized decision-making based on principles of liberal democracy and local participation. The first phase of this programme includes among others:

- Stakeholder consultation and advocacy on coastal zone management which integrates climate change adaptation through civil society networks for development of an operational framework.

The vision anticipates that people will migrate by choice to regions where more prosperity and better services are available. A national transportation system shall serve as a mechanism to overcome the transportation barrier. The achievement of the policy of population consolidation pursued thus far shall be supported by voluntary migration. Integrated development of island resources based on land use plans is envisioned as a foundation of sustainability.

<<http://www.maldivespartnershipforum.gov.mv/pdf/Local%20Governance.pdf>>

The Mangroves for the Future (MFF) programme is a unique partner-led initiative to promote investment in coastal ecosystem conservation for sustainable development. It provides a collaborative platform among the many different agencies, sectors and countries who are addressing challenges to coastal ecosystem and livelihood issues, to work towards a common goal. MFF builds on a history of coastal management interventions before and after the 2004 tsunami, especially the call to continue the momentum and partnerships generated by the immediate post-tsunami response ([www.mangrovesforthefuture.org](http://www.mangrovesforthefuture.org)).

The NSAP is not solely focused on mangroves. The term ‘mangrove’ is used as a symbolic label. In the aftermath of the tsunami of 2004, in the country that suffered most deaths, Indonesia, coastal mangroves were regarded as having provided a partial buffer which countered the force of the tsunami wave and thereby saved lives (UNEP, 2005). In the Maldives mangroves rarely grow at the shorefront, the interface of the land and the sea. They occur in depressions situated away from the immediate coastline (Naseer, 2006). The MFF programme acknowledges regional diversity and includes all coastal

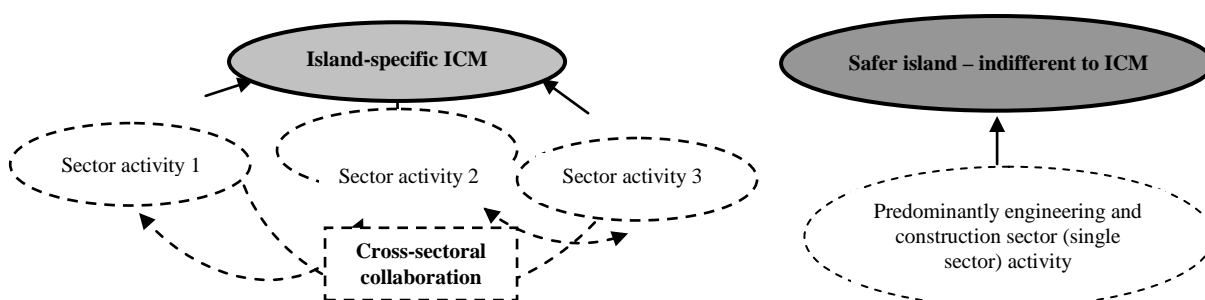
ecosystems. In the Maldives the dominant coastal ecosystems are the coral reefs. MFF Maldives provides an opportunity for ecosystem-based integrated coastal management (ICM) focused on coral reef islands.

The goal of ICM is to improve the quality of life of human communities who depend on coastal resources while maintaining the biological diversity and productivity of coastal ecosystems. ICM by its inherent nature requires action at local geographic sites - both entire ecosystems and parts thereof. Therefore it is in rhythm with the basic requirement of good governance and participatory democracy - the subsidiarity principle - the idea that a larger and greater body at the center should perform only those tasks which cannot be performed effectively at a more immediate or local level. Authority for implementation of site specific interventions should optimally flow from national policy and become confluent with the overall development process. At present a formal national ICM programme does not exist in the Maldives although the need is clearly articulated (7NDP; NEAP3; GOM, 2009). Once initiated, generally, it evolves through five stages of development (Annex 1). Progression toward the national process may best be facilitated by experience from model ICM case histories developed for particular islands as illustrated in Fig. 1.1. These model case histories could demonstrate best practices in ICM, stimulate programme development, and generate a core human resource network connecting the islands, atolls and the center. They will involve:

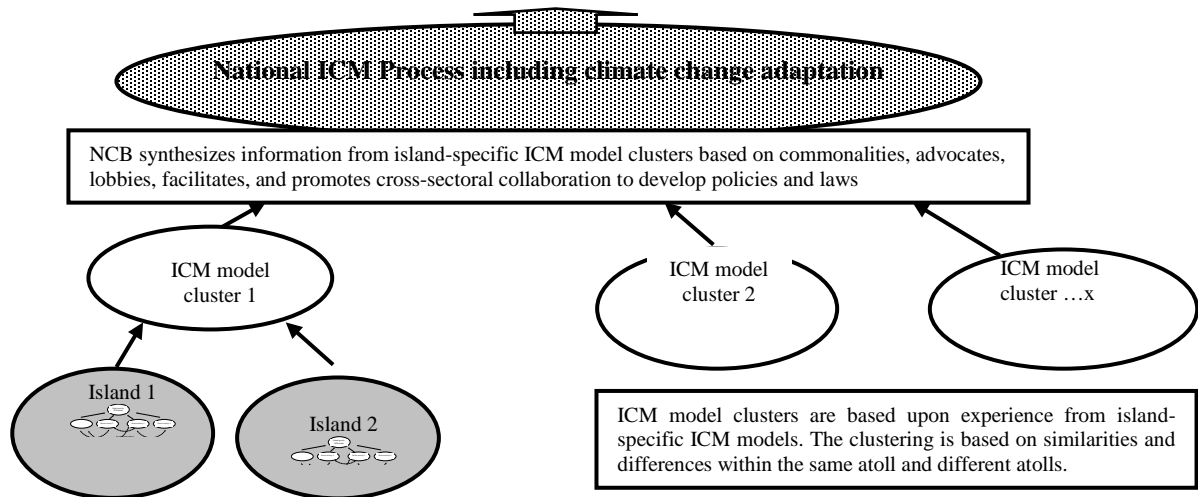
- Harmony with the national development vision and associated policies,
- Good governance based on participatory planning and decisions,
- Cross-sectoral collaboration,
- Opportunities for adaptive learning based on refined mapping,
- Opportunities for scientific inference based upon inter-island comparison, and
- Climate change adaptation.

Fig. 1.1 - Stages in the development of a national ICM programme. Stage 1 provides experience and knowledge for island-based ICM models to be used in Stage 2. A parallel process of development of safer islands proceeds under the national population consolidation process – dominated by the engineering. The two parallel development tracks have the potential to be mutually reinforcing (synergistic).

**Stage 1: Development of island specific case histories (ICM models), parallel with safer island development**



Stage 2: Developing a national ICM programme based upon lessons from island ecosystem ICM models



Two urgencies indicate the need for ICM:

- An increasing erosion trend where 97% of inhabited islands report beach erosion, of which 64% is severe, and
- Immediate implementation of the initial measures required for adaptation to climate change since delay may lead to more serious economic consequences (HMS, 2006).

ICM focused on direct contribution to human wellbeing also could serve as the vehicle for building confidence in planning implementation of activities in keeping with the National Adaptation Programme of Action (NAPA). The important consideration here is that populations participating now shall be aiming at benefits that would accrue only in the distant and uncertain future, even beyond their own lifespan.

## 1.2 Policies and Legitimacy

The challenging practical questions are based on imparting legitimacy to the ICM process:

- At what locations may ICM be initiated in the Maldives archipelago where geomorphology is highly diverse and boundary setting is very complex?
- How may the GOM deliver on its policy commitment to equity, economic growth and good governance where economies of scale affect the delivery of services to widely dispersed island populations?
- How can ICM dovetail into the long-term climate change adaptation process by way of adaptive learning? This challenge must support inter-generational continuity by way of a legacy of tested technical methodologies.

Meeting these challenges requires that many things be done concurrently. The GOM recognizes that it will not place itself in the position where it says it cannot do anything until it does everything. Action is required at levels ranging from the local to the global. The GOM has acquired global recognition and leadership among small island nations in planning for climate change. It has already set the target of becoming carbon-neutral in a decade. Similarly coastal zone management is now envisaged as a part of national policy to support and strengthen adaptation to impacts of climate change. Many uncertainties prevail. They may be reduced through strategic planning and proceeding in stages.

In the context of these challenges, the NSAP provides a supporting strategy:

- by enabling implementation of ICM for selected island ecosystems to test and develop models in parallel with;
- progressive development of a national programme which can benefit from actual experience drawn from island ecosystem-based ICM model development; and
- incorporating good governance, knowledge, empowerment, and public-private partnership (sustainable financing) as pillars.

### **1.3 Structure of the NSAP**

The NSAP is presented by way of the following sequential steps:

- The NSAP uses the trends identified in the Situation Analysis (Chapter 2) as its foundation, and the priorities in the NAPA incorporated into the ICM framework.
- The manner in which the trends inform the plan is briefly explained under ecosystem trend analysis and the relationship with planning options.
- The geographical unit for ICM implementation: 'island and island-chain ecosystems' are defined to provide clarity since entire atolls are also defined as ecosystems (e.g. AEC Project). The choice of island ecosystems as the geographic unit for ICM coheres with the 'subsidiarity principle' which underpins decentralization.
- The MFF Strategic Implementation Framework is briefly explained with comments on the relationship between its fifteen programmes of work (POWs) and Maldives' coastal ecosystem trends.
- The NSAP is presented in the format of the MFF Strategic Framework under three thematic programmes of work, Viz. Actions to Build Knowledge; Actions to Strengthen Empowerment; and Actions to Enhance Governance.



- The manner in which the elements of the NSAP harmonize with the development vision as articulated in key national documents and statements of the leadership is explained.
- This is followed by clarification of the implementation process and justification of the recommended methodology.
- The conclusion includes the way forward based on continuous adaptive learning.

## **2. SITUATION ANALYSIS**

### **2.1 Introduction**

Maldives, in its entirety, is a coastal nation where any point on the land mass becomes a part of the coastal zone. Land is one of the scarcest resources in Maldives comprising a mere 1% amongst the expansive 21,436 km<sup>2</sup> of reef. The total exclusive economic zone (EEZ) of the Maldives is 959,100 km<sup>2</sup>. The Maldives is made up wholly of coral reef ecosystems, which include reefs, lagoons, beaches, and vegetation. Typical ecosystems of a Maldives' atoll are described by Naseer and Hatcher (2004).

Development activities have had significant impact on the coastal ecosystems in the Maldives, especially evident in the inhabited islands. Some development activities such as harbour dredging and land reclamation permanently change the natural environment and damage the habitats while activities such as disposal of solid waste and sewage have a slow cumulative impact on the environment.

The Maldives depends entirely on the coral reef ecosystems to provide the asset base of the economy. Tourism, the largest contributor to GDP, is based on the attractiveness of its reef ecosystems for scuba diving, snorkelling and sun bathing, and fisheries depend on the productivity of the reef system to provide for bait fish and schools of migratory tuna. The environmental impact of tourism and fisheries activities is often managed to a high standard. On the other hand, human settlements development, transportation and energy projects are undertaken without adequate environmental management and there are no set environmental standards for these sectors.

The magnitude and nature of the vulnerability of the low lying coastal ecosystems of Maldives was fully exposed by the tsunami of 2004. Some 29,577 people were displaced and 82 lost their lives. Of the inhabited islands, 53 were severely damaged, and another 14 islands had to be evacuated. The World Bank estimated the damage at USD 472 million. Many lessons were learned from the tsunami including the need to enhance and preserve the natural protection provided by the coral reefs and mangrove ecosystems to the islands, and the importance of proper risk and vulnerability assessments in development planning.

The existing urgencies for integrated coastal zone management (ICZM) are outlined in the Seventh National Development Plan (NDP7) and the Third National Environment Action Plan (NEAP3). Policy 4 of NDP7 aims to provide a protected and safe coastal environment for all Maldivians. The strategies are to build capacity for ICZM at island level, strengthen ICZM information base, strengthen policies, regulations and guidelines and develop mitigation and adaptation measures for coastal erosion. NEAP3 focuses on safer islands,

resilient ecosystems, healthy islands and access to clean water with elements of ICZM.

The Mangroves for the Future (MMF) programme is a partnership-led initiative aimed at promoting investment and action in ecosystem conservation for sustainable coastal development. The initiative seeks to effect demonstrable changes and results across four key areas of influence: regional cooperation, national programme support, private sector engagement and community action using a strategy of generating knowledge, empowering institutions and people to use that knowledge, and thereby promoting good governance in coastal areas. The Maldives MFF National Strategy Action Plan (MMF NSAP) is derived from the Regional MFF programme.

In Maldives, the entire country is a coastal environment that is under pressure from development activities and vulnerable to the impact of climate change. In the context of these challenges, the Maldives MFF NSAP provides an opportunity for implementation of ICZM for selected ecosystems to test and develop models in parallel with the development of a national ICZM programme.

## 2.2 Country Setting

### (a) Geography and climate

Maldives is an archipelago of 25 low-lying coral atolls, located in a north to south direction, on the Laccadives-Chagos submarine ridge in the Indian Ocean (Fig. 2.1). This chain is 860 km long and 80 to 120 km wide. There are 1,190 small tropical islands, of which 358 islands are currently utilized mainly for human settlements, infrastructure and economic activities.

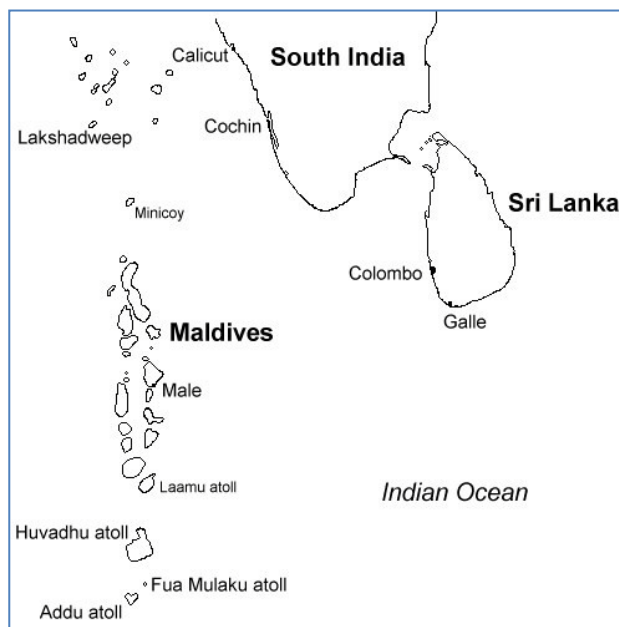


Fig. 2.1 - Location of Maldives

Maldives has a tropical monsoon climate. The South-west Monsoon is from May to November and the North-east Monsoon is from December to April. The south-west monsoon is the rainy season, when cloudy skies and moderate to rough seas are common. Wind speeds of 11 mph occur frequently and wind gusts of 35 mph have been recorded occasionally. In September and October conditions are calmer. The transitional period for the

monsoon system to change from south-west to north-east, usually begins in November. Calm seas, hot and dry days, cooler nights are more commonly experienced during this period. Frequent light winds usually from the north-east and variable sea breezes with an average speed of 9 km/h are also common. The transitional period from north-east to south-west monsoon begins in April with calm, windless days which are more common than at any other time.

Daily temperature varies between 31°C and 23°C, with a mean daily maximum of 30.4°C and a mean daily minimum of 25.7°C. Humidity ranges from 73 to 85%. The annual average rainfall for Maldives is 2,124 mm. Annual rainfall increases from north to south with the southern atolls and northern atolls averaging 2,277 mm and 1,786 mm respectively.

The current regime in the Indian Ocean is strongly influenced by the monsoon climate. In the region of Maldives the currents flow westward during the north-east monsoon period, and eastward during the south-west monsoon period. The ocean currents flowing through the channels between atolls are driven by monsoon winds. Generally, the tidal currents are eastward in flood and westward in ebb. The swells and wind waves experienced by Maldives are also conditioned by the prevailing biannual monsoon wind directions. The wind is typically strongest during April to July in the south-west monsoon period. During this season, swells generated north of the equator with heights of 2-3 m and periods of 18-20 seconds have been reported in the region. Maldives also experiences swells originating from cyclones and storm events occurring well south of the equator. It is reported that the swell waves from south-east to south-south-east occur due to strong storms in the southern hemisphere in the area west of Australia, in the direction of Maldives.

## **(b) Geology and geomorphology**

The atoll of Maldives comprises of 16 complex atolls, five oceanic *faros* (ring-shaped reefs exposed to the open ocean) and four oceanic platform reefs (reefs lacking deep lagoons that are exposed to the open ocean). Naseer and Hatcher (2004) provides a detailed description of the geologic and geomorphologic features of the coral reef ecosystems in the Maldives including the complex atolls, oceanic *faros* and oceanic platform reefs, including the total surface area, number of reefs, and areas of reef and island. Fig. 2.2 shows how the geomorphologic features vary across the Maldives from north to south.

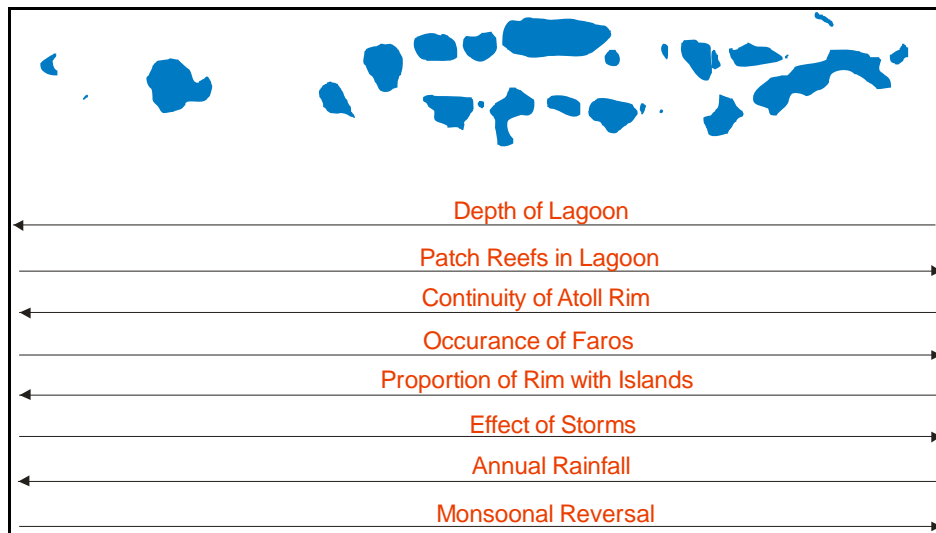


Fig. 2.2 - Trends in geomorphologic features across the Maldives

The coastal geomorphology of the Maldivian islands can be divided into two parts: the reef and the island (Francois & Saeed, 2006). The reef area usually consists of the reef flat and the outer and inner reef slopes. Reef flats are usually shallow, averaging 1.0-1.5 m at median tide. There is little variation in submarine topography. Lagoon areas are usually deeper than the reef flat, with depths reaching 15-20 m. Both reef flat and lagoon areas are covered with sand, coral rubble and sparsely distributed live and dead corals. Occasionally, seagrass occupy large areas near the island coastline.

Fig. 2.3 and Fig. 2.4 show simplified illustrations of the geomorphological features of an island.

There are more than 2,000 distinct coral reefs, greater than 1 ha in area, in the Maldives archipelago (Naseer and Hatcher 2004). About 529 are located on the rims of the complex atolls, five form the rims of the ocean *faros*, and four form oceanic platform reefs. The remaining reefs (about 1500) are lagoon patch reefs scattered throughout the lagoons of the atolls. The number of reefs in an atoll varies greatly, ranging from only seven in Seenu atoll to 268 in Alifu atoll. The surface area of the major reef structures of the Maldives including all coral reef and lagoon habitats of atolls totals 21,000 km<sup>2</sup>. The total reef area of the Maldives is close to 4,500 km<sup>2</sup>.

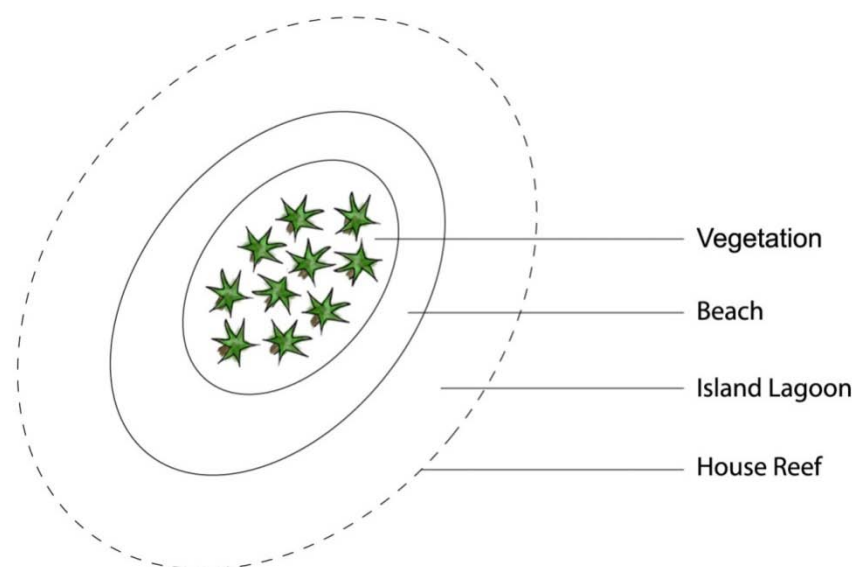
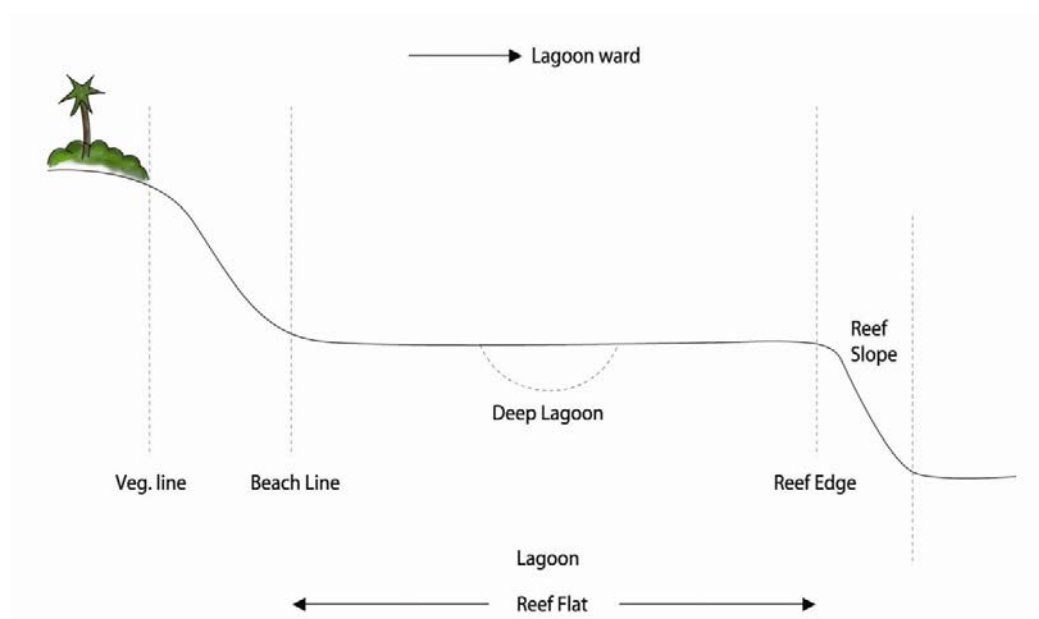


Fig. 2.3 - A simplified illustration of island geomorphology

ICZM needs to distinguish between island lagoons and atoll lagoons. The island lagoon is the area of the house reef ecosystem (reef flat) as shown in Figure 2.3 and 2.4, whereas the atoll lagoon is the area within an atoll reef (Ahmed Shaig, *pers comm.*). The depth of water is the main feature that distinguishes an atoll lagoon from an island lagoon. In the local language several distinct words are used to describe the different lagoons. These include terms such as: *kandu*, *etherevari*, *haa*, *giri*, *falhu*, *thila*. The clarity and uniqueness of these local definitions of the components of the reef ecosystems provide the understanding and knowledge on geomorphological elements that will form the main target of future ICZM initiatives.



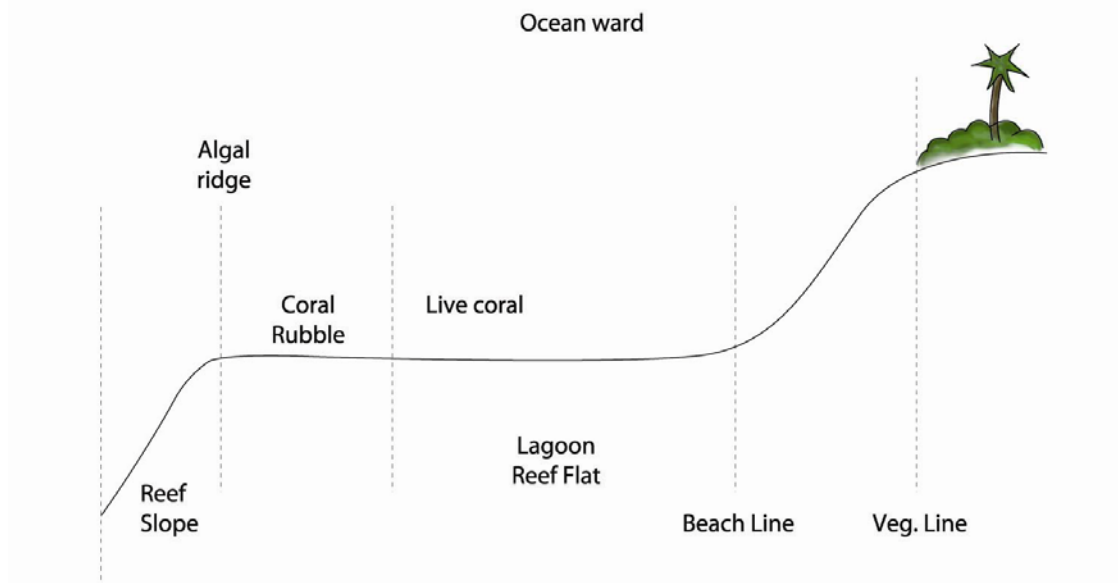


Fig. 2.4 - Lagoon ward and ocean ward cross-section of island profile

The main geomorphologic features of islands include the beach and beach rock. The coral islands of the Maldives are low lying with an average elevation of 1.5 m above mean sea level. Most islands are small and narrow and their topography is similar. The most dynamic coastal geomorphologic feature of a coral island is its beach. The unconsolidated nature of beaches and islands, together with the reversal of the monsoon from north-east to south-west, tend to create a naturally dynamic and unstable environment. As a result, both erosion and accretion contribute to the regular island building process (Francois & Saeed, 2006). Islands facing frequent storms or strong wind generated waves from the Indian Ocean often have high dunes on the ocean ward side. This seems to be a natural response of islands to oceanic severe weather events (Woodroffe, 1993) and to a possible rise in sea level rise (Kench & Cowell, 2002). Mangroves, marshes and small inland fresh water wetlands are found in some larger islands.

The coral reefs of Maldives were badly affected by the El Nino event of 1998 (CORDIO & SIDA, 2005). The shallow water coral communities were severely bleached and mortality exceeded 90%. An initial bleaching impact study was conducted in 1998 after establishing 15 sampling sites in the five regions of Haa Dhaalu, Malé atoll, Alifu atoll, Vaavu atoll and Addu-Gaafu Alifu atoll. Reef recovery has been variable over the several locations that have been monitored annually. The overall coral cover increased from approximately 2% to 28% between 1998 and 2005 over the 15 monitoring sites.

The community structure of the reefs may also be modified as a result of the bleaching event. Preliminary findings indicate that the reefs are now dominated by slow growing coral species such as agariciids and faviids rather than the branching acroporids and pocilloporids that were prevalent previously. Some re-colonisation of fast growing, branching growth forms of corals has also been reported.

AusAID and MRC conducted a study to assess the extent of damage to coral reefs caused by the tsunami of 2004. A total of 124 reef sites were surveyed in seven atolls covering about 170 km of reef margin. Although the overall physical damage caused by the tsunami was negligible, it may have hampered recovery of the reefs from the massive bleaching event of 1998. When the tsunami struck the reefs of Maldives were in the early stages of recovery from the bleaching. Many sites were found to have a light coating of sand. Small recruits are most vulnerable to smothering by sand and may make reef surfaces unfavourable for future settlement.

According to the CORDIO Status Report 2008 (CORDIO & SIDA, 2008), ten years after the bleaching event, several atolls of Maldives show very slow recovery. Somewhat higher rates of recovery were reported in certain areas, notably in reefs in the western atoll chain. The CORDIO Status Report 2008 further highlights the impact of development activities in Maldives on coral reefs. This is discussed in detail in Section 2.6 of this report.

Mangroves are an important ecosystem found on some islands of the Maldives. An estimated 12 percent of the 1,190 islands of Maldives have mangrove ecosystems representing 12 true mangrove species (Saleem & Nileysha, 2003). The mangrove ecosystems of Maldives are not estuarine-based and this is considered a unique characteristic. Some biophysical and geomorphological changes have been noted among the wetlands in different islands. Mangroves are a source of food, fuel wood, timber and medicine. More importantly, mangroves act as a buffer against waves and reduce erosion in islands. However, limited research has been undertaken on the wetlands of Maldives.

Beach erosion is one of the most serious environmental issues facing the islands of Maldives. On many islands, beach and shoreline sand is being washed off at a greater rate than it is accreted. The process of coastal erosion and accretion is extremely complex with interrelated climatic, geological, oceanographic, biological and terrestrial processes affecting the growth and stability of the reefs and island structures. Generally, during the monsoon sand and sediment are gradually washed off (eroded) from one side of the island and are carried along the shoreline to the other end of the island. This process is reversed during the next monsoon with sand being deposited (accreted) on the previously eroded side of the island (MEC, 2004).

### **(c) Definitions and boundaries**

Maldives does not have a specific definition for an island. The Oxford Dictionary defines an island as ‘...a piece of land surrounded by water’. In the absence of a country definition, the islands of Maldives can be considered to conform to the standard dictionary definition of an island. In the Maldivian context, an island is any land above water at high tide, any land having vegetation on it, any land having a considerable amount of vegetation



especially coconut palms and any land that can be used for any economic activity or public purpose including seasonal islands. In this regard, there are three main types of islands in Maldives; (1) vegetated islands that may be densely, thinly or barely vegetated; (2) sandbanks that are permanent, seasonal or tidal; and (3) faros that are permanent, seasonal or tidal. Establishment of a clear definition for an island in the Maldives context may be important for integrated coastal management.

The coastal geomorphology of an island includes the island as well as the surrounding reef as detailed in Section 2.2(b). Furthermore, about 96% of the islands are less than 1 km<sup>2</sup> in area and 100% of the population of Maldives is considered to be residing in the coastal zone. This provides the basis to establish an island with its reef as the coastal zone for ICZM in Maldives.

An important aspect for ICZM in Maldives is the complexity of resource use and the resulting resource use conflicts as detailed in Section 5. Based on the existing situation, defining boundaries and resource use rights may be crucial for ICZM. Suggested boundaries for resource use and ecosystem conservation based on traditional resource use methods and the allocation of land for private sector investments are as follows (Ahmed Shaig, *pers comm.*).

**Island physical boundary** is determined as the beach line at low tide. For all practical needs, the physical boundary of an island is its beach line at low tide.

**Industrial Islands** are islands with significant economic investments such as fishery, tourism and manufacturing.

**Special Use Island** is an island earmarked for special use by the government, such as defence, infrastructure, communications or research.

**Island resource use boundary** is an area on the reef earmarked as a resource use zone for an island. Additional areas on the reef flat could be explored by the island inhabitants for resource use. For inhabited islands these include fishery, gathering, recreation and floating structures. For Industrial islands (including resorts), this includes construction of over water structures, recreation and floating structures.

**Resource use zone** is the zone on the reef system where an island has exclusive resource use rights. These zones are only present in inhabited islands, special use islands and industrial islands. Resource use zone entitlements may include the use of resources within a radius 2 km from the house reef. The remaining zones should be considered as resource sharing zones.

**Resource sharing zones** are zones where an island does not have exclusive rights. If two or more inhabited islands share a reef system each inhabited island is entitled to a resource use zone of 2 km radius. If the resource use

zones of an industrial island and a special use island intersect, each industrial island is then entitled to half of the resource use zone. If the resource use zone of an inhabited island intersects with a special use island or an industrial island, the latter islands are entitled to 500 m from the vegetation line. If the intersection line is less than 500 m, an equidistant line may be drawn.

All resource use zones will have the right of passage. All harbours and reef entrances (neru) will have public access, but mooring in a harbour will be subject to conditions set by the island. All inhabited, special use and industrial islands have a right to extend their physical boundaries through reclamation, but only within the resource use zone. Any physical extensions are subject to Environmental Impact Assessments, with particular assessment of impacts on neighbouring island(s).

## 2.3 Coastal processes

The hydrographic environment of the Maldives consists of three primary areas: reef flats (including reef lagoons), atoll lagoons and the ocean. Specific hydrographical features associated with these areas influence the hydrodynamics at the atoll and island levels.

### (a) Tides

Tides experienced in the Maldives are mixed and semi-diurnal/diurnal. Typical spring and neap tidal ranges are approximately 1.0 m and 0.3 m, respectively (MEC, 2004). Maximum spring tidal range in the central and southern atolls is approximately 1.1 m. There is also a 0.2 m seasonal fluctuation in regional mean sea level, with an increase of about 0.1 m during February to April (North-east Monsoon) and a decrease of 0.1 m during September to November (South-west Monsoon). The astronomical tidal variations recorded in the country with respect to the mean sea level are presented in Table 2.1.

Table 2.1 - Astronomical tidal variations recorded in Maldives

Tide Level	Relative to Mean Sea level
Highest Astronomical Tide (HAT)	+0.64
Mean Higher High Water (MHHW)	+0.34
Mean Lower High Water (MLHW)	+0.14
Mean Sea Level (MSL)	0.00
Mean Higher Low Water (MHLW)	-0.16
Mean Lower Low Water (MLLW)	-0.36
Lowest Astronomical Tide (LAT)	-0.56

Source: (MEC, 2004)

The tidal range in Maldives is small (1m) and tides may have significant influence on the formation, development and changes in sediment processes around islands. Tides may also play an important role in lagoon flushing and water circulation within the reef as water residence time within an enclosed reef is highly dependent on tidal fluctuations.

Tides affect wave conditions, and wave-generated and other reef-top currents. Tide levels are believed to be significant in controlling the amount of wave energy reaching an island, as no wave energy crosses the edge of the reef at low tide under normal conditions.

### **(b) Waves**

Studies on wave condition in the Maldives are limited. Two major types of waves have been reported on the coasts of the Maldives: waves generated by local monsoon wind, and swells generated by distant storms. Wave energy is reported to be important for coral growth and reef development, sediment movement and settlement, lagoon flushing and circulation in the atoll (Naseer, 2003). In addition, specific wave power regimes have been identified for different areas of the Maldives. These aspects have implications for the type and perhaps the supply of sediments into the island, its coastal topography and exposure to storm surges and flooding. Pressures on wave conditions arise primarily from coastal development activities and possibly sea level rise.

### **(c) Currents**

Marine currents within the atoll lagoon and the reef flat have been rarely studied in the Maldives. Currents affecting water on reef flats, atoll lagoons and sea areas around reefs can be driven by tidal currents, wind-induced currents, wave-induced currents and oceanic currents. It is however presumed that the dominant monsoon season winds have a greater effect. Westward flowing currents are dominant from January to March and eastward currents from May to November. Studies on current flow within a reef suggest that waves and tides generate currents across the reef platforms, and are also capable of transporting sediment. Currents within a reef are modified by reef and island morphology. Coastal structures and land reclamation projects are known to influence current patterns within a reef, thus making the island more vulnerable to coastal erosion.

### **(d) Marine water quality**

Marine waters around the Maldives, both within atoll lagoon and reef flats, are known to be in pristine condition. Marine waters around the Maldives are characterised by a seasonally fluctuating mixed layer of relatively saline water from the Arabian Sea of 36 ‰ (36 ppt), and less saline water from the Bay of Bengal of 34 ‰ (34 ppt). Pressure on marine water quality arises usually, at local level around specific islands, primarily due to coastal infrastructure development activities, land reclamation and sewage disposal. In selected

cases, inappropriate solid waste disposal such as dumping of waste in the lagoon is known to deteriorate the local marine water quality. However, adequate studies have not been conducted to study marine water quality, and standards for marine water quality have not been established.

## **2.4 Demography**

According to Census 2006 (MPND, 2006a; MPND, 2006b), the population of Maldives is 298,968; 147,509 females and 151,459 males. From 2000 to 2006 the population increased by 28,867, a 10 percent increase over the 2000 census population of 270,101. The population of Malé increased by 29,624 (40%) over the last six years, while the population in the rest of the country decreased by 757 (-0.3%). The Maldives population surpassed 300,000 in July 2006, reaching a momentous milestone in population growth. In 2006, the population residing in Malé surpassed the 100,000 threshold for the first time with 35 percent of the Maldivian population living in Malé. Population is described in the Census Analytical Report (MPND, 2006b) (see also Annex 2).

### **(a) Population growth**

Population of Maldives has increased fourfold since 1911. Although an increase in the size of the population has been recorded in each census, the annual population growth rate has declined from 3.43 percent during 1985–1990 to 1.69 percent during 2000–2006. At the current growth rate of 1.69 percent the population of Maldives will double in about 40 years.

The annual population growth rate in Malé and the atolls are distinctly different. The annual growth rate of Malé has been on the increase since 1995 while in the atolls it has declined. Over the 2000–2006 census period the average annual growth rate in Malé is 5.7 percent, and minus 0.8 percent in the atolls. In 2006, the average annual growth rate in all the atolls was below the national average of 1.69 percent; 12 of the 20 atolls experienced negative growth.

Annex A provides a list of inhabited islands with their population size, annual growth rate and population density, according to Census 2006 (MPND, 2006a).

### **(b) Population structure**

Population growth and changes in the age-sex composition of the Maldives can be portrayed through population pyramids for the years 2000 and 2006 (Fig. 2.5). The general shape of the two pyramids is essentially the same. In year 2000, there is a relatively large proportion of people under 20 years of age and a relatively small proportion of people over 65 years.

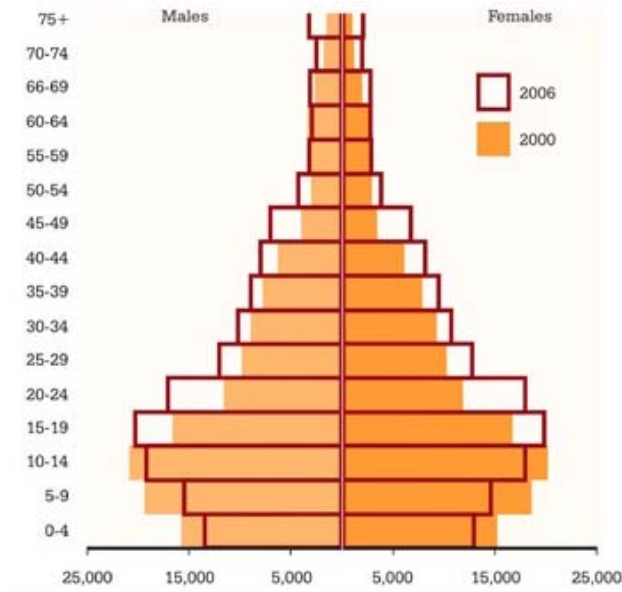


Fig. 2.5 - Total population by age and sex in 2000-2006

According to Census 2006, the largest age groups in 2006 were 15-19, 10-14 and 20-24, in that order. The number of children under 15 years totalled 93,796 (45,479 females and 48,317 males) and accounted for 31.4 percent of the population. The 15-64 age group comprises 50 single-year age categories, which makes it the largest age range group and includes youth, young adults and mature adults. This is also the source of most economic capacity of every nation. The 15-64 years age group numbered 189,443 and

made up 63 percent of the population at the time of the 2006 census. This is an increase of 26.6 percent since the 2000 census, when the working age population was 149,668 and represented 55.4 percent of the total population. Around 22 percent of the working age population consists of young people of 15-19 years. Only 11.4 percent of the working age population were 45-64 years of age.

**(c) Geographical distribution of the population**

The variation in the geographic distribution of population across the atolls, in 2000 and 2006, is shown in Figure 2.6.

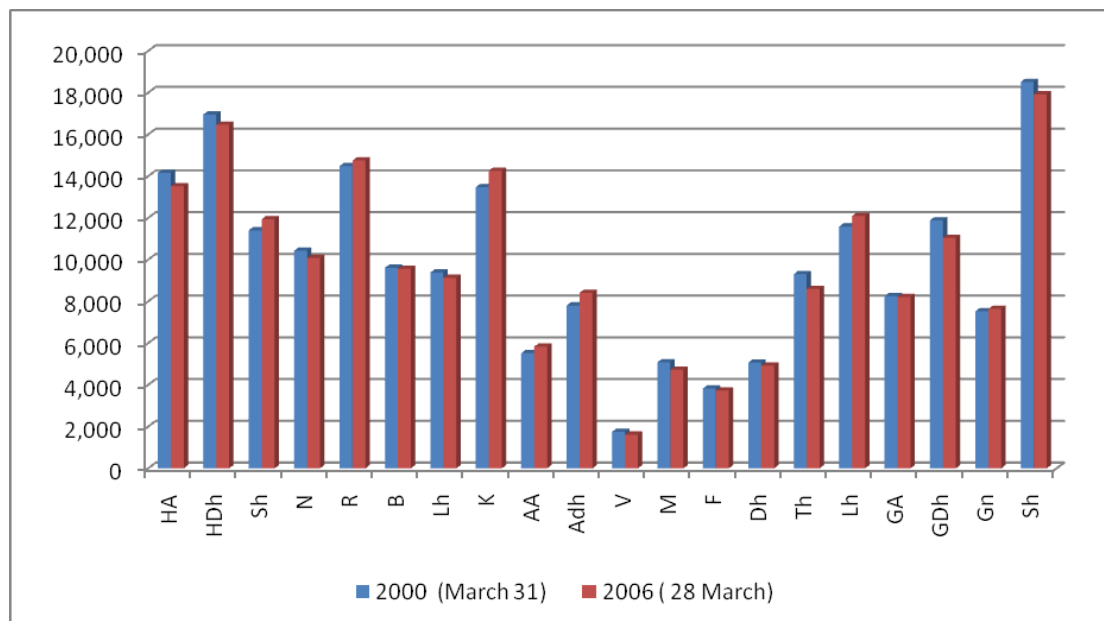


Fig. 2.6 - Population distribution across the atolls

Population per atoll ranges from 1,606 in the least populated Vaavu atoll, to 18,026 in Seenu atoll, the most populated atoll. Vaavu atoll is the only atoll with a population less than 2000.

Census 2006 uses seven main categories of population size that indicates the variation in the distribution of the population among the islands. The categories are detailed in Table 2.2.

**Table 2.2 - Distribution of the Maldives population over different size categories and types of islands**

Atoll / Island	Population			% share of total population
	Total	Male	Female	
Republic	298,968	151,459	147,509	100
Administrative islands	288,101	140,914	147,187	96.37
Population of less than 500 (75 Islands)	22,932	10,926	12,006	7.67
Population of 500 to 999 (58 Islands)	40,343	19,599	20,744	13.49
Population of 1000 to 1499 (30 Islands)	35,514	17,268	18,246	11.88
Population of 1500 to 1999 (17 Islands)	28,545	13,670	14,875	9.55
Population of 2000 to 4999 (12 Islands)	32,975	16,238	16,737	11.03
Population of 5000 to 5999 (3 Islands)	24,099	11,221	12,878	8.06
Population of 10000+ (1 Island)	103,693	51,992	51,701	34.68
Non-administrative Islands*	8,359	8,020	339	2.40
All Size Class	3,456	3,347	109	1.20
Resorts	3,827	3,676	151	0.96
Industrial Islands and Others	1,076	997	79	0.23

Source: MPND, 2006a

The population of Maldives is sparsely distributed across the 198 inhabited islands as indicated in Table 2.2. Some 105 islands, with a population of 500-2,000 each, account for 35 percent of the total population. Majority of the islands have a population less than 1000. There are 75 islands with populations of less than 500 each, accounting for about eight percent of the total population of Maldives, and 15 islands with populations of 2000-6000 each, accounting for about 19 percent of the total population. Malé is the only island with a population greater than 10,000.

Annex 7 provides maps of all atolls with all the inhabited islands and population of each island to show the distribution of the people across the archipelago.

#### **(d) Migration and urbanization**

Census 2006 defines a lifetime migrant as one who was born outside the island of usual residence, and has lived in that island for more than one year.

However, due to the small populations in the islands, the most appropriate level of aggregation for migration data is the atoll level. Accordingly, migration has increased from 15 percent in 2000 to 33 percent in 2006. This means that 33 percent of Maldivians have changed their atoll of residence at least once in their lifetime. The outward migration rate (OMR) for Maldives in 2006 was 34 (out of every 100 persons). The corresponding rate in 1995 was 15. Fourteen atolls had OMRs higher than the national average, and only Kaafu atoll and Malé had Inward Migration Rates (IMR) higher than the national average. All atolls, except Malé, Kaafu and Alifu Dhaalu, had net migration losses.

Malé is the main urban centre in the country and has the largest proportion of lifetime migrants in the country. In 1995, 45 percent of Malé population consisted of migrants, and this increased to 53 percent in 2006. Seenu atoll (12 %) and Gaafu Dhaalu atoll (11 %) had the highest number of lifetime immigrants next to Malé, followed by Thaa, Haa Alifu and Haa Dhaalu with eight percent each. Furthermore, lifetime migration was significantly gender selective in the Maldives: for every 100 female lifetime migrants there were 109 males in 1995 and 118 males in 2006.

Over 33 percent of all lifetime migrants, enumerated in 2006, stated they migrated in search of better education opportunities. A preference to live in the island and employment were the other two most often cited reasons for migration. Education was the single most important reason for migration from the atolls to Malé.

No studies have been undertaken to analyze migration from one island to another in the Maldives. The available data shows that significant migration has taken place from islands to Malé only. Hence, it is not possible to identify discernible patterns and construct a hierarchy of push and pull factors for migration among the islands. Hearsay points to lack of education opportunities and environmental vulnerabilities as the push factors.

### **(e) Employment and income**

Since the late 1970s there have been important changes in the structure, conditions, and opportunities for employment and self-employment in the archipelago (Francois & Saeed, 2006). The developments that have affected the employment profile include the shift to a tourism economy, the growing importance of public sector employment, and the apparent growth of the informal sector. Their consequences on employment and self-employment also have a spatial dimension on the distribution of opportunities. One of the main development policies that has influenced the distribution of employment opportunities is the establishment of Malé atoll and Ari atoll as the main tourism zones in the 1980s. Many from other atolls came to the resorts in Malé and Ari atoll, while their families resided in Malé.

**(i) Employment levels and sources**

The labour force participation rate improved from 59.8 percent in 2000 to 64.1 percent in 2006. Labour force participation rate improved slightly for Malé from 56.8 percent in 2000 to 58.5 percent in 2006. In contrast, labour force participation rate in the atolls improved significantly from 59.8 percent in 2000 to 64.1 percent in 2006. According to Census 2006, Kaafu atoll has the highest labour force participation rate of 77.6 percent, while Seenu atoll has the lowest at 59.2 percent.

According to the Vulnerability and Poverty Assessment II (VPA-II) data, unemployment is rising in the atolls. The male unemployment rate in 1997 was 4 per cent of the labour force and increased to 9 per cent in 2004, while female unemployment increased from 27 percent in 1997 to 28 percent in 2004. There are two important emerging trends in employment. The first important trend is the decline of employment in the fishing sector. However, the decline in fisheries employment is not in absolute numbers, it is relative to other sectors. It could be a reflection of new entrants in the labour force showing a preference for sectors other than fisheries. The second important trend is the increase in employment in the tourism sector. A commonly assumed cause is the growth in tourism sector from a mere 280 beds in two resorts in 1972 to 17,802 beds in 89 resorts by 2006 (MTCA, 2007). The causes behind the changes to employment have not been studied in detail.

**(ii) Income**

The best indicator for measuring differences in levels of income across geographic regions is GDP. However, in the Maldives GDP figures are only available at the national level. Hence an indicator of income poverty across the atolls is used to describe atoll level differences in income. The selected income poverty indicator is the headcount ratio - proportion of the population with income below a certain poverty line. According to VPA-II all headcount ratios for the complete spectrum of reasonable poverty lines have been more than halved during the period 1997-2004. The spectrum of all reasonable poverty lines begins with Rf4.34 (the equivalent of a dollar a day in 1993 purchasing power parity (PPP) terms) at the low end. At the high end it is Rf15 - the median per capita household income of the atoll population in 1997.

VPA-II states that the income distribution in Maldives is relatively unequal. Over the period 1997-2005 there has been a significant increase in inequality between Malé and the atolls. However, there has been some decline in inequality - within Malé and within the atolls. The median per capita household income in Malé was 2.3 times the average atoll income in 2004, up from 1.7 times in 1997.

Headcount ratio for poverty lines Rf7.5, 10 and 15 and income poverty index for all inhabited islands are provided in VPA-II. The data is given in Annex 3.



## 2.5 Governance and empowerment

Maldives is a sovereign, democratic Republic. In September 2007 the people of Maldives decided, through a referendum, on a presidential system of governance. In October 2008 Maldives held its first democratic presidential election under the new constitution ratified on 7 August 2008. Presently significant changes are being made to the local governance system to accommodate the new powers and authority vested in local councils to be elected by the constituents. Seven provinces have been declared and State Ministers have been appointed by the President for each province. The seven provinces are shown in Fig. 2.7.

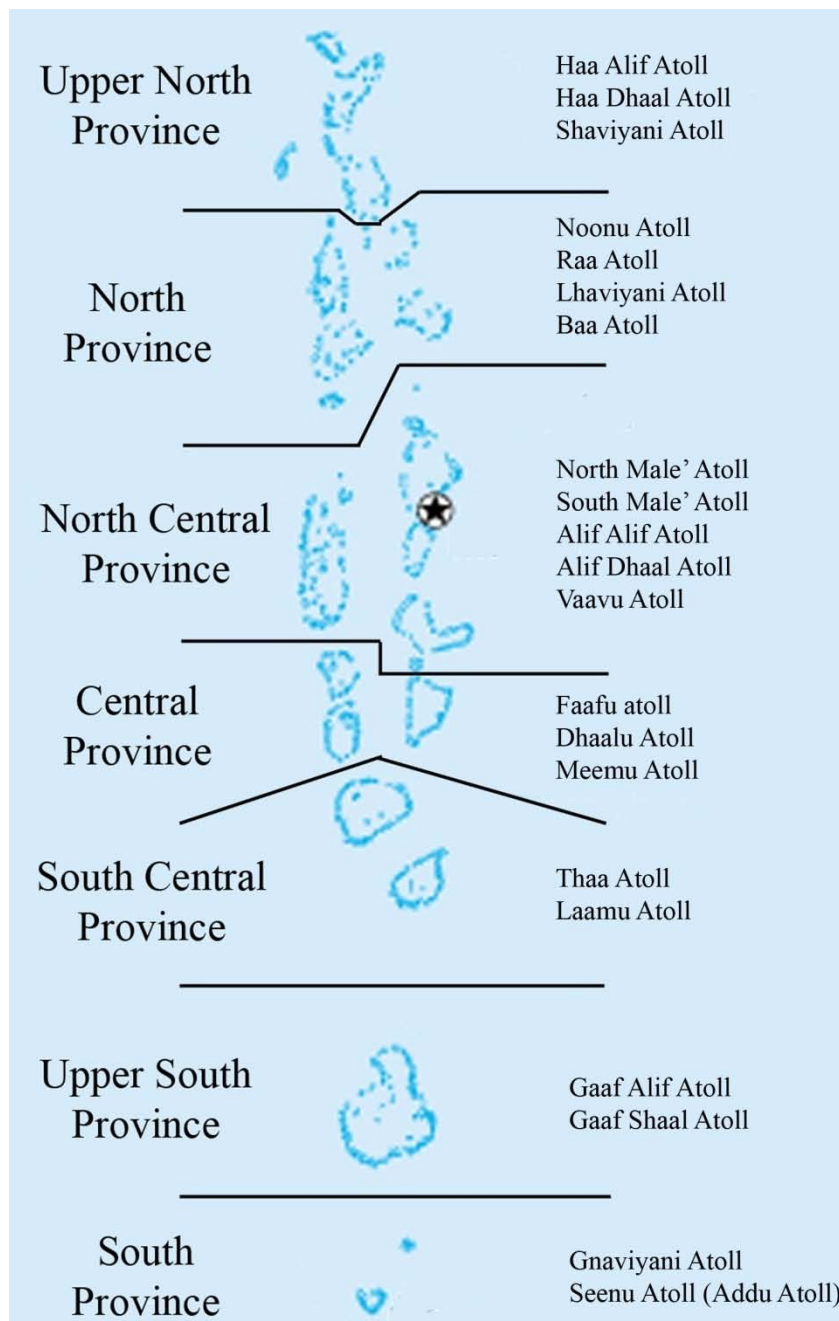


Fig. 2.7 - The provinces and atolls of each province

According to the Constitution, in order to provide for a decentralized administration, the President has the power, as provided in law, to create constituencies, posts, island councils, atoll councils and city councils. All members of councils created for decentralized administration shall be democratically elected by secret ballot, by their respective communities. Elections to island councils, atoll councils and city councils as provided for in the Constitution shall be held before 1 July 2009.

The responsibilities of councils elected to provide for decentralized administration is stated in the Constitution. The responsibilities include:

- (a) to provide democratic and accountable governance;
- (b) to foster the social and economic well-being and development of the community;
- (c) to establish a safe, healthy and ecologically diverse environment;
- (d) to achieve such other objects as prescribed by law.

The Constitution states that a bylaw or decision of a local authority shall be subject to Acts or Regulation of the People's Majlis. In addition, local authorities shall be provided with an annual budget from the Treasury as provided in law, and shall also have authority, in accordance with statute, to raise funds.

### **(a) Resource allocation**

Property rights are defined and established in informal institutions such as traditions. At the island level, all resources such as the beach, lagoon, reef, mangroves and open areas are understood and accepted as common property resources. There are no formal institutions that define rights to the common property resources.

At present, the allocation of land for diverse uses on an island is under the Mandate of the Ministry of Home Affairs. The decision-making process is delegated to the Atoll Office by the Ministry of Home Affairs. Land allocation is carried out at island level by the Island Development Committees and submitted to the Atoll Office for approval.

## **2.6 Ecosystem consequences of development trends**

### **(a) Fisheries**

Fisheries sector is a critical component of the economy. More than 20% of the population depends on fisheries as the major income earning activity. Fisheries is also the most dominant in terms of employment of the local labour force, employing over 15,000 fishermen. Fisheries contributes 7% to the GDP.

Fish, particularly tuna, is the primary source of dietary protein for the Maldivians (MEEW, 2007). A good overview of the development trends of the fisheries sector and adverse impacts such as depletion of specific species are discussed in Adam (2006) and are presented in this section.

In 2005, the total fish catch was 186,000 metric tons, and the export revenue was over US\$ 100 million. Tuna and tuna-related species accounted for approximately 89% of the total fish catch, and tuna products for US\$ 97 million of the export revenue. In Maldives, fish other than tuna species are classified as reef fish. In 2005, 11% of the fish catch was reef fish and contributed US\$ 7 million to the fish export revenue (MEEW, 2007).

Reef fishing activities in the Maldives was poorly developed. The increase in demand from tourist resorts and access to export markets has rapidly transformed reef fishing into an important income generating economic activity in the atolls. Groupers, live-tropical fish and sea-cucumber are fished exclusively for export while lobsters and other reef fish are harvested to meet the demand of the tourism sector. Many fishermen consider reef fishing as part-time employment carried out on an opportunistic basis. However, a few fishermen are employed full time as reef fishermen to supply tourist resorts. Some have formal contracts with the resorts for supplying reef fish (Adam, 2006).

Natural or anthropogenic disturbances on coral reefs are known to cause changes in community structure and species resilience, which has implications for the reef fishery. Human stresses such as overexploitation, catching immature fish and fishery during spawning periods, exacerbates the vulnerability of reef fishery (MEEW, 2007). Some species, such as reef shark, are protected in places but enforcement of these restrictions is nearly impossible in the vast marine environment. However, export restrictions on giant clams and certain species of coral are enforced effectively and are a potential solution to control the harvesting of other targeted species (MEC, 2004). The overexploitation of species in some locations is leading to localized species loss and disruption of ecological interactions and processes.

(i) *Bait fishery*

The live bait fishery is the largest reef fishery in the Maldives. It is conducted as a prerequisite for the pole-and-line fishing operations. As such, the exploitation history dates back hundreds of years. The fishery targets small schooling varieties associated with the coral reefs. Rehi (*Spratelloides gracilis*, silver sprats), muguraan (Caesionids or fusiliers), baodhi (Apogonids or cardinal fishes) are the favoured varieties although the south miyaren (*Encrasicholina heteroloba*) is one of the most important varieties (Adam, 2006).

Various techniques are used to lure the fish on to a square lift net deployed from the vessel using a pole and ropes. Night bait fishing using lights was

earlier believed to be inappropriate, although not considered detrimental to bait fishing in general. However, night bait fishing is now routinely practiced throughout the country and is the most favoured method. Flood lights of about 1-3 kW are shone over the surface from the side of the boat to attract ‘swarms’ of bait. There is no documented evidence that night bait fishing, using lights, attracts large amounts of by-catch that has to be discarded (Adam, 2006). Anchor damage to the reef takes place through intensive collection at certain points or concentration of boats on a reef over a period of days or even weeks. Harvesting of baitfish often disrupts ecological balance of reef areas where baitfish aggregate (MEC, 2004).

Data on catch and effort for bait has not been collected. However, surveys done at different periods have enabled the estimation of the total bait catch in the pole-and-line fishery. These estimates show that the live bait catch has been increasing rapidly. However, tuna catch per kg of bait appears to have remained more or less constant, about 7-8 kg of tuna per kg of livebait as indicated in Table 2.3 (Adam, 2006).

Table 2.3 - Estimate of quantities of live bait used annually in the Maldivian pole and line tuna fishery

Period	Estimated live bait catch (Mt)	Tuna catch / kg of bait
1978 - 1981	3000 ± 800 t	7.76
1985 - 1987	4800 ± 1200 t	10.29
1993	10500 ± 2600 t	6.56
1994	10600 ± 2700 t	8.45
2005	20000 t <sup>1</sup>	7.00

It is feared that a shortage of live bait will restrict the expansion of the pole-and-line fishery. At present, roughly 100 kg of bait are required per fishing trip (210, 000 days requiring 20,000 tonnes live bait). This is about

Source: (Adam, 2006)

15% increase in the bait required per day as compared to 20 years ago, which is a direct result of increasing the size of fishing vessels (Adam, 2006).

#### (ii) Sea cucumber fishery

The fishery started in 1985 and harvests are targeted exclusively for export. At least nine species of sea cucumber (*beche-de-mer*) are exported. Some species are more valuable and larger individuals fetch more than smaller ones. Sea cucumbers being sedentary are extremely easy to harvest; fishermen need only a face mask and snorkel. The most valuable species (*Thelenota ananas*, known as *alanaasi*), was soon over-exploited and they gradually moved to harvesting less favoured species *Holothuria (Halodeima) atra*, or locally known as *fulhi* and *holhi*. This has been the major component of the fishery since 1990. By the mid 1990s this resource was grossly overfished and a ban on using SCUBA diving gear for collection was introduced. Although the restriction is in place it has not been effectively implemented (Adam, 2006).

<sup>1</sup> Unpublished data, MRC

Table 2.4 - Exports of sea-cucumber from Maldives (1985-2005)

Year	Qty (Mt)	Value (Rf)	Value US\$	FOB (\$/kg)
1995	93.81	8,316,827	706,612	7.53
1996	145.33	7,600,524	645,754	4.44
1997	318.03	8,559,723	727,249	2.29
1998	85.0113	4,067,649	345,595	4.07
1999	53.841	4,795,478	407,432	7.57
2000	205.245	28,524,834	2,423,520	11.81
2001	225.852	34,330,925	2,682,104	11.88
2002	190.795	38,044,294	2,972,210	15.58
2003	293.335	43,147,093	3,370,867	11.49
2004	182.057	31,049,007	2,425,704	13.32
2005	117.397	23,223,586	1,814,343	15.45

Source: Adam, 2006

Export figures given in Table 2.4 indicate that the quantities of sea cucumber harvested has varied over the years. However, generally there is an increasing trend in the exports of dried sea cucumber. The unit value of sea cucumber has increased steadily through the years.

### (iii) Aquarium fisheries

A variety of small-bodied and colourful reef fish are exported to Sri Lanka and Europe since 1979 for use in marine aquariums. The fishery has always been limited to a few exporters based in Malé or nearby islands. In Maldives, as any form of 'destructive method of fishing' is banned, fish are caught with hand nets using SCUBA or snorkelling. The fishery peaked during 1994-1996, exporting about 300,000 fish a year and earning MRF 7 million (0.6 million US\$) as shown in Fig. 2.8. The fishery activity has been increasing in recent years with the increased access to European markets. As a result, exporters are earning a higher unit value compared to earlier years (Adam, 2006).

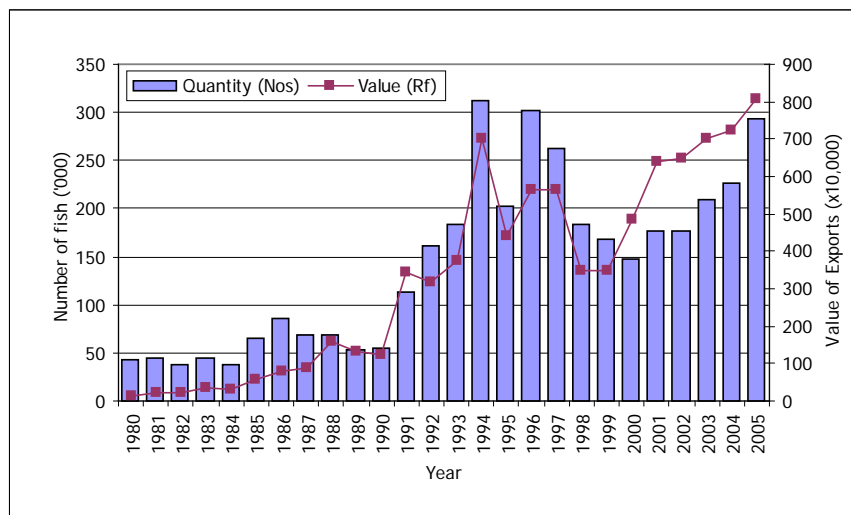


Fig. 2.8 - Export of live tropical fish from the Maldives (1980-2005) (Adam, 2006)

The fishery is regulated by having species-specific quotas implemented by the Ministry of Economic Development and Trade, and Malé Customs. Although the mechanism for regulation exists, it appears there are lapses, on the part of all concerned, in effective implementation (Adam, 2006).

*(iv) Shark fishing*

The shark fisheries have been an important source of income for the fishermen for some time. However, many of the shark resources are now depleted. Together with the pressure from the tourism industry shark fishing is now a very restricted activity. Table 2.5 shows the shark catch and export value for 1995-2005.

Table 2.5 - Estimated weight of shark catch and their (FOB) export value (1995-2005).

Year	Quantity (MT) (Est)	MRf. (FOB)	US\$ (Million) (Eq.)
1995	1286	3,535,000	1.150
1996	1598	2,536,000	1.065
1997	2068	8,125,177	1.540
1998	1234	6,419,425	1.395
1999	1095	1,218,028	0.953
2000	1575	3,302,584	1.980
2001	1396	7,761,530	1.388
2002	1081	4,627,413	1.143
2003	317	5,522,184	1.213
2004	406	1,627,559	0.908
2005	308	0,256,760	0.801

Three different types of shark, or three different fisheries for the shark, existed in the Maldives. The reef sharks have been fished throughout the Maldives using gillnet, handline and longline. Reef shark, as the name suggests, is associated with the coral reefs and so reef shark fishing has always been a contentious issue with the tourism industry (Adam, 2006).

Source: (Adam, 2006)

Due to over-exploitation of reef and near shore pelagic shark stocks, government introduced regulations, in 1995 and in 1999, banning all types of shark fishing, inside and within 12 miles of atolls, in the main tourism zone and in certain specified zones. In addition fishing whale sharks is prohibited (MEC, 2004). In February 2009 MFA announced the complete ban on fishing for any species of shark within twelve miles from the atoll rim of all atolls of Maldives, effective from 1 March 2009.

*(v) Grouper fishery*

Targeted fishery for groupers started in 1993 in response to the accessibility of overseas markets. Within no time a ‘grouper fishery’ was established with buyers having their holding facilities located in popular grouper fishing islands. Faafu and Vaavu atolls were the most popular, while many others considered grouper fishing as a part time activity. The major destinations of export are Far Eastern countries, especially Hong Kong (Adam, 2006).

About 15 species, representing all the genera occurring in the Maldives (*Plectropomus*, *Epinephalus*, *Cephalapholis Variola*, & *Aetheloperca*), are exported. The fishery peaked in 1997 producing a record catch of over a million groupers earning MRF 55 million (4.67 million US\$) as export revenue (Fig. 2.9). The fishery has gradually declined since then and in 2005 only about 300,000 groupers were exported earning only about MRF 15 million (1.17 million US\$) (Adam, 2006).

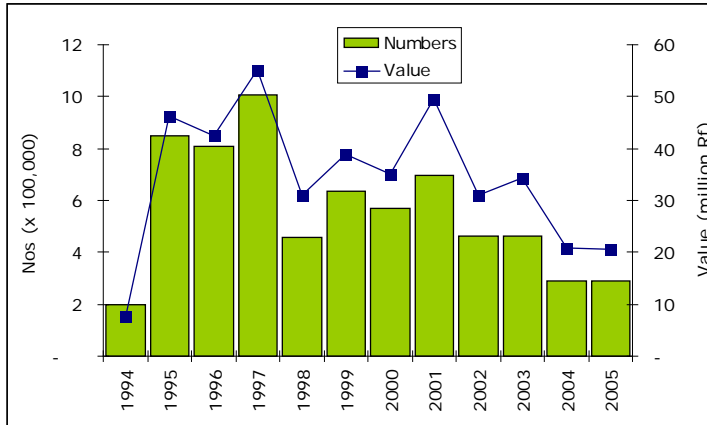


Fig. 2.9 - Exports of groupers (estimated nos.) and its value as reported by Malé. (Adam, 2006)

There has been no regulatory management for the grouper fishery, which is now showing signs of serious depletion. In the most recent survey conducted by the Marine Research Centre it was shown that about 50% of the catch is immature. The aggregation behaviour of groupers and the predictable

spawning period makes them extremely vulnerable to fishing gear (Adam, 2006).

(vi) *Lobster fishery*

The lobster fishery gained momentum due to opening up of tourist resorts in the country. Five species of lobsters are harvested in the Maldives. Table 2.6 shows the lobster catch and value. They are mainly collected at night by fishermen swimming with lights. The catches appear to be levelling off but the value offered for lobsters is increasing. It may be that decrease in abundance is causing a shortage in supply, thereby increasing the prices (Adam, 2006).

Table 2.6 - Catches of lobster and their value as reported by island offices

Year	Qty (nos)	value (Rf)	Unit value
1995	23,000	1,525,000	66.30
1996	37,523	3,155,647	84.10
1997	37,543	2,830,372	75.39
1998	29,375	2,803,709	95.45
1999	24,183	2,259,977	93.45
2000	23,483	1,948,240	82.96
2001	43,172	4,173,054	96.66
2002	59,980	4,960,220	82.70
2003	48,120	5,401,428	112.25

Management measures include ban on exploiting female lobsters under 25 cm with berried eggs. Again, it has been difficult to implement this as there was no proper means of monitoring the breach of this regulation (Adam, 2006).

Source: (Adam, 2006)

## **(b) Agriculture**

Agriculture is vital for food security, nutritional status and livelihoods of the atoll population. Agriculture contributed 2.6% to GDP in 2005 (MPND, 2006b). The total cultivable land area is estimated at 27 km<sup>2</sup>, with 18 km<sup>2</sup> on inhabited islands and 9 km<sup>2</sup> on uninhabited islands (MFAMR, 2006). The main subsistence crops include banana, watermelon, cucumber, taro, coconut, breadfruit, mango, sweet potato, pumpkin, papaya, luffa, cabbage and brinjal (MEEW, 2007). In 2007, the value of agricultural products traded in Malé market was MRF 91,680, an increase of 5% over 2006.

The contribution of the agriculture sector to GDP has continued to decline in the past decade. However, the sector still holds considerable importance to the island communities in terms of food security, nutrition and employment opportunities (MPND, 2007a).

For commercial farming purposes 32 uninhabited islands are leased for 21-year periods. In addition, 75 percent of inhabited islands have some degree of agricultural activity. MFA currently has two agriculture centres located in the North and South of the country. Both centres play an important role in providing agriculture support and extension services to rural communities (MPND, 2007a).

Agriculture sector is constrained by the limited availability of cultivable land, poor quality of soil and the abundance of cheap imports of vegetables and fruits. The available cultivable land is 103 m<sup>2</sup> per capita. In 2003, the Maldives imported US\$ 32.4 million worth of vegetable products, US\$ 25.9 million worth of meat and meat products, US\$ 3 million worth of animal and vegetable fats and oils, and US\$ 37.8 million worth of prepared foodstuffs (MEEW, 2007).

### **(i) Introduction of new species**

The MOFAMR highlights the introduction of plant pathogenic microorganisms and insect pests as a major pressure on the terrestrial biodiversity. An influx of planting material and fruits and vegetables from neighbouring countries, without proper quarantine procedures, is leading to a rapid build up of these pests and diseases. The isolated and scattered nature of the islands is no longer an effective barrier against import of alien species into the Maldives (MEC, 2004).

### **(ii) Use of fertilisers, herbicides and pesticides**

In the face of a build-up of invasive species and the spread of diseases more and more people have to rely on the use of fertilisers and hazardous pesticides for their control, which contaminates soil, harvested products, and the environment in general with its residues (MEC, 2004).



Use of fertilizers shows an increasing trend possibly due to expansion of agriculture. There is a 33 percent increase in fertiliser imports in 2003 compared to 2000. Around 20 percent of imported fertilisers are inorganic fertilisers such as mineral or chemical fertilisers. Organic fertiliser imported into the country includes cow dung and other manure, which is required in larger amounts compared to the inorganic fertilisers. Inorganic fertilisers though used in smaller amounts contaminate soil and is a threat to biodiversity. Specific impacts such as eutrophication in the marine waters due to leaching of fertilizers have not been studied.

Seven types of agricultural pesticides are imported into the country while additional household pesticides are also being used. Use of almost all of these products is on an increasing trend indicating a detrimental impact on biodiversity.

**(c) Human settlements**

Maldives is the sixth smallest sovereign state in terms of land area. The total land area of the Maldives is estimated to be approximately 235 km<sup>2</sup>, based on the latest satellite and aerial imagery. This land is divided over 1,192 coral islands, 96% of which are less than 1 km<sup>2</sup> in area. Only 10 islands are more than 2.5 km<sup>2</sup>. The largest island Laamu Gan, has an area of 6.1 km<sup>2</sup>. Land is highly scarce and the 358 islands that are currently in use account for 176 km<sup>2</sup>. The 834 unutilised islands make up only 59 km<sup>2</sup>. The total beach area is estimated at 13 km<sup>2</sup> or 5% of the total land area, and the coastline of the Maldives is estimated to be 2,300 km long (Shaig, 2006a).

Land reclamation is a major coastal activity that is being undertaken in Maldives. The main reason for land reclamation is over-crowding in some islands due to population growth. Already 34 of the inhabited islands do not have additional land for new housing and another 17 islands will reach their carrying capacity by 2015. The largest land reclamation project carried out so far is Hulhumale' (Kaafu atoll) where approximately 2 km<sup>2</sup> was reclaimed to reduce population pressure on Malé (Shaig, 2006a).

**(i) Beach erosion**

The beaches that represent 5% of the total land area of the Maldives, are of an unconsolidated nature and naturally dynamic and unstable. More than 97% of inhabited islands reported beach erosion in 2004, of which 64% reported severe beach erosion as shown in Fig. 2.10.

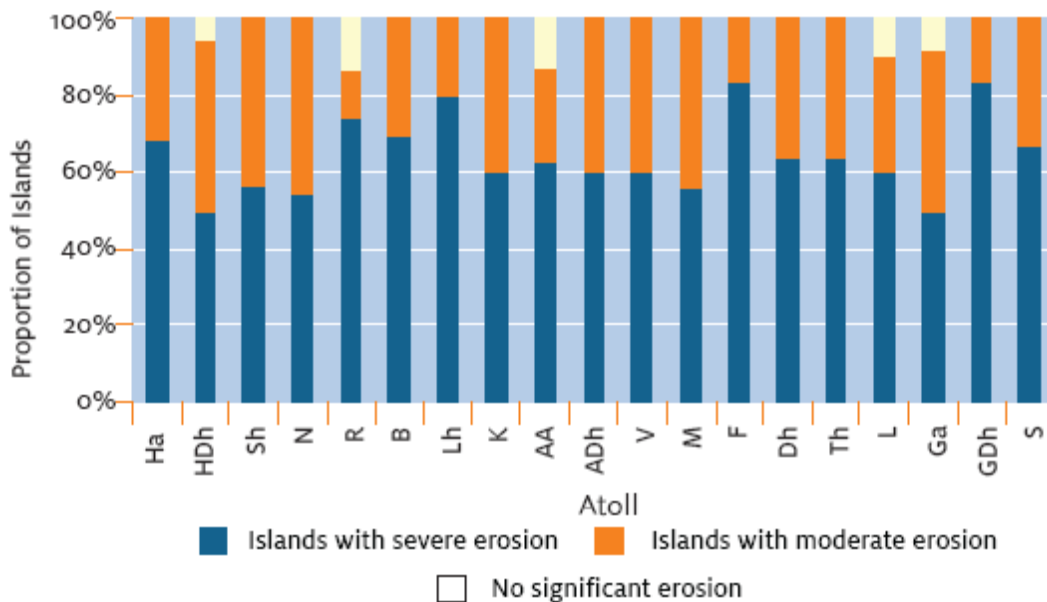


Fig. 2.10 - Extent of beach erosion in Maldives. (Shaig, 2006a)

Erosion patterns of inhabited islands have been further complicated due to human intervention in coastal areas. The problem of erosion is not specific to inhabited islands. More than 45% of the 87 tourist resorts have reported severe erosion.

**(ii) Removal of vegetation**

Due to the increasing population, demand for land is on the increase, and clearing vegetation for house construction is on a continuously increasing trend. The fact that 34 of the inhabited islands do not have any available land for new housing can be used as a proxy indicator for clearance of natural vegetation for human settlements. In contrast, the pressure on natural vegetation from the demand for firewood is reducing. The decreasing trend is the direct result of using kerosene and gas for cooking. Also as the market for dried fish decreased, the demand for firewood lessened. Firewood was widely used throughout the country to boil and smoke the fish prior to the operation of the collector vessels (MEC, 2004).

**(d) Critical infrastructure**

At present there are five airports of which two are international. Three major commercial sea ports have been developed in the Malé, HDh. Kulhudhuffushi and S.Hithadhoo. More than 128 island harbours had been developed by year 2006 in inhabited islands, resorts, airports and islands leased for economic and administrative purposes. There are at least 350 piers in resorts and inhabited islands. The main causeways are located in Laamu and Seenu atoll. Tourism infrastructure makes up the bulk of economic infrastructure both in terms of investment value and quantity. Each resort has its own power generation, water production and sewerage system. More than 1200 over-water structures

have been developed as guest rooms, spas and restaurants in tourist resorts (Shaig, 2006b). Other critical infrastructure includes environmental services and utilities. There are waste management systems, sewerage systems and erosion mitigation measures such as near-shore breakwaters and groynes. Utilities infrastructure includes powerhouses and desalination plants and their distribution systems.

An upcoming major new development that involves critical infrastructure is the transport network announced by MHTE on 27 November 2008. This transport network is planned to connect all the inhabited islands. The archipelago has been divided into 7 regions; each region covers 20 to 50 interchange/terminal nodes. The government intends to attract investors to establish and run this public transportation network, by allowing them to enter into the booming tourism industry of Maldives. The successful party to establish and run the transport network will be awarded beachfront real estate for commercial uses such as guest houses, motels or industrial developments. This may have implications on coastal processes and biodiversity.

Critical infrastructure is associated with the two crucial issues of biodiversity loss and unfavourable changes to coastal processes. Inappropriate coastal modification and engineering practice, including dredging and blasting of channels and harbours, construction of groynes and jetties, and coastal landfill, leads not only to direct habitat loss but also to deterioration of water quality. Dredging often leads to siltation, killing corals and other organisms by smothering them or reducing light penetration to them. In addition, coastal modification can isolate lagoons from the sea by changing coastal currents and affecting sand movements. This in turn often causes beach erosion, with loss of coastal and terrestrial habitats (including turtle nesting sites), and profound negative impacts on adjacent reef areas (UNDP & GOM, 2002).

### **(e) Tourism**

Tourism in Maldives began in 1972 with a mere 280 beds on two resort islands. Today there are 21,256 beds in 87 resorts (MPND, 2004). In 2007, tourist arrivals stood at 675,889 and the average duration of stay was 8.5 nights. Tourism contributes about one third to the GDP and accounts for 17,000 direct jobs (World Bank, Asian Development Bank and UNDP, 2005). The sector also provides indirect employment and other opportunities in transport, communication, agriculture, distribution and construction as well as in the more dispersed local economies. The tourism industry, directly and indirectly accounts for a high proportion of government revenues. In 2006, income from resort leases amounted to USD 100.49 million, the current tourism bed tax of USD 8 per day generated USD 39.42 million and the tourist airport departure tax generated USD 7.18 million (MTCA, 2007). The tourism sector is expected to grow significantly over the next five years with the opening of 53 new resorts with an additional 10,000 beds.

Tourism development at present is guided by the Third Tourism Master Plan (TTMP). In accordance with the vision set out in the TTMP tourism has now expanded to all the atolls of Maldives. Consequently, resort development is no longer limited to the 'one island, one resort' concept and instead involves development of resorts or hotels in parts of inhabited islands. Among the six goals of the TTMP is "...ensure environmental sustainability in the development and operation of all tourism products,...". As tourism is extremely dependent on the preservation of the natural beauty of Maldives, the industry is highly regulated to ensure environmental sustainability. Nevertheless, there are adverse impacts on the environment from tourism owing to unprecedented growth of the industry. The critical environmental issues are briefly considered below. Among these, an aspect that has not been studied in detail is the impact of clearing seagrass beds found in the lagoon of resorts. Some islands seem to have seagrass beds naturally while in other islands seagrass is introduced from perhaps nearby areas. Little is known of the species and reasons for outbreaks.

Under the TTMP tourism has also been introduced to inhabited islands. The islands are indicated in the maps in Annex 7.

*(i) Diving, snorkelling and recreational fishing*

The start of tourism created new demands for the coral reef resources through recreational activities such as diving, snorkelling and fishing. At any resort, at any given time, 70 to 80% of the tourists are snorkellers while 25 to 35% visit the Maldives primarily for diving. Assuming 1.5 dives for every tourist arrival the total number of annual dives in 2006 is estimated at about one million (MEEW, 2007).

Coral reefs have been observed to suffer from direct damage caused by poor snorkelling and diving practices. Divers sometimes break coral for souvenirs. In addition, divers and snorkellers are taken to a site in large numbers in a single trip on a regular basis by many resorts. The number of visitors may exceed the carrying capacity of the site with possible ecological consequences that are poorly studied (Robinson, 2001). Furthermore, anchor damage from diver and fishing boats is significant at some sites although generally it is considered to be minimal (UNDP & GOM, 2002; MEC, 2004). Still, there are concerns about night fishing activities and the resulting anchor damage, and the garbage that is left on the reef. Despite the impacts noted, there are good practices observed in some resorts such as codes of practices and briefings to guests. In addition, some boats practice drift diving while others use mooring ropes and sand bags to avoid anchoring on reefs (Robinson, 2001).

Diving and recreational activities have also led to conflicts with local fishermen (Robinson, 2001). Tourists do not like fishing activities located at dive sites. On the other hand, fishermen claim that bait fish get scared and

scatter because of divers. These conflicts can cause decline of income generation from both sectors if not properly addressed.

**(ii) Demand for reef fish**

Demand from domestic resort market for 'dinner plate' reef fish has emerged leading to pressure on coral reef resources (UNDP & GOM, 2002). It is estimated that more than 7,000 tonnes of reef fish are consumed by tourist resorts alone. With a projection of one million tourist arrivals annually in the next few years and an average length of stay of eight nights, there will soon be a demand for an estimated 12,000 tonnes or more of reef fish from the tourism sector (MTCA, 2007). Hence, there is substantial pressure on reef fish population and already there are signs of over-exploitation in reef fisheries.

**(iii) Sewage treatment**

There is a gap in the technology used for sewage treatment among resorts. Many resorts developed in the 1980s and early 1990s continue to use inappropriate methods of sewage disposal. The older resorts use septic tanks to store sewage effluent and discharge untreated sewage into the sea beyond the reef edge. On the other hand, recently built resorts have adopted tertiary sewage treatment systems and use recycled water for landscape management. However, this is not the norm because there is no a statutory requirement for such systems to be installed at resorts (Robinson, 2001; MTCA, 2007). The potential impact of sewage discharge into the sea such as eutrophication are not monitored at present and therefore, long term effects, if any, are unknown.

**(iv) Beach replenishment**

Sand pumping and beach replenishment, usually takes place during the resort construction phase, but it is becoming more common and sand mining from the lagoon is taking place on an 'as needed' basis (Francois & Saeed, 2006). When this occurs, limited thought, if any, appears to go into the wider geographic impacts of the practice, and how this might alter the prevailing sediment budget of the area, and the amount of material required. Localised remedies may lead to neighbouring island problems. This operation on the whole is *ad hoc*, and commonly unsustainable in the long term, particularly if lagoon sand sources act as sediment stores for other islands or as 'seasonal' sources for the same island i.e. during north-easterly monsoons. The general pattern of erosion and accretion are described in Section 2 of the report.

**(f) Waste management**

Waste management is a relatively new, "modern" problem in the islands. While the rapid growth of tourism in the Maldives over the past 20 years has raised incomes and diversified livelihoods, there have been costs. Higher living standards have been accompanied by increased pressure on the country's resource base. Most notable is the increase in the quantity of solid

waste generated and changes in the composition of waste with growing volumes of non-biodegradable materials and lubricant residues. Few residential islands have satisfactorily functioning solid waste management systems and many dump wastes into lagoons, while others allow wastes to accumulate on beaches (World Bank, 2008).

An estimated 248,000 tons of solid waste was generated in the Maldives in 2007 and this figure is predicted to rise over the next five years to 324,000 tons, a 30 percent increase. Current arrangements for solid waste management on inhabited islands are inadequate. Most wastes are dumped onto the island foreshore and burned at low combustion temperatures. In addition, it is estimated that approximately 510 tons per year of medical waste is produced in the Maldives. Uncontrolled disposal of solid wastes, including medical waste, as it occurs today, is a threat to the coastal, marine and coral reef ecosystems.

There has been substantial ongoing work to build IWMCs in Maldives (consistent with the Sixth and Seventh National Development Plans). Since the 2004 tsunami,

- the ARC/CRC has completed construction of 79 IWMCs on 74 islands and conducted community awareness programs for waste management;
- UNDP is financing the construction of 20 IWMCs that are due for completion in 2007;
- the Government is financing the construction of 18 IWMCs by the Island Development Committees that are due for completion at the end of this year; and
- the EU/WB are financing the construction of 16 IWMCs under the South Ari Atoll project that is due for completion in 2010 (NIRAS, 2007).

In the tourism industry, in addition to the large quantity of waste that is generated, there is a general lack of accountability for waste disposal (World Bank 2008). This is often because there is no come back on the tourist resort if contracted boatmen do not dispose of the rubbish at the expected site. Furthermore, resorts are required to have incinerators, as a prerequisite for the license for operations, although questions remain whether resorts use the technology, and if used whether incinerators are used effectively (Robinson, 2001). It is clear that current arrangements for disposal are not particularly effective, especially in the more distant atolls from Thilafushi, the landfill site in Malé atoll. In some cases, resort generated litter ends up on the shores of inhabited islands, and in other cases, the reverse is true (UNDP & GOM, 2002). Waste is principally an aesthetic and health issue but there are also serious implications for the future environmental image of tourism in the Maldives.

## 2.7 Natural hazards and consequences

UNDP has made assessments related to natural hazards and vulnerability of the islands of Maldives to such hazards. The initial assessment of nationwide natural hazards was undertaken in 2005 by UNDP Maldives. The key findings of the exercise are presented in the report “*Developing a Disaster Risk Profile of Maldives*”. Following the initial assessment, more detailed island level assessments were carried out in 2008. This section provides the findings of the latter study presented in *Detailed Island Risk Assessment in Maldives: Natural Hazard and Physical Vulnerability Assessment Report* (UNDP Maldives, 2008). The study was conducted in ten inhabited islands across nine atolls of Maldives.

The natural hazards prevailing in the Maldives fall into 4 categories:

- Geological hazards – i.e. earthquakes and coastal erosion;
- Meteorological hazards – i.e. tropical cyclones and storms, thunder storms, waterspouts, heavy rainfall, and drought;
- Hydrological hazards – i.e. floods induced by heavy rainfall, storm surges, swell waves, *udha*, and tsunamis;
- Climate-related hazards – i.e. accelerated sea level rise, sea surface temperature rise, changes in monsoon pattern.

Among those listed above, floods (induced by tsunamis, abnormal swell waves, and heavy rainfall), windstorms, droughts, and earthquakes are counted as major natural hazards prevailing in the Maldives. The general pattern of occurrence of the major natural hazards prevailing in the Maldives are summarised in Fig. 2.11.

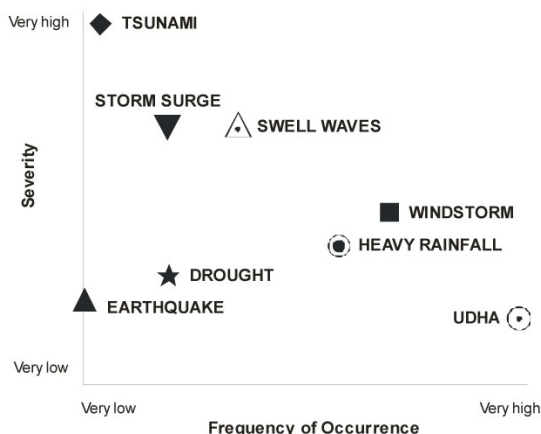


Fig. 2.11 - Relationship between hazard intensity and frequency of major natural hazards in the Maldives (UNDP Maldives, 2008)

Tsunamis, with predicted maximum wave heights between 3.2 to 4.5 m above MSL, are the most destructive and devastating of the major natural hazards. Maldives was severely affected by the Asian tsunami on 26<sup>th</sup> December 2004. Waves ranging from 1.2 to 4.2 m were reported from all the atolls of the Maldives. Over 35 inhabited islands were badly damaged with 29,580 residents displaced and 12,000 made homeless. An assessment undertaken jointly by the World Bank-ADB-UN system and the Government, estimated the total

damage at USD 470 million, equivalent to 62 percent of the GDP. Direct losses amount to USD 298 million, equivalent to 80 percent of the replacement cost of the national capital stock (MPND, 2007b).

Swell waves, storm surges, and *udha* may also cause severe impacts on many low-lying islands in the Maldives, with potential wave heights of over 2.5 m above MSL. Overall, swell waves and storm surges are of moderate intensity, often linked to a specific or series of atmospheric events, which are more severe in intensity. Unlike storm surges induced by storms, swell waves are less predictable and can occur in fair weather due to their distant origin. *Udha* is quite different from swell waves and storm surges. *Udha* refers to the annual rise in the water surface on the coast during the SW monsoon season, causing limited coastal flooding with a water depth of less than 0.6 m. *Udhas* are unique to the Maldives but how they originate remains unclear.

The other natural hazards such as windstorms, rainfall and droughts, and earthquakes are generally not severe. Windstorms may occasionally cause severe destruction across the islands, especially during localised storm activities. In most cases, heavy rainfall and droughts lead to temporary disruptions within the islands, but their impacts are rarely significant. Earthquake hazards are present only in the southern atolls.

#### **(a) Environmental vulnerability**

The *Detailed Island Risk Assessment in Maldives* (UNDP, 2008) also looks at the environmental vulnerability, in terms of the characteristics of the natural environmental setting of the islands, their vulnerability and resilience to natural extreme processes.

Generally, the natural environment of the Maldivian coral islands is highly resilient to natural extreme processes such as tsunamis, swell waves, and storm surges. The very fact that these islands have survived over 3,000 years amidst fluctuating sea level, varying climatic conditions and numerous natural hazard events is evidence of their natural resilience. Hazard events such as ocean induced flooding may have been regular events across the archipelago over hundreds of years. Damage to the physical environment from such events is usually minor. If damage or changes do occur, the natural recovery and adaptation is generally rapid in terms of the geological timescale. The formula for maintaining the natural resilience of the coral islands is simple: maintain its natural environment. However, with human habitation biophysical changes to the environment are inevitable and necessary. In addition, the geophysical features of any given island create certain hazard zones which experience a comparatively higher level of risk exposure. The expansion of human settlement into these hazard zones, human induced biophysical changes and the inflexibility in physical infrastructure adaptation have led to the unacceptability of hazard exposure.

#### **(b) Natural vulnerabilities and assets**

This study has confirmed the presence of certain natural vulnerabilities and assets with respect to major natural hazards, especially ocean-induced



flooding hazards. The key geophysical features include island size and width, topography, coastal vegetation, inland vegetation, geographic location within the reef, atoll and archipelago, the size of water lens, and the health of marine environment. Most of these features have dual properties. At one end of the spectrum, they are assets in mitigating natural hazards but become vulnerabilities at the other.

In summary:

- The most dominant of these features against sea induced hazards are the island size, width and topography.
- Island topography is one of the main natural vulnerabilities as well as the most efficient natural mitigation measure against flooding.
- The topographic profile within the island was also found to facilitate or prevent flood run-up.
- Coastal vegetation was also found to play an important role in reducing wave energy propagation on land.
- Island location within the archipelago or within the atoll exposes them to different natural hazards.
- Other geographic features which increase the resilience of islands include a large water lens and healthy marine environment.

Human-induced biophysical changes have exacerbated the natural vulnerabilities and also introduced new vulnerabilities. The most serious impacts appear to result from the alteration of topography and coastal environment, and from improper land use patterns. Alteration of topography involves land reclamation and road maintenance activities. Alteration of coastal environment through development activities such as harbour construction, beach erosion mitigation, and land reclamation often alter the coastal processes operating around the island. Consequently, most islands undergo rapid transformation in coastal processes. In some cases, this leads to rapid coastal erosion and decreases the natural adaptive capacity against natural hazards. Similarly, land use pattern in the island has a major impact on the natural defensive systems of the island. Land use with negative impacts includes settlement encroachment into coastal vegetation belts, and subsequent removal of vegetation protection, and the alteration of the protective oceanward ridges. The removal of vegetation for settlement purposes further exposes islands to natural hazards, such as wind storms.

### **(c) 'Safer Islands' programme**

Following the tsunami disaster, the concept of "Safe Islands" was developed by the former Government of Maldives. Safer Islands programme extends the population and development consolidation approach of the former Government, to incorporate in a network of selected focus islands, the aspects

of ecological disaster mitigating, emergency communication and power systems, and self-reliant disaster management and emergency relief.

The *Detailed Island Risk Assessment* deals with some implications for the Safer Islands programme based on the findings of the study of the ten inhabited islands. In summary:

- Alterations to the physical environment will have consequences for hazard exposure in any island. Current high impact development activities need to be re-evaluated and streamlined to minimise the impact on hazard exposure. Land reclamation activities require urgent attention in this regard. The regulations and a best practices guide for reclamation need to be established, based on informed studies. Potential steps that can be considered include replicating defensive features of the natural environment such as proper topographic profiling, soil profiling, re-vegetation, drainage establishment and minimising construction phase irreversible impacts on the environment.
- It is important that the most critical environmental vulnerabilities be addressed within any safe island development programme. These include restoring terrestrial and marine environments, addressing negative effects of past improper reclamation activities, and protecting exposed zones in the islands.
- Elements proposed in the present safe island development concept needs to be reviewed based on the findings of this study. These include the drainage zones, vegetation belt and their proposed functions within the EPZ zone, and the concept of topographically raised evacuation zones. The vegetation zone needs to reconsider their width, composition and timely introduction within the broad development programme. Constant height of ridges needs to be reviewed as there are different wave regimes across different zones and locations in Maldives.

With regard to Safer Islands it should be kept in mind that national development policies may be subject to changes with the change in Government in November 2008.

## **2.8 Summary of stakeholder consultations**

Stakeholder consultations were held with eight different government agencies, one Malé-based NGO, two atoll-based NGOs and two atoll councillors. Table 2.7 provides the result of stakeholder consultations held in Malé. Discussions with the two atoll-based NGOs and two atoll councillors are also provided. List of people interviewed are provided in Annex 5.

**Table 2.7 - Results of Stakeholder Consultations**

Policies and plans	Ongoing projects/ programmes	Key issues related to coastal resources and Constraints	Opportunities for mainstreaming with MFF	Other ministries/ agencies for multi-sector collaboration for ICM	Link(s) to provincial development	Suggested criteria for selection of islands for model ICM
<b>Department of National Planning, Ministry of Finance &amp; Treasury</b>						
<ul style="list-style-type: none"> <li>➤ 7NDP is the key document at present.</li> <li>➤ Decentralisation in progress. Ten year Master Plan for Provinces and sectoral plans based on Master Plan may be prepared (as indicated in the decentralization concept paper)</li> <li>➤ Previous administration's Population Consolidation policy out of the mandate now.</li> <li>➤ Previous administration had plans to have 7 'safer islands'. Two islands, dhuvaafaru and villifushi have been completed (physically)- Not clear whether 'Safer islands' will be continued</li> </ul>	<p>Currently 7NDP is being harmonized with the MDP Manifesto and in the near future key indicators will be identified for monitoring the manifesto</p> <p>National Planning Council formed on 3<sup>rd</sup> February:</p>	<p>Unclear on policies to be followed at present.</p>	<ul style="list-style-type: none"> <li>➤ Incorporating environmental management into Provincial Master Plans.</li> <li>➤ Awareness for authoritative figures and the public in the new government on environmental management and vulnerability of islands. Awareness need to be strong, to ensure acceptance of the reality</li> <li>➤ Capacity building at provincial levels very important.</li> </ul>	<ol style="list-style-type: none"> <li>1. Ministry of Housing...</li> <li>2. Ministry of Home Affairs</li> </ol>	<p>Ten year provincial master plans.</p>	<ol style="list-style-type: none"> <li>1. Islands already negatively impacted by coastal processes such as erosion.</li> <li>2. Priorities of provincial plans.</li> <li>3. Islands identified in housing plans, transport network plan, decentralization plan, as focus islands need to be integrated in the MFF plans</li> </ol>
<b>Ministry of Tourism, Arts and Culture</b>						
<ul style="list-style-type: none"> <li>➤ Third Tourism Master Plan.</li> <li>➤ Currently under review recognizing the need to adapt to the new government. Major changes are not expected.</li> <li>➤ Staff will be recruited at provincial levels mainly for monitoring and issuing</li> </ul>	<ul style="list-style-type: none"> <li>➤ Demarcation of project sites???</li> <li>➤ Diversifying products to include visits to ecologically important sites.</li> <li>➤ Identifying sites with potential for ecological tourism.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Reclamation undertaken in resorts? Inhabited islands? Industrial islands?</li> <li>➤ Inadequate involvement of the Ministry in identifying and managing MPAs and PAs.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Formulating plans for tourism related to cultural and heritage sites including shipwrecks.</li> <li>➤ Management of wetlands in tourism projects that include wetlands?</li> </ul>	<ol style="list-style-type: none"> <li>1. Ministry of Housing, Transport and Environment.</li> <li>2. Ministry of Fisheries and Agriculture.</li> <li>3. Ministry of Home Affairs.</li> </ol>		<p>Reflection of resource use conflicts</p>

Policies and plans	Ongoing projects/ programmes	Key issues related to coastal resources and Constraints	Opportunities for mainstreaming with MFF	Other ministries/ agencies for multi-sector collaboration for ICM	Link(s) to provincial development	Suggested criteria for selection of islands for model ICM
<p>permits.</p> <ul style="list-style-type: none"> <li>➤ Atoll Councils will have the mandate to determine new projects and programmes.</li> </ul>			<ul style="list-style-type: none"> <li>➤ Involve Tourism Ministry in identifying and managing Protected Areas.</li> </ul>	<p>4. Maldives Association for Tourism Industry. 5. Liveaboard Association of Maldives.</p>		
<b>Ministry of Fisheries and Agriculture</b>						
<ul style="list-style-type: none"> <li>➤ Currently work is ongoing for streamlining MDP manifest with 7NDP.</li> <li>➤ No major policy changes are anticipated.</li> <li>➤ Sustainable management of marine resources such as turtle conservation, coastal and offshore species management and Integrated Reef Resources Management.</li> </ul>	<ul style="list-style-type: none"> <li>➤ RAFFTA</li> <li>➤ Vessel monitoring system is to be established by the end of the year. The system will monitor fishing activities of 6-10 local fishing vessels as a pilot project. The responsible agency for monitoring is MRC.</li> <li>➤ Online searchable database on uninhabited islands and their status. The objective is to provide data to the public. The traditional system of island leasing to communities, <i>Varuva</i> system is to be dissolved.</li> <li>➤ Improving fisheries and agriculture monitoring. A system for annual submission of data is being developed. There is a possible link to EIAs that will help collect baseline information for islands.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Resource use conflicts between fisheries and tourism.</li> <li>➤ Currently working with Tourism Ministry on a regulation related to boundaries issues.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Establishing baseline data for uninhabited islands that will help allocated islands for different uses.</li> <li>➤ Online database for EIA with possible links to fisheries and agriculture activities.</li> <li>➤ Training of staff at provincial levels.</li> </ul>	<p>1. Tourism. 2. Environment.</p>	<p>1. Two provinces officially announced; the North and South province. 2. Ministry has allocated staff for these two provinces for the interim period. 3. Role of Provinces will mainly be related to permits and data collection. 4. - Staff will be trained for the provincial levels.</p>	<p>1. Atoll level representation of coastal management issues. 2. Display of ecological linkages within an atoll.</p>
<b>Environment Section, Ministry of Housing, Transport and Environment</b>						
<ul style="list-style-type: none"> <li>➤ Third National Environment Action Plan is drafted and to be finalized soon.</li> <li>➤ NEAP3 is derived from NDP7.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Work is ongoing on the redrafting of the Environment Act. The draft has been shared with key sectoral ministries.</li> <li>➤ Major projects detailed below.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Overlaps in the mandate of Environment Section and Fisheries Ministry.</li> <li>➤ The new Fisheries Act particularly has overlaps with</li> </ul>	<ul style="list-style-type: none"> <li>➤ Through the projects implemented by Environment Section currently.</li> <li>➤ Redrafting of the</li> </ul>	<p>1. Ministry of Tourism, Arts and Culture. 2. Ministry of Fisheries and</p>	<p>1. It is planned that each province will have an Environment</p>	<p>1. Potential for partnerships between major sectors. 2. Address issues of resource ownership.</p>

Policies and plans	Ongoing projects/ programmes	Key issues related to coastal resources and Constraints	Opportunities for mainstreaming with MFF	Other ministries/ agencies for multi-sector collaboration for ICM	Link(s) to provincial development	Suggested criteria for selection of islands for model ICM
<ul style="list-style-type: none"> <li>➤ Efforts to harmonise NEAP3 with MDP Manifesto is ongoing.</li> <li>➤ National Sustainable Development Strategy (NSDS) is to be launched soon and work is being carried out to align NSDS with MDP Manifesto.</li> <li>➤ Generally not many changes are expected to NEAP3 and NSDS.</li> <li>➤ Once the policy documents are finalized a work plan will be developed.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Environment Section is undergoing major structural changes.</li> <li>➤ It is planned that the Environment Sector will have 3 main sections;                             <ul style="list-style-type: none"> <li>(1) Ministry department that will focus on policy and legislation, advocacy, awareness, international commitments and projects;</li> <li>(2) Climate Change and Energy that will focus on environment-friendly energy, commitments under UNFCCC, climate change adaptation and vulnerability, and exposure of vulnerability of Maldives to international funding community and;</li> <li>(3) Environment Protection Agency that will be the watchdog and will focus on implementation of the Environment Act and related regulations and standards. Particular areas of the EPA will be EIA, biodiversity conservation, water, sanitation, waste and the NSDS.</li> </ul> </li> </ul>	<p>the mandate of Environment Section.</p> <ul style="list-style-type: none"> <li>➤ Inadequate capacity at technical and administration staff level in Environment Section.</li> <li>➤ Currently insufficient funding is an issue.</li> </ul>	<p>Environment Act and development of related regulations.</p>	<p>Agriculture on conservation issues related to fisheries.</p>	<p>Unit that will liaise directly with the Ministry and EPA.</p> <p>2. At the atoll level there will be Environment Officers that work under the direction of the Ministry.</p> <p>3. - Implementation of EPA is unclear as the EPA was just established in March 2009.</p>	
<b>Marine Research Centre</b>						
<ul style="list-style-type: none"> <li>➤ In accordance with policies of Fisheries Ministry.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Tagging of tuna and reef fish.</li> <li>➤ National Coral Reef Monitoring under which 15 sites have been established. Additional sites are being identified under the World Bank Environmental Management project implemented in the North Province.</li> <li>➤ Research of Fish Aggregating Devices.</li> </ul>	<p>Species specific conservation is lacking mostly due to overlaps in the mandates of key ministries.</p>	<ul style="list-style-type: none"> <li>➤ Alternative Livelihood Study linked to the planned ban of shark fisheries.</li> <li>➤ Stock assessments of target species such as shark as baseline.</li> <li>➤ Piloting fisheries replenishment areas as protected areas.</li> <li>➤ Resorts act as semi-protected areas</li> </ul>	<ol style="list-style-type: none"> <li>1. Ministry of Fisheries and Agriculture.</li> <li>2. Ministry of Housing, Transport and Environment.</li> </ol>		<ol style="list-style-type: none"> <li>1. Sites that demonstrate resource use conflicts.</li> </ol>

Policies and plans	Ongoing projects/ programmes	Key issues related to coastal resources and Constraints	Opportunities for mainstreaming with MFF	Other ministries/ agencies for multi-sector collaboration for ICM	Link(s) to provincial development	Suggested criteria for selection of islands for model ICM
			currently. There is potential to establish a network of protected areas in collaboration with resorts.			
<b>Live and Learn</b>						
<ul style="list-style-type: none"> <li>➤ Live &amp; Learn Environmental Education is a non-profit, non-government organisation which promotes greater understanding and action toward human and environmental sustainability through education and dialogue building.</li> </ul>	<ul style="list-style-type: none"> <li>- Recently revised the environmental education curriculum from grade 1 to 7. Tools such as flipcharts, environmental monitoring kits and textbooks have been developed. Live &amp; Learn will be sending trainers to the atolls in collaboration with UNICEF Teachers Resource Centre.</li> <li>- E-learning courses are planned to be developed for environmental education.</li> </ul>	<ul style="list-style-type: none"> <li>➤ There is a need to institutionalise environmental management activities that are implemented under projects.</li> <li>➤ Skills development is lacking, for example, beach and land surveying.</li> <li>➤ Need to address the attitude gap towards natural resources.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Objectives of MFF are not clear enough to identify links to the project.</li> <li>➤ Short-term training to enable Environment Ministry to initiate monitoring activities as soon as possible.</li> <li>➤ Give priority to education and awareness among communities and resorts.</li> </ul>	<ol style="list-style-type: none"> <li>1. Environment</li> <li>2. Ministry of Education</li> </ol>		
<b>National Disaster Management Centre</b>						
<p>Main policy document is 7NDP.</p>	<ul style="list-style-type: none"> <li>- SEEDS Asia project is being undertaken in Shaviyani since 2008 with the objective to identify the most appropriate coastal vegetation types for coastal areas of Maldives.</li> <li>- Draft bill on disaster management under the former government. Whether the bill is subject to changes under the new government is not clear.</li> <li>- Awareness activities in collaboration with UNDP planned for 2009.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Status of NDMC is still temporary therefore commitment to disaster management is inadequate.</li> <li>➤ Thus roles and responsibilities of different agencies in disaster management remain unclear.</li> <li>➤ Capacity issues with only school leavers available for employment. Need experienced staff to work at NDMC.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Encourage volunteerism in environmental management and natural disaster management.</li> <li>➤ Long term plans and strategies for awareness raising in disaster management.</li> <li>➤ Monitoring mechanism for projects that are being undertaken that</li> </ul>	<ol style="list-style-type: none"> <li>1. Environment</li> <li>2. Transport</li> <li>3. Ministry of Defence and National Security</li> </ol>	<ol style="list-style-type: none"> <li>1. Draft Act needs to be revised to incorporate local governance changes.</li> <li>2. Atoll and Island Councils need to be authorized for disaster management.</li> <li>3. - Education and training to Atoll</li> </ol>	

Policies and plans	Ongoing projects/ programmes	Key issues related to coastal resources and Constraints	Opportunities for mainstreaming with MFF	Other ministries/ agencies for multi-sector collaboration for ICM	Link(s) to provincial development	Suggested criteria for selection of islands for model ICM
		<ul style="list-style-type: none"> <li>➤ Absence of a culture of volunteerism generally around Maldives.</li> <li>➤ Ad-hoc awareness and education programmes, therefore efforts are not consolidate.</li> <li>➤ There is a steering committee however the meetings are ad-hoc and not targeted.</li> </ul>	<p>will help in future coordination and identifying of gaps.</p> <ul style="list-style-type: none"> <li>➤ Mechanism to involve NDMC in other relevant sectors so that disaster management is streamlined in sectoral policies.</li> <li>➤ Study design of 'Safer Islands' and look into ways of improving.</li> <li>➤ Development of proposals to tap the funding sources available. Currently NDMC does not have the capacity to engage in fund raising and project implementation.</li> </ul>		and Island Councils on disaster management.	
<b>Ministry of Home Affairs – State Ministers for Central North, Upper North and Central</b>						
<ul style="list-style-type: none"> <li>➤ Ten year master plan for each province to be formulated.</li> <li>➤ Under the ten year provincial master plan each atoll and each island will have development plans.</li> <li>➤ Provinces will implement activities in accordance with national policies.</li> </ul>	- Local governance structure is in infancy and projects and programmes are unclear at present.	<ul style="list-style-type: none"> <li>➤ Awareness of environmental issues that can lead to initiative by communities.</li> <li>➤ Lack of monitoring of protected areas and species.</li> <li>➤ Need to research on economic benefits of conservations.</li> <li>➤ Need to establish baseline for coral reef conservation.</li> <li>➤ Impose tax for revenue generation that can fund conservation such as diving</li> </ul>	<ul style="list-style-type: none"> <li>➤ Awareness and education activities for communities and community leaders.</li> <li>➤ Mechanism for monitoring protected areas and species.</li> <li>➤ - Establish systems for revenue generation from conservation that can go into environmental protection.</li> </ul>	<ol style="list-style-type: none"> <li>1. Environment</li> <li>2. Planning</li> </ol>	<ol style="list-style-type: none"> <li>1. Post July 2009 all provinces will be operating independently to the national government.</li> <li>2. Provinces will be providing all basic services, issue of permits and monitoring activities.</li> <li>3. - NCB of MFF will have</li> </ol>	1. - Each province is to have model islands for ICM.

Policies and plans	Ongoing projects/ programmes	Key issues related to coastal resources and Constraints	Opportunities for mainstreaming with MFF	Other ministries/ agencies for multi-sector collaboration for ICM	Link(s) to provincial development	Suggested criteria for selection of islands for model ICM
		tax, pollution tax, and sewerage discharge tax. ➤ Too early in the stages of local governance to identify priority areas for environmental management.			provincial members.	
<b>Housing, Ministry of Transport, Housing and Environment</b>						
➤ 7NDP is the current policy document which may be reviewed in the near future. ➤ Generally the policy is to conserve all wetlands on inhabited islands.	➤ New government pledge to build 10,000 housing units across the atolls. Target islands are being identified. ➤ Harbour development in inhabited islands. ➤ Reclamation projects in islands with housing shortages.	➤ Community mindset is generally to reclaim wetlands and maximize land.	➤ Training on land use planning in the atolls. ➤ Environmental expertise input to the draft legislation and regulations related to Land Use Planning and Building Act.	1. Department of National Planning 2. Environment 3. Previously Atolls Ministry, now Ministry of Home Affairs 4. Atoll and Island Offices as the implementation agencies.	1. Housing has been conducting workshops of 1 week in the atolls on the basics of land-use planning. – Under the new local governance provinces are to develop land use plans. Housing ministry will be approving all land use plans prior to implementation.	



Stakeholder consultations were also held with NGOs in Addu atoll and Province Office and Atoll Office of Addu and Baa atoll. Below are the details of discussions and issues highlighted.

## **Society for Development of Addu - NGO**

Is Eedhigali Kulhi a successful model for protected areas? Why?

- It is not seen as a good model for protected areas nor does it help people to understand the purpose of establishing protected area
- Government provides no or little support to the atoll for Eedhigali Kulhi protection
- For Eedhigali Kulhi to be successful as a protected area, self-financing mechanisms need to be introduced and established at the atoll level. For example, ways to generate revenue from the protected status given to the wetland.
- Funds can be generated through activities such as nature walks which can target tourists as well as people from the atoll.
- Community is not aware of the value of Eedhigali Kulhi, which is another major reason why the wetland is not successful as a protected area.
- The coral reef in the Eedhigali protected area is the most unaffected during the 1998 bleaching. However, no measures have been taken to prevent damage from activities such as bait fishing.

The main barriers to, and needs for, successful protected areas can be summarized as:

- No funds available from international agencies for concrete projects that carry out activities on the ground; most are studies and reports
- There needs to be avenues where atoll and island level NGOs can affiliate with top government officials such as through committees
- Active NGOs exist at atoll and island level and for NGOs to engage in activities there needs to be coordination with government agencies. Such coordination requires permanent staff and office for NGOs. However, NGOs are restricted by funds. Donor agencies do not have mechanisms that provide funds to NGOs.
- There is very little scope in projects to pilot or test alternatives to activities that are detrimental to the environment or protected areas. For example, pilot organized nature trips for schools that are carried out using golf carts that can enter the Eedhigali Area without causing damage to the area. Huts can be put up in the area that provides information and allows people to enjoy the scenery and area.

Sand mining has emerged as a major resource conflict

- The main reasons are to do with who owns the sand in the atoll and to whom does resource rent belong
- Permission to mine sand by a resort in the atoll has been provided by the government and the resource rent goes to the central budget
- The concern of the Addu people is that Addu does not directly benefit from this especially when sand is a premium in the atoll
- So far sand mining is carried out by the people of the atoll mostly for construction purposes within the atoll and the quantities are small and spread over time. The price of aggregates in Malé is MRF48 and the price of aggregates in Addu is MRF90 after the transportation costs. There is an urgent need to make aggregates available for communities at reasonable prices.

Water shortage in Addu at such a large scale for the first time

- Public water supply tanks have been removed due to poor maintenance
- Groundwater is contaminated by improper sewage systems
- Government is not prepared to address the issue despite the period being the dry season in Maldives

In order to address critical environmental issues, local NGOs need to be strengthened

- The estimated annual budget for an NGOs basic needs such as office and two permanent staff is USD5000. However, no mechanism for international donors to support NGOs in this manner.
- The Community Organization Development Council needs to be look at priorities in allocating funds contributed by line ministries
- Government interests/priorities are different or misunderstood and not reflective of the needs at atoll and island level. For example, the need in the atoll is for housing and not land reclamation.

For livelihood development and environmental protection it is important to consider atoll level rather than island level

- There are deep rooted social and political aspects that interfere with environmental protection
- Island level focus leads to identity issues that create or exacerbate social divisions. With such social divisions it is difficult to put focus on environmental protection. In fact social divisions sometimes have led to resource use conflicts.
- The issues are cross-cutting and inter-linked across an atoll and there are interdependencies among the islands in an atoll

- Cultural, traditional and historical backgrounds influence the scale for coastal management

### **Maavahi - Addu Atoll NGO**

Maavahi has been involved in Eedhigali Protected Area prior to the area being declared as a protected area

- Conducted clean up, awareness activities and land surveys
- Eedhigali Kulhi has revenue generating opportunities such as through significant species, introduction to tourists as an activity on Addu atoll
- People are not aware of Eedhigali Kulhi being declared as a protected area and the value
- Studies carried out on Eedhigali Kulhi and also other relevant environmental studies are not accessible to the public
- Current status of the Government on Eedhigali Kulhi such as planned activities are unknown

Need for opportunities for NGOs such as Maavahi to participate in projects and programmes in the Government. For example, in the NCB of MFF programme.

- Success of initiatives such as protected areas lie with involvement of atoll and island NGOs in the decision-making level
- Government needs to be provide such opportunities to NGOs
- Access to information through media and internet is very limited for the general public. For example, Addu atoll does not receive the major newspapers on a daily basis.

Need to look at self-financing mechanisms for protected area systems or environmental activities

- There is a question of who owns the revenue generated from a resource located in a specific atoll or island

### **Abdulla Sodiq, Addu Atoll Councilor**

Success of eedhigali Kulhi as a protected area

- It is not clear who is responsible to maintain the system and the roles of different stakeholders
- It is a difficulty for NGOs and island level committees that the wetland is under Environment Ministry which is situated in Malé
- There are issues of coral and sand mining, tree felling and waste disposal in the area
- Previously reclamation of the wetland area was unofficially encouraged by the atoll and island offices

- Eedhigali Kulhi has potential to generate revenue for environmental protection but there has to be direct benefits to the atoll

Sand mining has emerged as a serious environmental issue that has social implications

- Main cause for sand mining is that there are no alternative construction materials available. This is an issue that needs to be addressed urgently
- There are dredging activities that are carried out without EIAs and other permissions
  - Issues of sedimentation and adverse impact on bait fishery in the area
  - No one to take responsibility for negative impacts and mitigation measures
- In sand mining and also other resources such as trees, there is a conflict in granting permission from the Ministry when the ownership of the resource is believed to lie with the people of the atoll

Water shortage in Addu

- Household tanks and public facilities and household tanks are not sufficient to ensure water supply especially during the dry season
- Total coliform in groundwater in tested households has been found to be above the WHO standards for drinking water
- There are concerns about rainwater contamination due to residential and industrial activities area being mixed

Land use plans is a priority for Addu atoll at present

- None of the islands have land use plans
- Land use plans have been developed previously but changes have been made by Atoll Office or Housing Ministry that were not suitable or agreeable to the community. For example, these land use plans did not take into account power supply routes or road safety issues. In some instances there have been double allocations.
- It is considered better to relocate people according to a new land use plan

Waste is a major issue in Addu atoll especially with tourism being introduced in the atoll

- Waste is disposed by open burning mostly because the regional waste management facility is not equipped adequately
- The facility has been open for 10 years but a proper system has not been established
- The Atoll Office provides a subsidy to reduce costs to the community

Changes need to be made to decision-making processes

- Atoll level participation is important and there needs to be avenues for community to participate in decision-making
- Awareness, education and training is required for staff of province, atoll and island offices as well as state ministers for provinces
- Province and Atoll Offices need to be authorized for province and atoll level decisions. Permissions should not be issued by the central government to override decisions of province or atoll offices, for example in the case of sand mining
- Input by the community to national policies is crucial and mechanisms need to be established to facilitate this

In selecting islands for ICM or environmental management activities the whole atoll must be considered as a single land mass

- Because of the social and economic interlinkages and also interlinkages among ecosystems
- In addition, selection of single islands for project activities encourage issues of island identity and resulting conflicts between island communities

**Yoosuf Moosa, Baa Atoll Councilor and Abdul Bagir Ahmed, Senior Assistant to Atoll Chief**

Beach erosion is major concern in inhabited islands that needs urgent attention

- People need to be made aware of activities that exacerbates erosion such as improper land reclamation using waste and clearing vegetation along the coastline

Waste management needs to be addressed urgently

- It is important to coordinate with resorts to address waste management at the atoll level
- In the current World Bank Project that will establish a regional waste management facility, there are issues of selecting a site. Every atoll prefers to have the site in that atoll and every island prefers to have the site close to their island.
- Regarding the World Bank project there are concerns how the waste management system will be financed and sustained after the completion of the project and allocated funds are exhausted
- Waste management systems in the atolls need to consider the question of discrimination between people in Malé and people in the atolls. People in Malé do not have to pay for waste disposal to Thilafushi while the systems for atolls are designed for users to pay.

Protected areas established in Baa needs management systems

- There is the question of how the PAs can be maintained
- Awareness is also needed for people to understand the significance of the PAs
- A mechanism is needed whereby the revenue generated from diving and other marine activities of tourists can be for the direct benefit of the atoll community
- Resorts assist in environmental activities and the partnerships need to be better established and improved for long term activities

Decentralisation seems to be vague at present and authority to Atoll and Island Offices are not clear

- It is perceived that atolls do not have capacity for implementation of decentralization
- Need training not just in environment but also in taking initiatives
- Role of Atoll Offices are expected to reduce largely under provincial development
- People are unable to gauge the changes to local governance and some express concerns that difficulties will arise where the role of Atoll Offices are reduced

Land use plans

- Baa atoll has atoll development plans and island development plans. However, implementation of the plans are slow or have not started

There are active NGOs in Baa and further support needs to be provided to strengthen NGOs

- Training on funding opportunities, how to write proposals and how to raise funds

For environmental management activities it is preferred to have programmes at atoll level rather than island level

- Atoll level programmes can be scaled down to islands depending on the nature of the issue

## **2.9 Selection of ICZM model sites**

At present a formal ICZM programme does not exist in the Maldives. MHTE has been charged with the responsibility of developing a national ICZM programme. The NSAP under the MFF programme provides an opportunity for implementation of ICZM for selected island ecosystems to test and develop

models in parallel with the development of a national ICZM programme. As such a set of criteria and a selection process is needed to identify model sites for ICZM.

The criteria recommended for selection of model ICZM sites are designed to be flexible, ensure inclusiveness of sectors and enable partnerships among stakeholders. There are three major criteria as described below.

**Criterion 1: Geographic equality to ensure that there is at least one ICZM model in each province.** Equal opportunity for all provinces was stressed by the respective State Ministers during the stakeholder consultations held with Ministry of Home Affairs for this situation analysis. Hence, it is important that the ICZM programme ensures equal opportunity to the provinces. In addition, experience in different provinces will bring in valuable lessons learned for ICZM.

**Criterion 2: Encourages co-management among key stakeholders.** Criterion 2 takes into account the important aspect of resource use conflicts and boundaries. Fig. 2.12 shows the main categories of sites that require key stakeholders to co-manage and address issues that arise from resource use and unclear boundaries.

Fig 2.12 - Main Categories of Sites

Category A: At least one inhabited island and one resort within the same lagoon



Category B: More than one inhabited island sharing lagoon area



Category C: One inhabited island isolated by house reef



Fig. 2.11 - Illustration of main categories of sites related to resource use conflicts.

Criterion 2 will be used to shortlist ICZM model sites in each province. Priority will be given to Category A, followed by Category B; Category C will have the least priority. If more than one site fits the priority Category then the site selection decision will lie with the province level decision-making mechanisms.

**Criterion 3: Inhabited islands with medium population size.** In selecting inhabited islands priority will be given to medium size populations. The assumption is that people in small islands will have the tendency to migrate. Further, the larger islands will require activities of greater scale



and also are likely to have higher government interventions for environmental management.

Given that MHTE is intending to select 10 ICZM model sites, three more sites can be selected based on Criteria 4, 5 and 6. The islands under Criteria 4, 5 and 6 will be selected by the NCB.

**Criterion 4: An inhabited island located close to a terrestrial protected area or island.** The protected area may be within the inhabited island. This model will allow the study of effectiveness of protected areas and the willingness of communities to engage in the management of protected areas.

**Criterion 5: An inhabited island close to a marine protected area.** The rationale for this criteria is similar to Criterion 4. In addition, marine protected area will bring in tourist resorts, a major stakeholder in ICZM.

**Criterion 6: Inhabited Island with a wetland area enclosed within the island.** In Maldives only one wetland area is officially declared as a protected area. As described elsewhere in the report, wetland areas in inhabited islands are often neglected or used for waste dumping and land filling to reclaim as land. An exception, noted in other similar reports, is the wetland in Gnaviyani atoll Fuahmulah that is left in a relatively pristine state by the people as it had been a source of drinking water in the past. However, pressure is building to reclaim the area for additional land. Hence, such an ICZM model site can give the community the opportunity to take the initiative in understanding the value of the wetland and hence in conserving the area.

Under the new local governance model the provinces will shortlist potential sites and the NCB shall make the final decision on the sites in accordance with MFF objectives and guidelines, and national policies. The NCB will act as the neutral decision-making platform for selection of ICZM model sites.

### **3. ECOSYSTEM TRENDS**

#### **3.1 Introduction**

The Situation Analysis (Chapter 2) revealed important change trends in island ecosystems. Some measurable, e.g. beach erosion rate, while others are anecdotal but very important for planning. The paramount planning question is how should the NSAP respond to the trends? Assessment of the trends is made on the basis of the most important criterion – the value that society places on environmental quality. Since international tourism is the primary driver of the existing and future national economy, optimal coral reef quality is essential to secure the international market. This would immediately carry a payoff also in the fishery sector which is inextricably linked as the source of bait.

The change trends occur at islands that are inhabited, tourism resorts and industrial islands. The changes that occur at islands cannot be generalized to entire atolls. The reverse process also is not meaningful since aggregate information for atolls is not representative of actual changes at particular islands. The diversity among islands in an atoll is very high. Therefore, the appropriate geographic units for application of ICM planning are primarily the inhabited island ecosystems. This requires operational definition.

#### **3.2 Island Coastal Ecosystem – The Geographic Units for ICM**

The inhabited island ecosystem is the smallest land unit that is significant for ICM planning because it has the following attributes:

- (i) a definable boundary based upon existing use practices;
- (ii) most ecological change trends occur within the boundary;
- (iii) an elected entity 'Island Council' that is representative and has legitimacy as a decision making entity exists in the present institutional context; and
- (iv) the 'island ecosystem' is the eventual site of all impacts of relevance to human wellbeing stemming from coastal resources management and mismanagement, as well as sea level rise and other consequences of climate aberration.

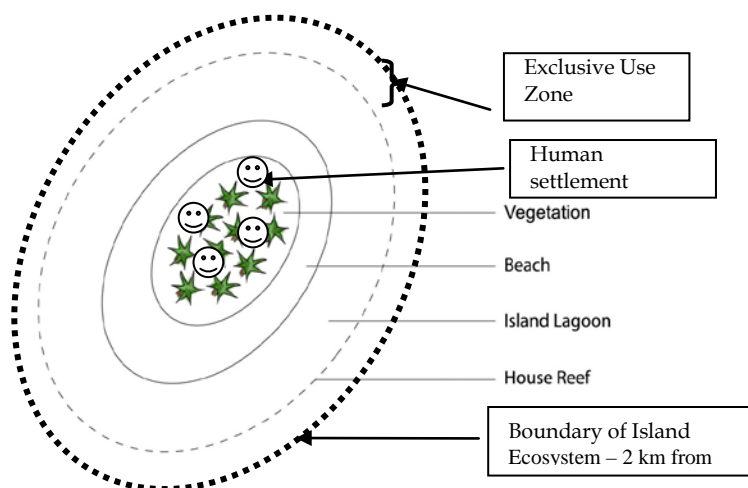
Every island is a unique entity within an atoll ecosystem. A natural ecosystem is an interacting combination of physical and chemical factors together with plant and animal communities existing at particular locations (Odum, 1971). Ecosystems are interconnected in various ways with everything else in the wider environment. This scientific definition is not amenable to ICM. Coastal managers must be in a position to address tangible attributes of coastal

ecosystems within a defined boundary in keeping with relevant institutional arrangements (Holling, 1976). Therefore, the entities for ICM in the NSAP are 'island and island chain ecosystems'. Human populations constitute necessary targets for ICM. Therefore inhabited islands (Administrative Islands) are the primary geographic units in the NSAP. Resort Islands and Industrial islands are the secondary ICM units. Uninhabited islands are relegated to the realm of biodiversity conservation and are indirectly included in the NSAP by way of marine protected areas.

The conceptualization of island and island chain ecosystems in this manner can be harmonized with the concepts developed for atoll ecosystems (see Chapter 2 - Situation Analysis) and applied by the MEH&T in the 'Atoll-based Ecosystem Conservation Project (AEC Project) now being implemented as a step in a longer process for Baa Atoll<sup>2</sup>; and for Addu Atoll as the "Framework for an Ecosystem-based Management Plan"<sup>3</sup>.

Island coastal ecosystems:

Island ecosystems are composed of the terrestrial and its aquatic component extending to 2 km seaward from the edge of the coral reef shelf, and include the component habitats, coral reef, beach, littoral vegetation, depression mangroves, lagoons, human population, built environment, cultivated vegetation, among others (Fig. 3.1). The ICM boundary of an island ecosystem is the seaward demarcation situated 2 km from a house reef and includes the 'exclusive resource use zone'. These coastal ecosystems possess both bio-physical and sociological attributes which are mutually interactive. Therefore they may better be perceived 'socio-ecological systems' (Fig. 3.2). The four essential ecosystem attributes for management are: (i) structural complexity, (ii) linkages, (iii) dynamic stability, and (iv) resilience.



**Fig. 3.1 - Idealized Island Ecosystem - the geographic unit for ICM. The boundary is situated 2 kilometers from the 'house reef' and includes an exclusive resource use zone. Island ecosystems are more complex where shared resource use zones are included.**

*Structural complexity:* The

<sup>2</sup> [http://www.mv.undp.org/Documents/Atoll\\_Ecosystem\\_Conservation\\_ProDoc.pdf](http://www.mv.undp.org/Documents/Atoll_Ecosystem_Conservation_ProDoc.pdf)

<sup>3</sup> <http://www.gefcoral.org/Portals/53/downloads/EBM%20Framework-Addu%20Atoll.pdf>

island ecosystem conforms to the basic requirement of a ‘system’ in that it is composed of interacting parts (structural complexity): the land terrace with its vegetation and the built environment, the beach and the coral reef, etc. The coastal manager will seek to maintain integrity and balance among the parts.

*Linkages:* A second system attribute of the island ecosystem is that it is not isolated. It is connected (linkages) with the wider environment by water movement, biological migrations, transportation among others. However, a coastal manager’s activities are confined within the exclusive resource use boundary. Therefore, he or she will not be required to grapple with daunting oceanographic processes of great complexity.

*Dynamic stability:* A third systems attribute is that it is changing but stable, therefore it has dynamic stability, as demonstrated by the seasonal ‘erosional’ shift of the beach, replenishment of the groundwater lens, etc. The coastal manager will address significant issues such as erosion and be in a position to implement solutions where possible.

*Resilience:* The fourth systems attribute possessed by an island ecosystem is that it has the ability to bounce back after a shock and therefore is resilient. This has been demonstrated by the manner in which island ecosystems (socio-ecological systems) affected by the tsunami of 2004 have retained their biophysical character, and its population coped with disaster, etc. In another example, bleached corals have recovered together with their complex food webs (UNEP, 2005; Zahir, 2002; Zahir *et al.*, 2002). A coastal manager, when trained, will have the capacity to intervene and manage measurable attributes of a coastal ecosystem. However, management of resilience will require a comprehensive knowledge base supported by research.

An island coastal ecosystem is best conceptualized as a socio-ecological system for the purpose of management. This enables understanding of interaction and interdependencies among the (i) biophysical and social process components that constitute an island ecosystem, and (ii) the manner in which they are influenced by the cascade of policies from the national to the island level. Policies have the potential to both positively and negatively impact the behaviour of a complex island SES. Participatory planning and decisions made on the basis of the ‘subsidiarity principle’ at the island level have the potential to ensure sensitivity of policies to the behaviour of the SES (Fig. 3.2).

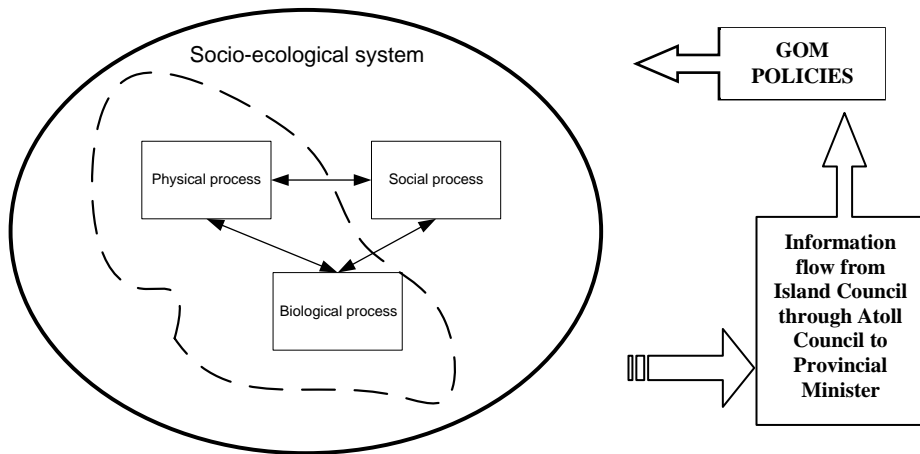


Fig. 3.2 - An island ecosystem conceptualized as a socioecological system (SES). The oval includes the entire SES. The broken line separates the biophysical and biological constituents that generally change together independently or under the influence of the social component. Policies impact the behaviour of the SES from outside. Island-based planning has the opportunity to influence GOM policy.

### 3.3 Ecosystem Based ICM

ICM is a process of searching for the best combination of practices to suit a changing environmental situation in a coastal ecosystem. ICM is not a unitary answer since the achievement of 'best practice' in a continuously changing biophysical and socio-economic settings cannot be static. The search has to be flexible to suit the rhythm of ecosystem change. Clarity regarding the principles and elements of ICM is therefore useful in understanding the meaning and content of the NSAP. The main focus of ICM is inhabited islands and island chain ecosystems. The relevant aspects are defined below.

*Island chain ecosystems* are inhabited and uninhabited islands which share a common structural platform. The water separating the islands is shallow and has corals in the light penetration zone. A shared boundary is demarcated by the exclusive resource use zone and 'resource sharing zones'. Change in coastal processes in one member can interact and influence the behaviour of neighbours.

*Integrated Coastal Management (ICM)*: The goal of ICM is to improve the quality of life of human communities who depend on coastal resources while maintaining the biological diversity and productivity of coastal ecosystems. Therefore, ICM must integrate government with the community, science with management, and sectoral with public interests in preparing and implementing actions that combine investment in development with the conservation of environmental qualities and functions (GESAMP Reports and

Studies No. 61, 1996). ICM as a national process evolves over a period of time into an institutionalized formal programme approved and financed by the central budget. The scope and focus of ICM is included the UN Agenda 21<sup>4</sup>.

*Principal Features of ICM:* These are summarized below to show the diverse aspects that need to interact and cohere to become a national ICM programme.

*Geographical:* It takes account of interrelationships and interdependencies (viz., physical, chemical, biological, ecological, sociological) between the terrestrial, littoral, beach and coral reef habitats, inhabitatnts, built environment which constitute an island ecosystem;

*Temporal:* It supports the planning and implementation of management actions in the context of a long-term strategy to address change trends in ecosystem structure and functioning;

*Sectoral:* It takes account of interrelationships among the various human uses of coastal areas and resources as well as associated socio-economic interests and values, relative efficiencies of development sectors and their optimization;

*Political/Institutional:* It provides for the widest possible consultation between government, social and economic sectors and the community in policy development, planning, conflict resolution and regulation pertaining to all matters affecting the development, use and protection of coastal areas, resources and amenities.

ICM programme development is more appropriately seen as a process which travels through five stages of development (Annex 1). These stages constitute an ongoing iterative process which implies they are repeated cyclically and undergoes change as required on the basis of evaluation. The initial completion of the five consecutive stages constitutes a 1<sup>st</sup> Generation programme. Evaluation which is the 5<sup>th</sup> Stage is the key to constructive progress since it enables adaptive management (learning and adjusting) of the ICM process. Successive programmes constitute the evolutionary and maturation process which adapts policies and strategies according to the evaluation carried in Stage 5. ICM is a process of sustainable development and therefore has political implications. Definitions for terms used in the NSAP are provided in Annex 4.

### **3.4 Coastal Ecosystem Trends**

The main coastal ecosystem trends, their direct and indirect causes where known, and the relevant planning option are summarized in Table 3.1. Trends generally classify in four classes which suggest the planning options available for addressing them (Box 2). All trends have multiple causes and cannot be

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<sup>4</sup> <http://www.fao.org/docrep/meeting/003/w1639e/w1639e00.htm#OBJECTIVES>

reduced to simple cause-effect relationships. The study and analysis of the trends revealed the issues to be addressed in planning.

***Box 2. The four classes of trends and suggested planning options***

A simplified classification of trends indicates the four planning options that are available.

- (i) *Maintaining the existing situation*: if the ecosystem trends do not diverge from environmental values and development expectations, measures may be planned to ensure continuation of the existing situation with safeguards provided by appropriate policies, monitoring of key indicators, and by proactively addressing imbalances.
- (ii) *Restoring equilibrium*: if the ecosystem trends diverge from environmental values and development expectations and the causes are known, corrective measures may be implemented by way of organized societal behaviour, technology and appropriate institutions.
- (iii) *Knowledge acquisition*: in the event that ecosystem trends diverge from environment values and development expectations, but the causes are not known appropriate research may be included to generate the required scientific understanding.
- (iv) *Environment impact assessment*: New development projects will be required as the nation aspires to stabilize as a middle-income country. It will also be desirable, to anticipate unforeseen and new ecosystem change trends that may occur which diverge from environmental values and societal expectations and to incorporate precautionary safeguards.

Responding to trends where divergence between societal values and environmental quality is recognised, and where the causes are known requires organized intervention among multiple sectors (multiple-sector organized intervention - MSOI). As an example, coral reef degradation at island ecosystems which serve the interests of tourism (snorkeling, diving) may be the site for collection of bait fish for the tuna fishery. Adverse impacts from both sectors are generally known. Addressing them in search of an adequate compromise requires organized consultation, collation of relevant information, and identification of win-win situations. The identification of practical win-win compromises ensures that adherence to standards and codes of behaviour by the participating sectors become sustainable with appropriate incentives in place.

**Table 3.1 - The coastal ecosystem change trends as identified in the Situation Analysis, the direct and indirect causes and relevant planning options. These trends are substantiated by policy documents and position statements recently made by the GOM (see text for explanation).**

<b>Ecosystem/SES Attribute</b>	<b>Change Trend - Issue</b>	<b>Planning Options</b>
<b><i>Geomorphology</i></b>		
Beach	97% of inhabited islands now report erosion – 67% rank as severe. 45% of 87 resorts report severe erosion. Multiple causes include unplanned settlement expansion, misplaced construction works, land clearing, etc.	Multiple, inter-sectoral, organized interventions (MIOI) including law enforcement, property rights, etc, regulated land use by way of processes such as ICM. Research & modeling where causes are unclear.
Beach ridge	Depleted in some islands owing to settlement expansion	MIOI
Coral reef	Some bleached reefs are recovering from 1990s. Fishery and tourism stress is increasing. Bleaching likely to increase with rise in sea-surface temperature (SST)	MIOI to address known stresses. Future impacts to be monitored and researched.
Lagoon	Information not available on impacts and linkages of dredging, sand mining, seagrass removal, nutrient loading, etc.	Research
Seagrasses	Damage to seagrasses reported, scientific information not available	Research
Land	Stresses through settlement expansion, vegetation clearing and wetland filling are increasing. In some islands land resources are increased through planned engineered. This class likely to increase with population consolidation	MIOI, EIAs as applicable, research where required by too many uncertainties
Littoral vegetation	Haphazard clearing is noted which diminishes beach ridge behaviour	MIOI, research
Depression mangroves	Inadequate information on distribution on inhabited islands	Research
Drainage Zone,	Island-specific management of drainage zones, enhancement of flood detention and drainage, management options inadequately known	MIOI, research
Wetlands	Reported to be diminishing through filling for diverse property-related activities	MIOI, research
Groundwater	97% of households on islands use rainwater since groundwater depleted. Desalination plants provided to 38 islands after Tsunami 2004. Freshwater for agriculture (food security) diminishing	MIOI including catchment regeneration, integrated land use, etc
Biological diversity	Coral reef biodiversity decline in quality: impacts from fishery and tourism are implicated	MIOI, research
<b><i>Demography</i></b>		
Island population (Male excluded)	Most island populations have about doubled during the past four decades. At present, some island populations are decreasing (emigration), others increasing (immigration), some being abandoned (voluntary migration policy). Future trends under population consolidation programme unclear	MIOI coupled with applied research
Migration	Emigration has increased from islands that are inadequately served to those that contribute to improved wellbeing.	MIOI supported by ICM at island of choice for immigration
Poverty, vulnerability	Poverty and vulnerability have declined at the national level. Both exist at higher than national average in distant islands and atolls. Likely to decrease with establishment of transportation network, regionalization, decentralization and trade promotion.	MIOI (including enhancement of livelihood-related biodiversity), research
<b><i>Tourism</i></b>		
Employment	Remittances from tourism jobs increasing and contributes to wellbeing of 'at-home' family members. Likely to expand in keeping with operationalization of new resorts. Optimal benefits from tourism may derive from public-private (P-P) partnership promotion.	MIOI, consultation with private sector on modalities of P-P partnerships
<b><i>Fishery</i></b>		
Food security, income	Decreasing tuna catch per unit of bait fish. Market demand, inadequate management, depleting coral reef habitat for bai fish.	MIOI
<b><i>Agriculture</i></b>		
Food security, income	Decreasing yields from home gardening, irrigation constraints	MIOI
<b><i>Waste Management</i></b>		
Health improvement	A deteriorating health trend linked to water pollution, improper sanitation, excessive groundwater extraction, depleted catchment	MIOI, research, modelling
<b><i>Global change: climate aberration &amp; sea level rise</i></b>		
SES adaptation	Impacts will aggravate over decadal and longer periods. The challenge is adherence to measures that address impacts whose nature is uncertain. Modelling based on risk factors and vulnerability indices is required.	Research and assessments



## 4. The National Strategy and Action Plan

### 4.1 MFF Strategic Planning and Implementation Framework

The immediate question is whether the MFF Strategic Planning and Implementation Framework (Framework) provides an adequate foundation for action to address the existential problem faced by the Maldives in the face of climate change. This question is best answered after presentation of the NSAP. A brief explanation of the programmes of work, POWs, that constitute the Framework first will be useful.

The MFF goal and objectives contribute toward the conservation and restoration of coastal ecosystems as an essential part of the coastal development infrastructure. The objectives are of two types:

- Objective 1: aimed at conservation and restoration working directly through actions required to manage coastal ecosystems sustainably, equitably and effectively.
- Objective 2: aimed at strengthening the broader frameworks that influence people's investments and actions, and which enable or hinder development of coastal ecosystems in a sustainable manner.

Together the interventions address both the direct and underlying causes of ecosystem degradation, unsustainable livelihood and persistent vulnerability in coastal areas of the Indian Ocean countries (Fig. 4.1).

These interventions are made operational within the overarching framework of ICM. All the definitions (Annex 4) utilized in the NSAP are adapted to be responsive to the objectives of the MFF Programme in the context of the Maldives. The NSAP is integrated with the national development plans of the Maldives to ensure that it acquires effectiveness and efficiency by not duplicating ongoing and already planned activities [see Section 4.2 (b) (iv)].

*Programmes of Work (POWs).*

The MFF Framework is composed of fifteen (15) programmes of work (POWs). The manner in which they are sequenced and relate to each other can be adapted to country situations (Fig. 4.2). These POWs and specific activities are arranged under three themes:

- Building knowledge;
- Strengthening empowerment; and
- Enhancing governance.

	Results that will strengthen the environmental sustainability of coastal development	Results that will promote the investment of funds and effort in coastal ecosystem management
<b>REGIONAL COOPERATION</b>	<p>R1.1 More effective institutions and mechanisms for cooperation in coastal ecosystem management</p> <p>R1.2 Safe space and constructive dialogue for discussing sensitive issues</p> <p>R1.3 Stronger regional voice in global dialogues and decisions</p>	<p>R2.1 Increased prioritisation of coastal ecosystem management in the development agendas of regional institutions</p> <p>R2.2 More efficient and effective impact and use of resources to support environmentally sustainable coastal development at the regional level</p>
<b>NATIONAL PROGRAMME SUPPORT</b>	<p>N1.1 More effective policy, legal and institutional mechanisms for inter-sectoral coordination in environmental aspects of coastal management</p> <p>N1.2 Strengthened alliances and procedures to improve environmental law enforcement and compliance</p> <p>N1.3 More inclusive development planning, appraisal, approval and monitoring processes which reflect ecosystem needs</p> <p>N1.4 More sustainable, equitable and effective protection, and where necessary rehabilitation, of coastal ecosystems</p>	<p>N2.1 Increased prioritisation of coastal ecosystem management across national development agendas, policies and budgets</p> <p>N2.2 More aware, engaged and empowered civil society supporting coastal ecosystem conservation</p> <p>N2.3 Increased and more effective investment of funds in coastal ecosystem management</p>
<b>PRIVATE SECTOR ENGAGEMENT</b>	<p>P1.1 Enhanced action in coastal conservation through partnership with the private sector</p> <p>P1.2 More environmentally sustainable business, industry and commerce in coastal area</p>	<p>P2.1 Greener business plans which recognise and reflect ecosystem services</p> <p>P2.2 Enhanced investment in ecosystems as infrastructure, and fair payment for the benefits of ecosystem services</p>
<b>COMMUNITY ACTION</b>	<p>C1.1 More environmentally sustainable coastal livelihoods</p> <p>C1.2 More integrated development and conservation actions which serve to reduce vulnerability and increase resilience among coastal communities</p>	<p>C2.1 Improved participation in, support for, and benefit from, ecosystem conservation among coastal dwellers, especially women</p>

Fig. 4.1 - Mangroves for the Future: The Programmes of Work

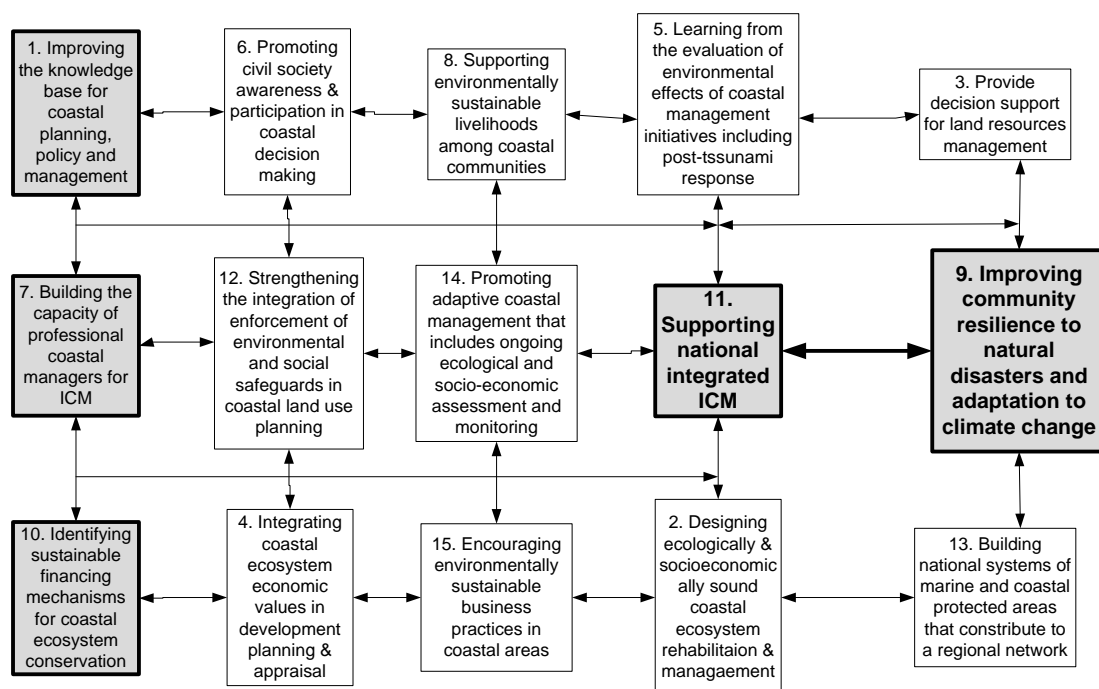


Figure 4.2- A possible set of relationships of the inter-dependent POWs (numbered) focused upon the eventual development of a national ICM programme, and adaptation to climate change (Nos. 9 & 11). The POWs with the heavier borders are the key poles of the ICM process development which also supports adaptation to climate change. The POWs in the NSAP may be sequenced and prioritized in keeping with the decisions made at diverse levels of institutional consultation.

## 4.2 National Strategy and Action Plan (NSAP)

### (a) Specific Goal and Objectives

The goal and objectives are in conformity with national policies and priorities contained in the 7NDP the NAPA, NEAP3 and documentation presented by the GOM to the Development Partners’ Forum in March 2009. The existing policies and strategies shall require harmonization with the vision emerging under the National Development Council (NDC).

**Goal:** To initiate and enable the progressive development of a nation-wide ICM process that is fully responsive to and advances implementation of the NAPA, and the population consolidation programme underway to ensure equitable sharing of benefits of economic growth based on good governance and public-private partnerships.

#### **Objectives:**

1. To initiate consultation with all levels of government to foster shared knowledge, and facilitate a common agenda at all institutional levels for producing a 1<sup>st</sup> Generation ICM Plan.

2. To identify and introduce mechanisms to ensure that ICM supports implementation of the NAPA and the population consolidation programmes.
3. To initiate assessments that can lead to the building of stakeholder constituencies on islands selected to serve as ICM models, to obtain precise information on relevant issues, and to formulate guidelines for nation-wide replication.
4. To recognize mechanisms for public-private (P-P) partnerships to acquire sustainable, optimal and equitable economic benefits from development opportunities based on coral island ecosystems.
5. To stimulate policy commitment toward the national ICM programme as the vehicle for bridging the gap between short term benefits and the long-term, inter-generational continuity of processes required to span the next century.

## **(b) NSAP Preparation and Implementation**

### **(i) NSAP Preparation**

The NSAP was developed by way of consultations in May 2008 and in February 2009 (Annex 5). Consultation during May 2008 included discussion with key government agencies regarding their perceptions and expectations from ecosystem-based ICM. A draft NSAP was presented to agency representatives for discussion at the end of that consultation. Finalization of the NSAP, however, was postponed until completion of the presidential elections in December 2008. Consultation during February 2009 led to further development of the NSAP including a draft of Situation Analysis. Stakeholder consultations at that time yielded information more relevant to the emerging policy environment, particularly regionalization and decentralization. The present NSAP draws on the Situation Analysis and national planning documents developed since election of the President in December 2008. The draft NSAP was submitted for approval by the National Coordinating Body chaired by the Ministry of Environment, Housing & Transport has been prepared in a manner that imparts adequate flexibility to it. Therefore it may be adjusted in keeping with the policy and institutional environment that are emerging following the general election in May 2009 and the direction set by the National Planning Council (NPC).

#### *Stakeholder Consultation*

A systematic stakeholder consultation was conducted in February 2009 with government agencies, NGOs and two councilors. The outcome is included in the Situation Analysis (Chapter 2). Fresh consultation may be warranted in view of the governance system in place following the general election in May 2009.

Table 4.1 provides the National Strategy and Action Plan for Maldives. The column labeled 'Contribution to Results' refers to the sources of knowledge, R: Regional study; N: National study; C: Community participatory processes; and P: Private sector contribution. An example is provided under POW1.

**Table 4.1- National Strategy and Action Plan (NSAP)**

PROGRAMMES OF WORK	ACTIONS/OUTPUTS	CONTRIBUTION TO RESULTS
<b>ACTIONS TO BUILD KNOWLEDGE</b>		
<p>1. Improving the knowledge base for coastal planning, policy and management</p> <p><i>Maldivian reality:</i> A formal coastal zone management process does not exist although the need for it is recognized.</p> <p><u>Problems:</u> A. Absence of shared understanding of benefits of ICM for coastal ecosystems. B. Paucity of knowledge of 'actual' coral reef fish population structure and replenishment pattern since pelagic and coral reef fish are lumped in statistics. Meaningful management policies and regulations are therefore illusive. C. Multidisciplinary research required to build knowledge for fishery-island ecosystem interactions. D. Absence of maps on an adequate scale for ICM E. Inadequacy of observations and model development pertaining to the</p>	<p>1.1 Initiate Programme Preparation (Stage 2) of a 1<sup>st</sup> Generation ICM process and take it through the 5 stages in the short term (5 years). The 'coastal zone management and climate change elements' have already been included in the high level vision statements. Dialogue with the legislature needs to be initiated by Minister of MEEW&amp;T leading to clearance for formal inter-Ministry consultation in keeping with the 7NDP, NAPA &amp; NEAP3. Early consultation with the Attorney General is desirable to ensure that all legal requirements are fully understood while mapping the details of Programme Preparation (to have a champion for ICM at this level would be an advantage).</p> <p>1.1.1 Identify medium (population 500-2000) islands for testing and establishing models in ICM to inform activity at 1.1. and begin planning and implementation starting with strategically selected islands, at the minimum of one island per Province, in keeping with appropriate criteria (Section 2.6). Begin consultation and assessments at selected islands, including:</p> <ul style="list-style-type: none"> <li>• Assessment of the perceptions and problems of habitat management, water resources, waste management and hazard risk;</li> <li>• Coral reefs in relation to fisheries;</li> <li>• Aspirations and expectations in human development.</li> </ul> <p>1.1.2 Initiate and engage industry, mainly tourism and fisheries in progressive discussion with the intention of promoting private-public partnerships, and producing a few champions for ICM based upon a clear understanding about mutual benefits for industry and long term productivity of ecosystems (also see POW 10).</p> <p>Initiate map preparation on an adequate scale in collaboration with 'surveying authorities' for the islands selected at 1.1.1 for establishment of property boundaries, GIS databases with geo-referencing <u>compatible</u> with those of the Ministry of Housing and Urban Development to enable harmonization with its zoning plans. The ICM planning would include maps of:</p> <ul style="list-style-type: none"> <li>• management zones, and common property resources,</li> <li>• coral reef,</li> <li>• beaches with sites sensitive to erosion and form and extent of Monsoonal shift,</li> <li>• beach ridge,</li> <li>• littoral forests,</li> <li>• drainage zone, depression mangroves and tide influenced marshes/wetlands that serve as flood detention areas,</li> <li>• plantation and settlement areas,</li> <li>• contours showing natural catchments that have a role in groundwater recharge,</li> <li>• others?</li> </ul> <p>1.3 In collaboration with the Island Council, develop participatory awareness and consensus on the definition, structure and functioning of 'island' and 'island-chain' coastal ecosystems as the bio-physical</p>	<p>R: (i) It is intended that ICM in Maldives be initiated under MFF. Support from Sri Lanka which has 3 decades of active ICM is envisaged.</p> <p>(ii) Support for modeling the human dimension of adaptation to sea level rise.</p> <p>N: Awareness on island ecosystem structure and functioning, and benefits of ICM is primarily a task for Maldivian technical agencies, backed by participatory research.</p> <p>C: Communities are pivotal partners in map preparation since all land use decisions would be feasible based on consensus (supported as necessary by regulations).</p> <p>P: Participation of tourism and fishery industry representatives in ICM initiation is required from the outset to explore areas for private-public (P-P) partnerships and investment.</p>

PROGRAMMES OF WORK	ACTIONS/OUTPUTS	CONTRIBUTION TO RESULTS
<p>human dimension of impacts of global change and applied research to support decisions regarding long-term adaptation measures on scales down to a few kilometers. Modeling is absent on the required scale.</p>	<p>foundation for mapping, and ICM measures for formal and voluntary coastal managers at the island level (ecological boundary setting, protection &amp; managed use for development, dependent livelihood, strengthening local organizations and linking them to decision making processes, development of legal structures law enforcement, monitoring mechanisms, training) leading to an understanding of the evolution of a coastal management process.</p> <p>1.4 Carry out overall industry assessments of fisheries (including mariculture) and tourism to map out long term trajectories spanning about two decades to recognize the direction in economic growth and relationships with climate change implications and harmonization with NAPA and ecosystem-based ICM. Questions that may be raised are: (i) to what extent and where may cannibalization of incipient islands occur to safeguard threatened inhabited islands? (ii) what are the clusters of islands and associated incipient islands, perhaps in association with MPAs, whose long term integrity requires safeguards, (iii) what will be the linkages be among (i) &amp; (ii) and island ecosystem-based ICM.</p> <p>1.5 Progressively map the island and island-chain ecosystems on an appropriate scale to enable monitoring resources and diverse uses and facilitating ICM (understanding what exists and maintaining their integrity) to set them apart from the safer islands and other highly urbanized islands where coastal engineering has irreversible transformed the coast.</p> <p>1.6 Initiate anthropological studies on the selected islands to understand inheritance and migration patterns, gender relationships, youth aspiration among others to identify those population segments that may be classed as poor and are subject to multiple deprivation.</p> <p>1.7 Acquire technical information for promoting fishery diversification with a view to enhancing total contribution to fish supply (without shifting the stress from one species to another) while testing participatory techniques for improving efficiency of bait fish (reduce existing wastage &gt; 30% to less than 10%).</p>	
<p>2. Designing ecologically and socio-economically sound coastal ecosystem rehabilitation and management.</p> <p><u>Problems:</u> A. Weak or non-existent ICM in the 'safer island' programme. Engineering designs are insensitive to biodiversity.</p>	<p>2.1 Assess the 'safer island' programme of the GOM and identify the value-added contribution that can be made by the MFF through ICM with particular attention to the class of islands not addressed in the 'safer island' programme. ICM in these islands shall address:</p> <ul style="list-style-type: none"> <li>- coral reef habitat,</li> <li>- beach habitat,</li> <li>- waste management,</li> <li>- ground water quality,</li> <li>- community resilience for multiple hazards including floods,</li> <li>- reducing poverty implications of unsustainable natural resource use</li> <li>- strengthening participation - governance,</li> <li>- mapping mechanisms for enrolment of women in ICM,</li> <li>- awareness: adult and school-going population,</li> </ul>	
<p>3. Provide decision support for ridge-to-</p>	<p>Geo-physically not applicable to the Maldives. However, integrated management of the highest contours on the island terrace with the corals</p>	

PROGRAMMES OF WORK	ACTIONS/OUTPUTS	CONTRIBUTION TO RESULTS
<p>reef approaches to land resources management.</p> <p><u>Problems:</u> A. Depleted freshwater resources (viz. groundwater) stemming from salinity intrusion, post-tsunami contamination, inadequate investment. The situation is aggravated by increasing frequency of flooding in some island ecosystems (storms and swells).</p>	<p>reef extending to the edge of the island shelf is required with a view to addressing:</p> <ul style="list-style-type: none"> <li>• groundwater resources,</li> <li>• agriculture and food security,</li> <li>• beach stability,</li> <li>• coral reef integrity, and</li> <li>• relief to poor households situated at more exposed locations.</li> </ul> <p>3.1 Map the island terrace contours to determine the areas that may serve as ‘natural catchments’ for capture and recharge of groundwater with the objective of:</p> <ul style="list-style-type: none"> <li>• assessing the results of interventions that have addressed the water scarcity issue and draw lessons for ICM</li> <li>• designing management measures for facilitating groundwater recharge,</li> <li>• enabling managed extraction and shielding from salinity intrusion,</li> <li>• preventing contamination through improper wastewater management,</li> <li>• providing incentives for freshwater conservation including rainwater harvesting both collectively (e.g. schools) and individually by utilizing the SGF to set up replicable models.</li> </ul>	
<p>4. Integrating coastal ecosystem economic values in development planning and appraisal.</p> <p><u>Problems:</u> Contradiction between 7NDP and investment in small and medium islands.</p>	<p>4.1 Conduct total ecosystem valuation for island ecosystems (socio-ecological systems) aimed at facilitating investment decisions, taking into consideration:</p> <ul style="list-style-type: none"> <li>• value of lost opportunity to contribute to the national economy by a child born in an island ecosystem beset with deprivations relative to the counterpart in Male, and</li> <li>• appropriate discount periods (e.g. adult life spans relevant to active economic contribution).</li> </ul>	
<p>5. Learning from evaluation of the environmental effects of coastal management initiatives, including post-tsunami response.</p> <p><u>Problems:</u> Contradictions among several assessments, conclusions and recommendations based upon favoured positions of assessing entities</p>	<p>5.1 The available post-tsunami evaluations reveal that the impacts on biodiversity components of island ecosystems range from significant to insignificant while impacts on coral reefs may be erased in the short term without external intervention. The social impacts however were serious apart from lives lost and property damaged. The consequences of destruction of sanitation systems, saltwater seepage into groundwater, crop impacts are likely to have serious consequences. These are also the aspects that are most likely to be affected by smaller scale multiple hazards including storm and swell floods.</p> <p>5.1.1 Assess the social consequences of the tsunami of 2004 on small and medium inhabited islands with the objective of analyzing and understanding by way of participatory approaches:</p> <ul style="list-style-type: none"> <li>- location specific impacts on sewage systems,</li> <li>- character of floodwater (saltwater) retention areas that persisted for long periods and most likely caused salinization of the groundwater lens in a manner that the seasonal rains could not replenish,</li> <li>- explicit documentation of the differential impacts on women,</li> <li>- potential mitigatory measures in the event that channel and lagoon hydrodynamics did not have an overriding influence on inundation.</li> </ul>	

PROGRAMMES OF WORK	ACTIONS/OUTPUTS	CONTRIBUTION TO RESULTS
<b>ACTIONS TO STRENGTHEN EMPOWERMENT</b>		
<p>6. Promoting civil society awareness and participation in coastal decision making</p> <p><i>Maldivian reality: Highly resilient island communities that have adapted to common natural hazards but are unprepared for rare events such as the tsunami of 2004. Unheard voice of small and medium island coastal communities whose relatively small numbers are ignored within the existing political power structure and decision making processes where urban vote banks are overwhelming.</i></p> <p><u>Problems:</u> A. Development planning requires participation island communities leading to shared decisions on resource (island) allocation</p> <p>B. Inadequate incentives for sustained community advocacy (activism) on environmental interventions.</p>	<p>6.1 Create information material including translation to Dhivehi of all documents that can provide understanding of the:</p> <ul style="list-style-type: none"> <li>• structure and functioning of island and island-chain ecosystems in the context of relevant hydrodynamics in terms of the four essential ecosystem characteristics;</li> <li>• nature and origins of natural hazards including balanced presentation of future megathrust tsunamis (improbable in the next 400 years) based on expert analysis of the Sunda and Sumatran Megathrust Faults such as by Sieh (2005, 2006);</li> <li>• the more realistic short term hazards such as storms and swells;</li> <li>• practical mitigatory measures such as investment in shelters and warning systems (e.g. Bangladesh);</li> <li>• value of lost opportunities based upon economic valuations of inadequate investment by the GOM;</li> <li>• income opportunities that exist through partnership building with the private sector with appropriate equity contributions (labour, security for investments) from island communities based upon professionally prepared business plans aimed particularly at food security, eco-tourism and mariculture;</li> <li>• acquisition of ‘common property rights’ to island clusters (inhabited and uninhabited) that can serve as community assets for livelihood enhancement, empowerment and promotion of good governance (see Definitions);</li> <li>• the role of advocacy and political activism and relationship to the media, to NGOs, and to international networking through modern communication technology;</li> <li>• development of relevant case study documentaries.</li> </ul>	
<p>7. Building the capacity of professional coastal managers for integrated coastal management.</p> <p><u>Problems:</u></p>	<p>7.1 Conduct a needs survey including all atolls (five Development Regions) to determine:</p> <ul style="list-style-type: none"> <li>- the ‘head count’ number of professional coastal managers required during the next 3 decades;</li> <li>- the incentives required (reward system) to retain their professional services at the level of the atoll (or Development Regions) and career path leading to the central offices (Male);</li> <li>- the range of multi-disciplinary skills that need to be imparted to the coastal managers for field level discharge of responsibilities to:</li> </ul>	



PROGRAMMES OF WORK	ACTIONS/OUTPUTS	CONTRIBUTION TO RESULTS
<p>A. Inadequate cadre of professional coastal managers and associated research staff to apply ecosystem-based ICM planning and adaptive management techniques to island and island-chain ecosystems.</p> <p>B. Lack of a mapped knowledge base for training professional coastal managers (see Programme of Work No. 1)</p>	<ul style="list-style-type: none"> <li>• generate constructive political activism at the island level, and</li> <li>• coordination and advisory roles at the central level.</li> </ul> <p>7.2 Develop a curriculum for training in ICM to be used at the Maldives College of Higher Education including:</p> <ul style="list-style-type: none"> <li>- field based staff training in diverse forms of information collection, fisheries, anthropological, mapping, and other technical subjects;</li> <li>- social mobilization skills, 'learning to listen' and assist local communities in planning their own socio-economic development,</li> <li>- multidisciplinary research.</li> </ul> <p>7.3 Build the planning skills of members of island development committees and similar grassroots level organizations to enable informed interaction with 'coastal managers'.</p>	
<p>8. Supporting environmentally sustainable livelihoods among coastal communities</p> <p><u>Problems:</u></p> <p>A. The contrasting perceptions pertaining to the coral reef fishery (e.g. stock depleted versus not depleted). The fishers do not acknowledge depletion while tourist interests (contributing 70% to GDP) perceive depletion and seek strict regulation.</p>	<p>8.1 Conduct national media campaigns advocating appropriate forms of 'common property rights' for small and medium island communities to contribute toward asset building. These assets may serve in investment partnerships with the private sector to generate enhanced personal income and community investment funds.</p> <p>8.2 Study population trends of coral reef fish to provide information for stock management (long term study with phased short and medium term reporting for planning), particularly species with</p> <ul style="list-style-type: none"> <li>• high demand from tourist sector,</li> <li>• export demand, and</li> <li>• species captured as bait</li> </ul> <p>8.3 Determine the market relations that drive the coral reef fishery (tourist sector, bait fishery) to reduce exploitation of fisherfolk by commercial interests and to ensure equitable pricing.</p> <p>8.4 Research and determine feasibility of changing the coral reef fishery from its existing 'open access' to a 'common property resource-CPR' management system whereby legal and financial incentives are provided for co-management (PC: public-community, and possible PPC: public-private-community) to serve multiple uses and to empower fishers in negotiations related to conflict resolution and development of a code of conduct incorporating the essential elements that contribute to sustainability of CPR management.</p> <p>8.5 Value the coral reef fishery from a multiple use perspective and apply discount rates that are compatible with long term persistence of 'island' and 'island-chain ecosystem' (see 4.1).</p> <p>8.6 Initiate research on investment in mariculture as PC partnerships (private-community partnerships) based upon:</p> <ul style="list-style-type: none"> <li>• coral reef species with high local tourist market;</li> <li>• species used in bait fishery;</li> <li>• labour and security for culture systems as equity contribution from</li> </ul>	

PROGRAMMES OF WORK	ACTIONS/OUTPUTS	CONTRIBUTION TO RESULTS
	island communities (individually, or collectively through 'Island Development Committees')	
<p>9. Improving community resilience to natural disasters</p> <p><u>Problems:</u> A. Absence of scientific information on the relative exposure of coastal communities to multiple hazards.</p>	<p>9.1 Assess the relevance of the national vulnerability and risk assessment programme being conducted under the MNDP to understand relevance and implications for island ecosystems.</p> <p>9.1.1 The communities located at sites with higher exposure and vulnerability may then be trained to explore the 4 factors that contribute to resilience:</p> <ul style="list-style-type: none"> <li>- robustness of infrastructure;</li> <li>- resourcefulness;</li> <li>- rapid recovery – doing things quickly to get back on the feet;</li> <li>- absorb lessons learnt including shifting to safer locations.</li> </ul>	
<p>10. Identifying sustainable financing mechanisms for coastal ecosystem conservation</p> <p><u>Problems:</u> A. Coastal communities lack assets to enter into P-P partnerships for implementing sustainable financing mechanisms (e.g. eco-tourism, mariculture etc)</p> <p>B. Island allocation for private sector investment is predominantly with the elite power structure in the absence of formalized community rights of common property resources (CPRs).</p>	<p>10.1 Three classes of opportunity (based upon shared interests of the private tourism sector and public sector coastal development) already exist in the spatial structure of the tourism industry (200 inhabited islands and &gt;87 resort islands, and the ratio of tourists:Maldivians :: 2:1) , Viz.:</p> <ul style="list-style-type: none"> <li>• (i) Symbiosis between tourism and development of public infrastructure for local community where islands are shared.</li> <li>• (ii) Collaboration and technology sharing between carbon-neutral resort islands and inhabited islands which have also made progress in this regard.</li> <li>• (iii) Twinning between resort islands and contiguous inhabited islands for technology transfer.</li> <li>• (iv) Adoption of inhabited islands by resorts for technology transfer where (i) and (ii) are not feasible options.</li> </ul> <p>10.1.1 The foundation for P-P partnerships could be established by</p> <ul style="list-style-type: none"> <li>- Mapping of every inhabited island including the exclusive use zone and the land uses,</li> <li>- Guided dialogue between the private sector and island/atoll representatives (within the decentralization framework) to understand mutual interests, appropriate incentives and institutional arrangements that would enable dovetailing with the long term adaptation requirements (Ref: NAPA),</li> <li>- Developing institutional arrangements with the GOM for island ecosystem based ICM model development.</li> </ul>	
<b>ACTIONS TO ENHANCE GOVERNANCE</b>		
<p>11. Supporting national integrated coastal management programmes</p> <p><u>Maldivian reality:</u> <i>Exclusion of coastal</i></p>	<p>11.1 Assessment of regulatory institutional relationships focused on identification of the 'weak links' in law enforcement supported by actual case histories to demonstrate positive and negative consequences. This would reveal:</p> <ul style="list-style-type: none"> <li>- sectoral conflicts;</li> <li>- deficiencies of the laws;</li> <li>- relationship among power structures;</li> </ul>	<p>N1.1 Clarity in the institutional weaknesses that need strengthening to support balanced and transparent law</p>

PROGRAMMES OF WORK	ACTIONS/OUTPUTS	CONTRIBUTION TO RESULTS
<p><i>communities from meaningful developmental decision making coupled with biased law enforcement.</i></p> <p><u>Problems:</u> A. Regulatory and law enforcement mandates fragmented among separate government agencies in contradiction with ecology.</p>	<p>- mechanisms for acquiring transparency and accountability.</p> <p>11.2 Awareness raising at the coastal community level to reveal the consequences of law enforcement weaknesses and steps to be taken individually and collectively to safeguard against negative externalities on coastal ecosystems. The awareness raising may promote:</p> <ul style="list-style-type: none"> <li>- public interest litigation leading to development of case law;</li> <li>- preventing land expropriation, allocation of uninhabited islands to private sector without consultation of traditional users;</li> <li>- public attention on island livelihoods.</li> </ul> <p>11.3 Support for media campaigns based on the technical aspects of ecosystem decline stemming from weak law enforcement and improper land use.</p>	<p>enforcement.</p> <p>N1.2 Strengthened alliances and procedures to improve environmental law enforcement and compliance.</p> <p>C1. Organized political activist cells that can link with media to acquire public attention</p>
<p>12. Strengthening the integration and enforcement of environmental and social safeguards in coastal land use planning</p> <p><u>Problem:</u> Exclusive resource use rights for inhabited islands already exist</p>	<p>12.1 Explore mechanisms for common property resource rights for clusters of inhabited and uninhabited islands which serve fishery and agricultural interests to promote investment and economic growth.</p>	
<p>13. Building national systems of marine and coastal protected areas that contribute to a regional network</p>	<p>13.1 Maldives already has a system of 25 MPAs. Additionally three protected land areas (mangrove areas of K. Huraa, Eidhigali Kulhi and Koathey area of S. Hithadhoo. Protected islands include ADh. Hurasdhoo. B. Olhugiri and Ga. Hithaadhoo. This system is anticipated to expand in keeping with tourism demand and a favourable public perception (ERC, 2007).</p>	
<p>14. Promoting adaptive coastal management that includes ongoing ecological and socio-economic assessment and monitoring</p> <p><u>Problem</u> Every inhabited island is characterized by 'high risk' because of the concentration of life and property. Therefore each must have a fully trained</p>	<p>14.1 Summarize lessons from recent coastal hazards including (i) high wave incident of 1987 which flooded 1/3<sup>rd</sup> of Male, (ii) wind and storm impacts of 1991, and (iii) tsunami 2004 in order to acquire information for adaptive learning in order to address impacts of climate aberrations and sea level rise. The lessons may be sifted to provide knowledge with regard to the following criteria:</p> <ul style="list-style-type: none"> <li>- robustness,</li> <li>- resourcefulness – participation (will + organization + skills),</li> <li>- rapid recovery,</li> <li>- absorbing lessons from experience.</li> </ul>	

PROGRAMMES OF WORK	ACTIONS/OUTPUTS	CONTRIBUTION TO RESULTS
and capable local population to address hazards.		
15. Encouraging environmentally sustainable business practices in coastal areas  <u>Problem:</u>	15.1 The key business is tourism. A ‘green credit’ system may facilitate the GOM in achieving a national carbon-neutral status. The multiple criteria may include: - sanitation, - waste disposal, - recreation management’ - seagrass management’ - participation in twinning and adoption programmes, - carbon footprint, - quality of eco-tourism certified by a ‘green certification’ committee.	

*(ii) NSAP Implementation*

The NSAP is a strategic and flexible document which has to be translated into practical action at inhabited islands. It has to be implemented in a very complex environmental context where biophysical and social diversity among island ecosystems is very high. Moreover they are highly dispersed. The national regionalization and decentralization policy provides a foundation for practical action in the context of local reality and relies on:

- Participation and capacities of the people of the islands;
- Deliberation based upon appropriate scientific knowledge that would ensure decisions are based on reason (science); and
- Empowerment ensuring that discussion is tied to action that is perceived to be meaningful and accessible to monitoring.

The island populations are relatively small and enable inclusive consultation and comprehensive participation to arrive at the combination of actions that would be responsive to problems and issues on a particular island (Fig. 4.3). Despite diversity, the islands selected for establishing ICM models could demonstrate deliberative, democratic practice that can be expanded horizontally to other islands and Provinces and vertically into higher and lower levels of institutional and social life. The first step in the process of ICM model building is impartial selection of the islands to provide legitimacy to the national process.

*(iii) Impartial Selection of Island Ecosystems for ICM Model Demonstration*

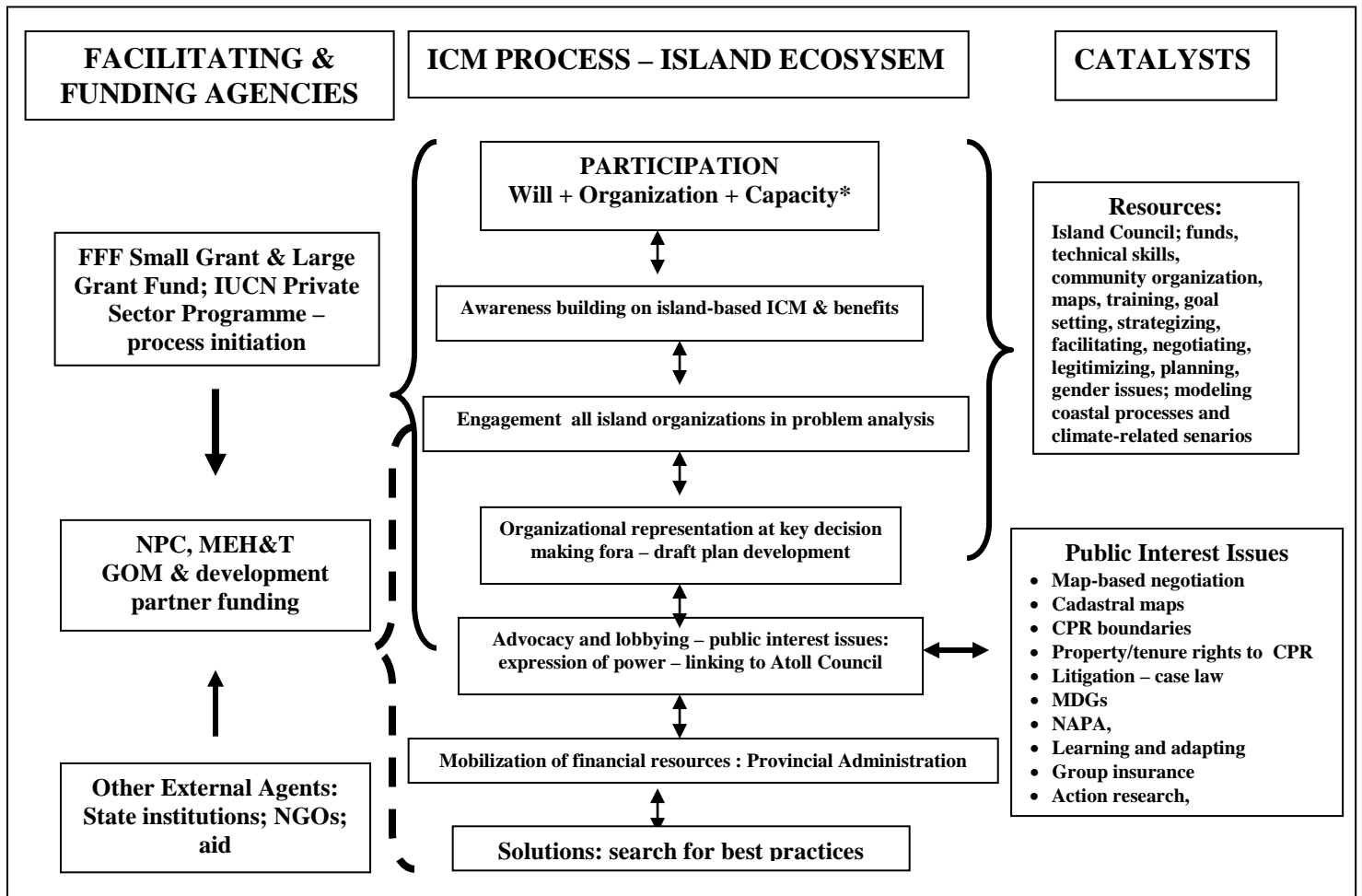
Selection of islands for ICM model building could be based upon a system of scoring multiple attributes of islands. The scores acquired then may be weighted based upon national policy criteria. Annex 6 provides a proposed scoring scheme and a method for assigning weights. The identification notations are in the provincial maps [Annex 7(a)-7(g)]. The corresponding scores assigned to every inhabited island are in the spreadsheet accompanying the provincial maps [Annex 6 – Table A6.2]. The development of an island-specific action plan (e.g. in the form of a logframe) would then follow. The planning principles that would be fundamental are:

- (i) A focus on specific, tangible problems,
- (ii) Involvement of ordinary people affected by these problems and officials close to them, and
- (iii) The deliberative development of solutions to these problems supported by technical information provided by relevant government agencies.

The institutional design features are already embodied in the national policy on regionalization and decentralization (Fig. 4.4).

- (1) devolution of public decision authority to empowered local units, particularly 'Island Councils);
- (2) creation of formal linkages of responsibility, resource distribution, and communication that connect these units to each other and to superordinate, more centralized authorities; and
- (3) use and generation of new state institutions to support and guide these decentered problem solving efforts rather than leaving them as informal or voluntary affairs.

Fig.4.3 - The process and content of participation in developing an island ecosystem based ICM plan. The participation of the government institutions provides cohesion. Initiation of NSAP implementation may be supported by grant funds from the MFF Programme. The 'subsidiarity principle' will be meaningful based on awareness and training and multi-sectoral integration supported by maps and models.



**(iv) Harmony and Synergy with Existing Plans**

The NSAP will adhere to the guiding principle of inclusive participation in the method of preparation of the island-specific action plan under the guidance and supervision of the Island Council. Consensus based interventions shall be prioritized for financial support from the MFF Small Grants Fund (SGF) and Large Grants Fund (LGF).

The National Planning Council (NPC)

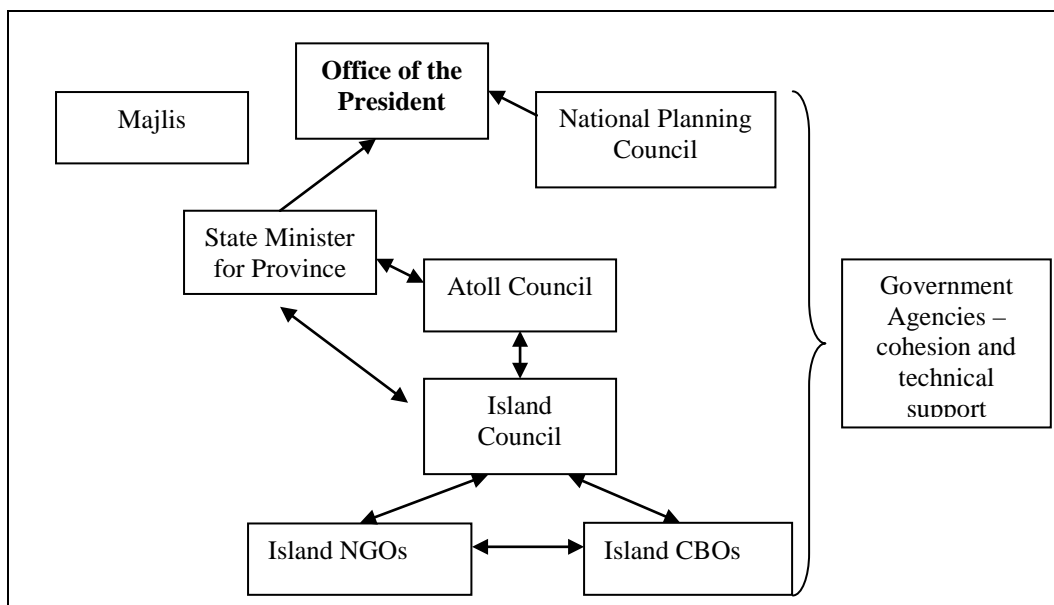
The role and responsibilities in relation to NSAP requires clarification.

7<sup>th</sup> National Development Plan (7NDP)<sup>5</sup>

7NDP is operational from 2006 to 2010 is the overarching policy with which all subsidiary plans must harmonize. The role of Vision 2020 has to be clarified in relation to the role of the NPC. The guiding principles of the 7NDP shared by the MFF NSAP are:

- Ensuring environmental sustainability,
- Providing economic opportunity for all within an implementation site,
- Promoting gender equality, and especially women’s empowerment as necessary,
- Enabling private and civil society participation.

**Fig.4.4 - The governance relationships among the President, Majlis, National Planning Council, Central Government administration, Atoll Council and Island Council. The ICM actions plan is developed by the Island Council and ratified at the higher institutional levels.**



<sup>5</sup> [http://www.planning.gov.mv/en/images/stories/ndp/seventh\\_ndp.pdf](http://www.planning.gov.mv/en/images/stories/ndp/seventh_ndp.pdf)

### National Adaptation Programme of Action (NAPA)<sup>6</sup>

NAPA is consistent with the policy directives of the 7NDP and adopts a programmatic approach to development which would necessarily imply integration. It seeks to create meaningful partnerships among public sector, private sector and civil society in a mutually supportive (symbiotic) manner. Its four objectives are:

- Reduce degree of adverse effects of climate change,
- Reduce poverty and promote equality to enhance adaptive capacity,
- Achieve synergy with national development goals, and
- Cost effectiveness.

The NAPA priorities are confluent with the MFF NSAP fundamentally by virtue of the latter's definition of 'coastal ecosystem' and 'integrated coastal management – ICM'. Additionally the MFF NSAP shall seek to acquire harmony by way of careful consideration of the (i) priority adaptation actions, and (ii) urgent and immediate adaptation projects that are already formulated for implementation under NAPA. The harmonization and integration shall be achieved during island based ICM planning under Island Councils.

### National Environmental Action Plan (NEAP-3)<sup>7</sup>

The third National Environment Action Plan (NEAP 3) sets out the agenda for environmental protection and management for the five year period 2009 – 2013. This plan is targeted to achieve measurable environmental results that matter to the people of the Maldives. The six strategic results of NEAP3 that are expected are: resilient islands; rich ecosystems; healthy communities; safe water; environmental stewardship; and a carbon neutral nation. NEAP3 provides the basis for environmental planning, budgeting, performance measurement, and accountability. Every year, annual performance targets and indicators will be presented in the budget request to be made to the Parliament. The performance against these goals and targets will be reported in the subsequent Annual Report on environmental protection.

### National Biodiversity Strategy and Action Plan (NBSAP)<sup>8</sup>

The three goals of the National Biodiversity Strategy and Action Plan are:

1. Conserve biological diversity and sustainably utilize biological resources.
2. Build capacity for biodiversity conservation through a strong governance framework, and improved knowledge and understanding.
3. Foster community participation, ownership and support for biodiversity conservation.

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<sup>6</sup> [http://www.mv.undp.org/documents/NAPA\\_final\\_draft\\_V3.pdf](http://www.mv.undp.org/documents/NAPA_final_draft_V3.pdf)

<sup>7</sup> [http://env.rol.net.mv/docs/Reports/Third%20National%20Environment%20Action%20Plan/NEAP\\_3\\_Final.pdf](http://env.rol.net.mv/docs/Reports/Third%20National%20Environment%20Action%20Plan/NEAP_3_Final.pdf)

<sup>8</sup> <http://www.cbd.int/doc/world/mv/mv-nbsap-01-en.pdf>

The National Commission for Protection of the Environment (NCPE) will act as a steering committee to coordinate the implementation programme. It will adopt work plans for various programmes, oversee timely implementation and monitor progress. A technical committee will be established to advise the steering committee on technical aspects of programmes and play a key role in monitoring and reviewing the progress of the NBSAP. In addition, the priority activities and project profiles presented in the document will guide the implementation of the NBSAP.

**(v) Monitoring & Evaluation Strategy: Learning and Adapting**

Monitoring and evaluation of the consequences of ICM, and the manner in which decision makers and coastal managers use that information will determine success or failure of the NSAP. This information may be used as an opportunity for extracting lessons from actual experience, and for applying them toward improving future endeavor. The latter constitutes learning and adapting and serves as a tribute to the continuing effort of human beings to enhance their wellbeing. This is incorporated into the NSAP (POW 14).

The choice of indicators is key to meaningful monitoring and evaluation. Carefully selected and measured indicators can reveal the manner in which coastal ecosystems contribute as development infrastructure (see Table 4.2). Brief reflection on the ICM learning cycle (Fig. 4.5) sets the foundation for the NSAP monitoring and evaluation strategy. When the ICM learning cycle is in harmony with the corresponding policy cycle (Fig. 4.5), the purpose of learning, and implications for coastal governance becomes clearer (Olsen, Lowry & Tobey, 1999). A distinction among, governance<sup>9</sup>, government<sup>10</sup> and management<sup>11</sup> here becomes necessary.

**Fig.4.5 The learning cycle for ecosystem-based ICM that establishes the foundation for adaptive management is related to the ICM policy cycle. The sequence of numbers reflects comparable behavioural attributes of decision makers, coastal managers and stakeholders responsible who participate in each step.**

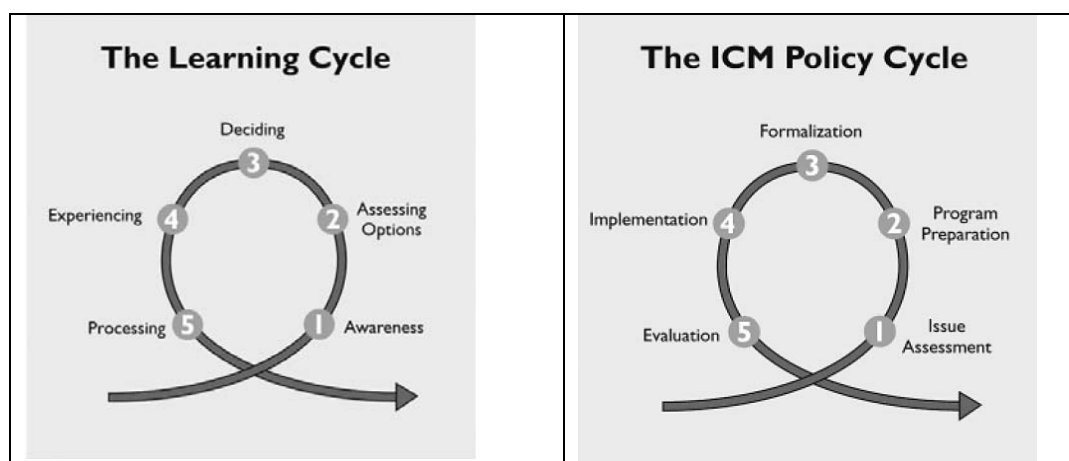
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<sup>9</sup> *Governance*: Governance is the process by which human societies negotiate the purpose, rules and procedures by which they regulate their activities and distribute power, access to resources and wealth. All governance systems are driven by the values that reflect what a society believes to be important. In its simplest form, governance is the process of decision-making. Balanced governance of coastal ecosystems may be achieved where participation occurs of all stakeholders including civil society, not only government.

<sup>10</sup> *Government*: Government pertains to the administration and enforcement of laws, rules and regulations. Thus, government may or may not be equitable depending on the manner in which decisions are made by those in positions of responsibility. Decisions may or may not be inclusive.

<sup>11</sup> *Management*: Management is the process by which human and material resources are harnessed to achieve a known goal within a known institutional structure. Governance sets the stage in which management occurs by defining or re-defining the fundamental objectives, policies, laws and institutions by which societal issues are addressed.





**Table 4.2. Indicators that require monitoring, evaluation and measurement in an ecosystem-based ICM process (adapted from Olsen, Lowry & Tobey, 1999)**

Step	Indicators
Step 1: Issue identification and assessment	<ul style="list-style-type: none"> <li>➤ Principal environmental, social and institutional concerns and their implications assessed.</li> <li>➤ Major stakeholders and their interests identified</li> <li>➤ Issues upon which the ICM initiative will focus its efforts selected</li> <li>➤ Goals of the ICM initiative defined</li> <li>➤ Stakeholders actively involved in the assessment and goal setting process</li> </ul>
Step 2: Plan preparation	<ul style="list-style-type: none"> <li>➤ Scientific research on selected management questions conducted</li> <li>➤ Boundaries of the areas to be managed defined</li> <li>➤ Baseline conditions documented</li> <li>➤ Action plan and institutional framework by which it will be implemented defined</li> <li>➤ Institutional capacity for implementation being developed</li> <li>➤ Second order behavioural change strategies at pilot scales tested</li> <li>➤ Stakeholders actively involved in planning and pilot project activities</li> </ul>
Step 3: Formal plan adoption & funding	<ul style="list-style-type: none"> <li>➤ Policies/plan formally endorsed and authorities necessary for their implementation provided</li> <li>➤ Funding required for programme implementation obtained</li> </ul>
Step 4: Implementation	<ul style="list-style-type: none"> <li>➤ Behaviour of strategic partners monitored, strategies adjusted</li> <li>➤ Social/ecosystem trends monitored and interpreted</li> <li>➤ Investments in necessary infrastructure made</li> <li>➤ Progress and attainment of Third Order outcomes documented</li> <li>➤ Participation of major stakeholder groups sustained</li> <li>➤ Constituencies, authorities and funding sustained</li> <li>➤ Program learning and adaptations documented</li> </ul>
Step 5: Self assessment and external evaluation	<ul style="list-style-type: none"> <li>➤ Program outcomes documented</li> <li>➤ Management issues reassessed</li> <li>➤ Priorities and policies adjusted to reflect experience and changing social &amp; environmental conditions</li> <li>➤ External evaluation conducted at junctures in the program's evolution</li> <li>➤ New issues or areas for inclusion in the programme identified</li> </ul>

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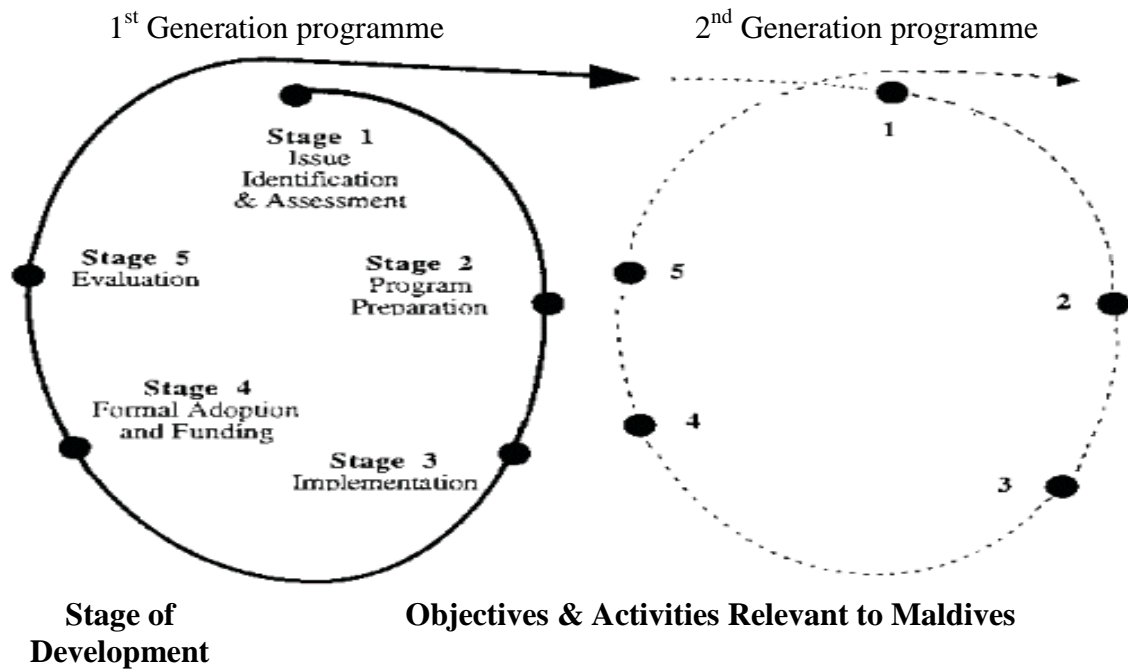
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**Annex 1.** *Process of development of a national ICM programme*

1: Issue identification and assessment

To define the requirements of an ICM programme based upon island ecosystems. Compile, integrate and prioritize information to define the environmental, social and institutional context in which the ICM programme will proceed. The major topics to address are (i) condition of coastal ecosystems, (ii) policy and institutional context, and (iii) the development context.

2: Programme preparation

The main purpose is to develop a management plan that constitutes a 'vision for the future'. This can be achieved by evaluating different options for action through a usually protracted consultative and planning process. The process of planning must incorporate the community level stakeholders of island ecosystems in a manner that they will, in their own interest, actively support management strategies and objectives.

3. Formal adoption and funding

To acquire high level administrative decision from the head/government agency, minister, cabinet or even presidential endorsement. This includes consideration and agreement on a budget from the central fund. However, a preliminary allocation may be considered to start off the process including assessments at Stage 1.

4. Implementation

To operationalize the management plan including resource development, institutional arrangements, monitoring systems, application of controls, regulations and incentives. Implementation invariably presents new, sometimes unforeseen, challenges and obstacles. Priority activity during this stage include (i) conflict resolution and public education, (ii) inter-agency coordination, training of coastal managers, (iii) infrastructure construction, planning and research on new areas and problems, and (iv) development actions.

5. Evaluation

To learn optimally from implementation experience. Evaluation addresses two broad questions (i) what did the 1<sup>st</sup> (or previous) generation programme accomplish and what can be learned in designing the next generation programme, and (ii) How have the priority issues and governance changed since the programme was initiated. Evaluation is essential to prevent the onset of institutional inertia.

**Annex 2: Population size, annual growth rate and population density by island**

Locality	Population 2006			Avg. annual growth rate	Area <sup>1</sup> (ha)	Population density
	Both sexes	Male	Female			2006
<b>Republic</b>	<b>298,968</b>	<b>151,459</b>	<b>147,509</b>	<b>1.69</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>29,964</b>	<b>14,833</b>	<b>15,131</b>	<b>1.57</b>	<b>NA</b>	<b>NA</b>
<b>Non administrative Islands</b>	<b>13,314</b>	<b>6,132</b>	<b>7,182</b>	<b>5.27</b>	<b>NA</b>	<b>NA</b>
<b>Male'</b>	<b>103,693</b>	<b>51,992</b>	<b>51,701</b>	<b>5.59</b>	<b>197.00</b>	<b>*469.82</b>
Henveiru	23,597	11,648	11,949	4.41	NA	NA
Galolhu	19,414	9,578	9,836	5.58	NA	NA
Machchangolhi	19,580	9,544	10,036	6.07	NA	NA
Maafannu	29,964	14,833	15,131	4.85	NA	NA
Villingili	6,956	3,462	3,494	8.02	26.90	258.59
Hulhumale'	2,866	1,620	1,246	NA	NA	NA
Hulhule and harbour	1,316	1,307	9	NA	NA	NA
<b>All Atolls</b>	<b>195,275</b>	<b>99,467</b>	<b>95,808</b>	<b>-0.06</b>	<b>NA</b>	<b>NA</b>
<b>Admin. islands in Atolls</b>	<b>13,801</b>	<b>6,596</b>	<b>7,205</b>	<b>-0.33</b>	<b>NA</b>	<b>NA</b>
<b>Non admin. islands in Atolls</b>	<b>33,806</b>	<b>16,956</b>	<b>16,850</b>	<b>5.27</b>	<b>NA</b>	<b>NA</b>
<b>North Thiladhunmathi (HA)</b>	<b>13,495</b>	<b>6,311</b>	<b>7,184</b>	<b>-0.80</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>13,314</b>	<b>6,132</b>	<b>7,182</b>	<b>-1.00</b>	<b>NA</b>	<b>NA</b>
Thuraakunu	347	150	197	-2.85	22.00	15.77
Uligamu	267	119	148	-3.32	112.68	2.37
Berinmadhoo <sup>1</sup>	0	0	0	NA	14.59	NA
Hathifushi	101	53	48	-6.57	4.10	24.63
Mulhadhoo	172	84	88	-7.12	118.18	1.46
Hoarafushi	2,204	1,051	1,153	-0.13	63.10	34.93
Ihavandhoo	2,447	1,209	1,238	2.84	60.54	40.42
Kelaa	1,200	527	673	0.06	213.38	5.62
Vashafaru	471	210	261	-3.94	31.38	15.01
Dhidhdhoo	2,512	1,130	1,382	-1.60	50.63	49.61
Filladhoo	548	253	295	-3.06	225.60	2.43
Maarandhoo	530	264	266	0.32	41.14	12.88
Thakandhoo	340	127	213	-6.64	45.00	7.56
Utheemu	521	205	316	-1.90	46.99	11.09
Muraidhoo	451	193	258	-1.14	49.50	9.11
Baarah	1,203	557	646	-0.90	248.80	4.84

Locality	Population 2006			Avg. annual growth rate	Area <sup>1</sup> (ha)	Population density
	Both sexes	Male	Female			2006
<b>Resorts and Industrial Islands</b>	<b>181</b>	<b>179</b>	<b>2</b>	<b>36.59</b>	<b>NA</b>	<b>NA</b>
Resorts	115	113	2	NA	NA	NA
Industrial and Other Islands	66	66	0	NA	NA	NA
<b>South Thiladhunmathi (HDh)</b>	<b>16,237</b>	<b>7,503</b>	<b>8,734</b>	<b>-0.72</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>16,214</b>	<b>7,486</b>	<b>8,728</b>	<b>-0.65</b>	<b>NA</b>	<b>NA</b>
Faridhoo	87	38	49	-10.02	23.27	3.74
Hanimaadhoo	1,184	583	601	2.66	259.47	4.56
Finney	291	116	175	-1.94	118.40	2.46
Naivaadhoo	375	160	215	-3.72	25.68	14.60
Hirimaradhoo	351	156	195	-1.10	42.88	8.19
Nolhivaranfaru	260	118	142	-7.89	150.16	1.73
Nellaidhoo	717	319	398	-0.73	29.74	24.11
Nolhivaramu	1,554	707	847	-0.02	221.10	7.03
Kuribi	430	207	223	-1.23	31.64	13.59
Kuburudhoo	85	35	50	-17.31	41.80	2.03
Kulhudhuffushi	6,998	3,299	3,699	1.02	172.20	40.64
Kumundhoo	889	402	487	-1.33	178.35	4.98
Neykurendhoo	835	370	465	-2.14	162.99	5.12
Vaikaradhoo	923	395	528	-4.50	96.54	9.56
Maavaidhoo	190	76	114	-8.66	36.48	5.21
Makunudhoo	1,045	505	540	-0.44	60.71	17.21
<b>Resorts and Industrial Islands</b>	<b>23</b>	<b>17</b>	<b>6</b>	<b>-23.21</b>	<b>NA</b>	<b>NA</b>
Resorts	0	0	0	NA	NA	NA
Industrial and Other Islands	23	17	6	NA	NA	NA
<b>North Miladhunmadulu (Sh)</b>	<b>11,940</b>	<b>5,641</b>	<b>6,299</b>	<b>0.76</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>11,830</b>	<b>5,535</b>	<b>6,295</b>	<b>0.63</b>	<b>NA</b>	<b>NA</b>
Kaditheemu	1,148	531	617	0.98	89.83	12.78
Noomaraa	412	174	238	-2.01	35.44	11.63
Goidhoo	416	180	236	-0.82	106.16	3.92
Feydhoo	695	324	371	0.93	81.73	8.50
Feevah	746	350	396	1.15	79.17	9.42

Locality	Population 2006			Avg. annual growth rate	Area <sup>1</sup> (ha)	Population density
	Both sexes	Male	Female			2006
Bilehffahi	398	175	223	-2.08	58.35	6.82
Foakaidhoo	1,201	566	635	2.06	55.55	21.62
Narudhoo	426	202	224	0.80	41.77	10.20
Maakadoodhoo	0	0	0	NA	90.70	NA
Maroshi	495	231	264	-3.42	26.72	18.53
Lhaimagu	529	245	284	1.17	37.41	14.14
Firubaidhoo <sup>1</sup>	0	0	0	NA	14.23	NA
Komandoo	1,333	644	689	-2.24	5.96	223.66
Maugoodhoo	795	381	414	2.30	26.66	29.82
Funadhoo	1,599	767	832	11.52	86.38	18.51
Milandhoo <sup>2</sup>	1,637	765	872	NA	125.50	13.04
<i>Note: Maakadoodhoo population now residing in Milandhoo</i>						
<b>Resorts and Industrial Islands</b>	<b>110</b>	<b>106</b>	<b>4</b>	<b>33.10</b>	<b>NA</b>	<b>NA</b>
Resorts	0	0	0	NA	NA	NA
Industrial and Other Islands	110	106	4	NA	NA	NA
<b>South Miladhunmadulu (N)</b>	<b>10,015</b>	<b>4,589</b>	<b>5,426</b>	<b>-0.67</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>10,015</b>	<b>4,589</b>	<b>5,426</b>	<b>-0.67</b>	<b>NA</b>	<b>NA</b>
Hebadhoo	396	160	236	-0.86	19.70	20.10
Kedhikolhudhoo	1,204	565	639	1.29	218.70	5.51
Maalhendhoo	561	278	283	-0.24	33.60	16.70
Kudafari	373	166	207	-0.99	22.50	16.58
Landhoo	582	258	324	-1.91	81.20	7.17
Maafaru	710	305	405	-1.09	114.30	6.21
Lhohi	552	272	280	0.80	35.20	15.68
Miladhoo	784	336	448	-0.56	18.10	43.31
Magoodhoo	209	92	117	-2.44	30.50	6.85
Manadhoo	1,201	565	636	-0.52	92.20	13.03
Holhudhoo	1,527	680	847	-0.38	17.20	88.78
Fodhdhoo	200	90	110	-5.35	24.60	8.13
Velidhoo	1,716	822	894	-1.39	42.60	40.28
<b>North Maalhosmadulu (R)</b>	<b>14,756</b>	<b>7,136</b>	<b>7,620</b>	<b>0.31</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>14,643</b>	<b>7,024</b>	<b>7,619</b>	<b>0.25</b>	<b>NA</b>	<b>NA</b>
Alifushi	1,974	939	1,035	2.12	45.63	43.26
Vaadhoo	320	141	179	0.05	31.30	10.22



Locality	Population 2006			Avg. annual growth rate	Area <sup>1</sup> (ha)	Population density
	Both sexes	Male	Female			2006
Rasgetheemu	504	236	268	-2.53	30.40	16.58
Agolhitheemu	272	111	161	-3.95	31.70	8.58
Ugoofaaruu	2,988	1,471	1,517	16.77	28.10	106.33
Kadhohudhoo <sup>3</sup>	0	0	0	NA	11.21	NA
Maakurathu	877	413	464	1.32	43.40	20.21
Rasmaadhoo	487	242	245	-1.84	22.70	21.45
Innamaadhoo	537	266	271	1.45	27.80	19.32
Maduvvari	1,558	745	813	0.30	16.40	95.00
Iguraidhoo	1,278	614	664	0.05	35.80	35.70
Fainu	251	120	131	0.13	50.10	5.01
Meedhoo	1,736	838	898	3.22	30.60	56.73
Kinolhas	345	163	182	-0.80	44.90	7.68
Hulhudhuffaaruu	1,516	725	791	7.96	48.60	31.19
<b>Resorts and Industrial Islands</b>	<b>113</b>	<b>112</b>	<b>1</b>	<b>9.97</b>	<b>NA</b>	<b>NA</b>
Resorts	109	108	1	NA	NA	NA
Industrial and Other Islands	4	4	0	NA	NA	NA
<b>South Maalhosmadulu (B)</b>	<b>9,578</b>	<b>4,973</b>	<b>4,605</b>	<b>-0.06</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>8,893</b>	<b>4,316</b>	<b>4,577</b>	<b>-0.51</b>	<b>NA</b>	<b>NA</b>
Kudarikilu	355	159	196	-1.48	13.70	25.91
Kamadhoo	231	117	114	-1.77	16.20	14.26
Kendhoo	858	435	423	2.06	14.50	59.17
Kihaadhoo	275	127	148	0.43	26.40	10.42
Dhonfanu	305	147	158	-1.41	12.60	24.21
Dharavandhoo	740	341	399	0.36	45.50	16.26
Maalhos	392	184	208	1.93	23.20	16.90
Eydhafushi	2,409	1,160	1,249	0.06	22.20	108.51
Thulhaadhoo	1,759	860	899	-1.64	4.97	353.92
Hithaadhoo	758	369	389	-3.15	28.39	26.70
Fulhadhoo	194	100	94	-2.68	31.50	6.16
Fehendhoo	114	62	52	-4.45	20.60	5.53
Goidhoo	503	255	248	1.45	113.54	4.43
<b>Resorts and Industrial Islands</b>	<b>685</b>	<b>657</b>	<b>28</b>	<b>7.35</b>	<b>NA</b>	<b>NA</b>
Resorts	562	534	28	NA	NA	NA
Industrial and Other Islands	123	123	0	NA	NA	NA

Locality	Population 2006			Avg. annual growth rate	Area <sup>1</sup> (ha)	Population density
	Both sexes	Male	Female			2006
<b>Faadhippolhu (Lh)</b>	<b>9,190</b>	<b>4,732</b>	<b>4,458</b>	<b>-0.35</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>8,346</b>	<b>3,973</b>	<b>4,373</b>	<b>-0.55</b>	<b>NA</b>	<b>NA</b>
Hinnavaru	3,017	1,358	1,659	-1.04	12.56	240.21
Naifaru	3,687	1,847	1,840	-0.09	14.27	258.37
Kurendhoo	1,218	570	648	0.22	19.70	61.83
Olhuvelifushi	294	124	170	-5.11	19.90	14.77
Maafilaafushi	130	74	56	3.08	49.20	2.64
<b>Resorts and Industrial Islands</b>	<b>844</b>	<b>759</b>	<b>85</b>	<b>1.83</b>	<b>NA</b>	<b>NA</b>
Resorts	501	467	34	NA	NA	NA
Industrial and Other Islands	343	292	51	NA	NA	NA
<b>Male' Atoll (K)</b>	<b>15,441</b>	<b>10,896</b>	<b>4,545</b>	<b>2.26</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>10,149</b>	<b>5,715</b>	<b>4,434</b>	<b>1.21</b>	<b>NA</b>	<b>NA</b>
Kaashidhoo	1,696	818	878	1.26	276.49	6.13
Gaafaru	800	401	399	-0.99	10.00	80.00
Dhiffushi	767	383	384	-2.53	18.78	40.84
Thulusdhoo	1,148	594	554	5.25	33.50	34.27
Huraa	849	510	339	3.13	18.80	45.16
Himmafushi	1,007	657	350	2.28	24.80	40.60
Gulhi	662	352	310	1.01	5.50	120.36
Maafushi	2,000	1,326	674	1.22	23.30	85.84
Guraidhoo	1,220	674	546	-0.07	18.20	67.03
<b>Resorts and Industrial Islands</b>	<b>5,292</b>	<b>5,181</b>	<b>111</b>	<b>4.50</b>	<b>NA</b>	<b>NA</b>
Resorts	4,462	4,376	86	NA	NA	NA
Industrial and Other Islands	830	805	25	NA	NA	NA
<b>North Ari Atoll (AA)</b>	<b>5,776</b>	<b>3,332</b>	<b>2,444</b>	<b>0.76</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>4,855</b>	<b>2,412</b>	<b>2,443</b>	<b>0.05</b>	<b>NA</b>	<b>NA</b>
Thoddoo	1,199	593	606	1.88	142.16	8.43
Rasdhoo	900	447	453	-0.38	16.50	54.55
Ukulhas	615	313	302	2.31	17.40	35.34
Mathiveri	483	244	239	-0.97	20.17	23.95
Bodufolhudhoo	456	237	219	-0.07	6.90	66.09
Feridhoo	439	208	231	-1.59	43.20	10.16

Locality	Population 2006			Avg. annual growth rate	Area <sup>1</sup> (ha)	Population density
	Both sexes	Male	Female			2006
Maalhos	248	110	138	-7.48	23.20	10.69
Himandhoo	515	260	255	1.48	16.40	31.40
<b>Resorts and Industrial Islands</b>	<b>921</b>	<b>920</b>	<b>1</b>	<b>5.09</b>	<b>NA</b>	<b>NA</b>
Resorts	921	920	1	NA	NA	NA
Industrial and Other Islands	0	0	0	NA	NA	NA
<b>South Ari Atoll (ADh)</b>	<b>8,379</b>	<b>4,721</b>	<b>3,658</b>	<b>1.18</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>6,921</b>	<b>3,314</b>	<b>3,607</b>	<b>0.74</b>	<b>NA</b>	<b>NA</b>
Hangnameedhoo	458	213	245	0.70	17.30	26.47
Omadhoo	676	303	373	0.96	21.10	32.04
Kuburudhoo	322	148	174	-2.93	4.90	65.71
Mahibadhoo	1,780	839	941	0.63	17.70	100.56
Mandhoo	294	165	129	0.87	28.80	10.21
Dhagethi	624	303	321	0.65	21.40	29.16
Dhigurah	420	210	210	2.42	42.80	9.81
Fenfushi	560	278	282	0.63	16.49	33.96
Dhidhdhoo	116	55	61	0.44	13.40	8.66
Maamigili	1,671	800	871	1.24	74.90	22.31
<b>Resorts and Industrial Islands</b>	<b>1,458</b>	<b>1,407</b>	<b>51</b>	<b>3.47</b>	<b>NA</b>	<b>NA</b>
Resorts	1,458	1,407	51	NA	NA	NA
Industrial and Other Islands	0	0	0	NA	NA	NA
<b>Felidhe Atoll (V)</b>	<b>1,606</b>	<b>882</b>	<b>724</b>	<b>-1.45</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>1,502</b>	<b>778</b>	<b>724</b>	<b>-1.55</b>	<b>NA</b>	<b>NA</b>
Fulidhoo	331	174	157	0.41	9.70	34.12
Thinadhoo	55	30	25	-12.11	9.10	6.04
Felidhoo	448	243	205	-0.76	11.80	37.97
Keyodhoo	510	262	248	0.13	7.30	69.86
Rakeedhoo	158	69	89	-6.74	4.00	39.50
<b>Resorts and Industrial Islands</b>	<b>104</b>	<b>104</b>	<b>0</b>	<b>0.00</b>	<b>NA</b>	<b>NA</b>
Resorts	86	86	0	NA	NA	NA
Industrial and Other Islands	18	18	0	NA	NA	NA

Locality	Population 2006			Avg. annual growth rate	Area <sup>1</sup> (ha)	Population density
	Both sexes	Male	Female			2006
<b>Mulakatholhu (M)</b>	<b>4,710</b>	<b>2,419</b>	<b>2,291</b>	<b>-1.27</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>4,654</b>	<b>2,364</b>	<b>2,290</b>	<b>-1.26</b>	<b>NA</b>	<b>NA</b>
Raimandhoo	156	80	76	-1.53	21.60	7.22
Madifushi <sup>3</sup>	0	0	0	NA	10.90	NA
Veyvah	174	93	81	-0.75	34.50	5.04
Mulah	1,129	553	576	-1.01	57.80	19.53
Muli	746	389	357	-0.89	28.91	25.80
Naalaafushi	321	161	160	1.40	8.90	36.07
Kolhufushi	811	405	406	-2.38	75.60	10.73
Dhiggaru	909	456	453	0.61	7.29	124.69
Maduvvari	408	227	181	-1.66	3.71	109.97
<b>Resorts and Industrial Islands</b>	<b>56</b>	<b>55</b>	<b>1</b>	<b>-2.22</b>	<b>NA</b>	<b>NA</b>
Resorts	56	55	1	NA	NA	NA
Industrial and Other Islands	0	0	0	NA	NA	NA
<b>North Nilandhe Atoll (F)</b>	<b>3,765</b>	<b>1,828</b>	<b>1,937</b>	<b>-0.27</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>3,662</b>	<b>1,727</b>	<b>1,935</b>	<b>-0.52</b>	<b>NA</b>	<b>NA</b>
Feeali	741	320	421	-1.25	13.60	54.49
Biledhdhoo	821	389	432	-0.12	29.50	27.83
Magoodhoo	518	248	270	3.40	17.70	29.27
Dharaboodhoo	279	144	135	3.43	36.50	7.64
Nilandhoo	1,303	626	677	-2.38	49.00	26.59
<b>Resorts and Industrial Islands</b>	<b>103</b>	<b>101</b>	<b>2</b>	<b>12.68</b>	<b>NA</b>	<b>NA</b>
Resorts	69	67	2	NA	NA	NA
Industrial and Other Islands	34	34	0	NA	NA	NA
<b>South Nilandhe Atoll (Dh)</b>	<b>4,967</b>	<b>2,577</b>	<b>2,390</b>	<b>-0.33</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>4,720</b>	<b>2,335</b>	<b>2,385</b>	<b>-0.71</b>	<b>NA</b>	<b>NA</b>
Meedhoo	919	519	400	0.20	8.90	103.26
Badidhoo	578	294	284	0.00	19.90	29.05
Ribudhoo	207	98	109	-11.75	16.10	12.86
Hulhudheli	566	261	305	1.28	15.50	36.52
Gemendhoo <sup>3</sup>	0	0	0	NA	4.70	NA

Locality	Population 2006			Avg. annual growth rate	Area <sup>1</sup> (ha)	Population density
	Both sexes	Male	Female			2006
Vaanee	211	93	118	-8.22	10.90	19.36
Maaeboodhoo	600	295	305	0.08	17.60	34.09
Kudahuvadhoo	1,639	775	864	4.74	67.01	24.46
<b>Resorts and Industrial Islands</b>	<b>247</b>	<b>242</b>	<b>5</b>	<b>9.43</b>	<b>NA</b>	<b>NA</b>
Resorts	201	196	5	NA	NA	NA
Industrial and Other Islands	46	46	0	NA	NA	NA
<b>Kolhumadulu (Th)</b>	<b>8,493</b>	<b>4,216</b>	<b>4,277</b>	<b>-1.52</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>8,451</b>	<b>4,174</b>	<b>4,277</b>	<b>-1.59</b>	<b>NA</b>	<b>NA</b>
Buruni	1,130	552	578	21.81	30.50	37.05
Vilufushi <sup>3</sup>	16	14	2	NA	13.50	1.19
Madifushi	720	357	363	1.35	17.69	40.70
Dhiyamigili	452	218	234	-1.14	23.54	19.20
Guraidhoo	1,137	535	602	-3.84	26.90	42.27
Kadoodhoo	347	159	188	-1.94	78.20	4.44
Vandhoo	268	138	130	-0.31	23.20	11.55
Hirilandhoo	845	448	397	1.78	25.10	33.67
Gaadhiffushi	198	100	98	-7.55	11.00	18.00
Thimarafushi	1,237	601	636	-3.61	14.50	85.31
Veymandoo	928	480	448	3.25	40.80	22.75
Kibidhoo	808	390	418	-0.51	30.80	26.23
Omadhoo	365	182	183	-1.31	32.80	11.13
<b>Resorts and Industrial Islands</b>	<b>42</b>	<b>42</b>	<b>0</b>	<b>43.84</b>	<b>NA</b>	<b>NA</b>
Resorts	0	0	0	NA	NA	NA
Industrial and Other Islands	42	42	0	NA	NA	NA
<b>Hadhdhunmathi (L)</b>	<b>11,990</b>	<b>6,173</b>	<b>5,817</b>	<b>0.57</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>11,743</b>	<b>5,928</b>	<b>5,815</b>	<b>0.35</b>	<b>NA</b>	<b>NA</b>
Isdhoo	1,559	755	804	1.41	293.67	5.31
Dhabidhoo	537	263	274	-1.87	46.60	11.52
Maabaidhoo	690	351	339	-2.31	43.30	15.94
Mundhoo	372	206	166	-5.47	19.70	18.88
Kalhaidhoo	434	233	201	0.04	24.75	17.54
Gamu	2,502	1,277	1,225	1.81	516.59	4.84

Locality	Population 2006			Avg. annual growth rate	Area <sup>1</sup> (ha)	Population density
	Both sexes	Male	Female			2006
Maavah	1,373	652	721	0.27	31.80	43.18
Fonadhoo	1,762	937	825	0.21	159.20	11.07
Gaadhoo	231	110	121	-2.47	69.40	3.33
Maamendhoo	845	401	444	-0.97	18.80	44.95
Hithadhoo	836	438	398	3.09	108.68	7.69
Kunahandhoo	602	305	297	2.18	81.30	7.40
<b>Resorts and Industrial Islands</b>	<b>247</b>	<b>245</b>	<b>2</b>	<b>16.59</b>	<b>NA</b>	<b>NA</b>
Resorts	0	0	0	NA	NA	NA
Industrial and Other Islands	247	245	2	NA	NA	NA
<b>North Huvadhu Atoll (GA)</b>	<b>8,262</b>	<b>4,185</b>	<b>4,077</b>	<b>0.03</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>8,007</b>	<b>3,934</b>	<b>4,073</b>	<b>-0.25</b>	<b>NA</b>	<b>NA</b>
Kolamaafushi	1,087	542	545	-0.78	20.30	53.55
Viligili	1,976	951	1,025	-2.24	55.00	35.93
Maamendhoo	1,000	508	492	2.01	48.50	20.62
Nilandhoo	534	258	276	3.52	56.70	9.42
Dhaandhoo	1,113	534	579	-0.54	12.60	88.33
Dhevadhoo	480	254	226	-3.37	20.50	23.41
Kodey	213	95	118	-3.31	104.38	2.04
Dhiyadhoo	79	34	45	-9.39	48.77	1.62
Gemanafushi	1,082	533	549	3.08	47.20	22.92
Kanduhulhudhoo	443	225	218	2.77	25.20	17.58
<b>Resorts and Industrial Islands</b>	<b>255</b>	<b>251</b>	<b>4</b>	<b>12.52</b>	<b>NA</b>	<b>NA</b>
Resorts	0	0	0	NA	NA	NA
Industrial and Other Islands	255	251	4	NA	NA	NA
<b>South Huvadhu Atoll (GDh)</b>	<b>11,013</b>	<b>5,395</b>	<b>5,618</b>	<b>-1.27</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>10,991</b>	<b>5,373</b>	<b>5,618</b>	<b>-1.24</b>	<b>NA</b>	<b>NA</b>
Madeveli	1,065	508	557	2.09	33.80	31.51
Hoadedhdhoo	668	324	344	4.06	88.14	7.58
Nadallaa	614	289	325	-1.17	41.40	14.83
Gadhdhoo	1,439	729	710	-2.78	22.20	64.82
Rathafandhoo	492	249	243	-3.57	35.20	13.98
Vaadhoo	662	319	343	-1.69	167.33	3.96

Locality	Population 2006			Avg. annual growth rate	Area <sup>1</sup> (ha)	Population density
	Both sexes	Male	Female			2006
Fiyoari	673	316	357	-3.82	72.60	9.27
Faresmaathodaa	936	471	465	0.02	47.95	19.52
Thinadhoo	4,442	2,168	2,274	-1.61	104.40	42.55
<b>Resorts and Industrial Islands</b>	<b>22</b>	<b>22</b>	<b>0</b>	<b>-12.52</b>	<b>NA</b>	<b>NA</b>
Resorts	0	0	0	NA	NA	NA
Industrial and Other Islands	22	22	0	NA	NA	NA
<b>Gnaviyani (Gn)</b>	<b>7,636</b>	<b>3,557</b>	<b>4,079</b>	<b>0.24</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>7,636</b>	<b>3,557</b>	<b>4,079</b>	<b>0.24</b>	<b>NA</b>	<b>NA</b>
Fuvammulah	7,636	3,557	4,079	0.24	420.00	18.18
<b>Addu Atoll (S)</b>	<b>18,026</b>	<b>8,401</b>	<b>9,625</b>	<b>-0.44</b>	<b>NA</b>	<b>NA</b>
<b>Administrative Islands</b>	<b>17,862</b>	<b>8,256</b>	<b>9,606</b>	<b>-0.58</b>	<b>NA</b>	<b>NA</b>
Meedhoo	1,458	641	817	-2.36	165.95	8.79
Hithadhoo	9,465	4,365	5,100	0.01	467.30	20.25
Maradhoo	2,043	1,018	1,025	-0.19	74.90	27.28
Feydhoo	2,724	1,223	1,501	-0.63	49.20	55.37
Maradhoofeydhoo	1,025	467	558	0.03	31.36	32.68
Hulhudhoo	1,147	542	605	-3.77	151.82	7.55
<b>Resorts and Industrial Islands</b>	<b>164</b>	<b>145</b>	<b>19</b>	<b>38.66</b>	<b>NA</b>	<b>NA</b>
Resorts	0	0	0	NA	NA	NA
Industrial and Other Islands	164	145	19	NA	NA	NA

**Note:**

<sup>1</sup> Population relocated to other islands under population consolidation programme

<sup>2</sup> Newly inhabited under population consolidation programme

<sup>3</sup> Population displaced to other islands due to tsunami

NA - Not applicable or Not available

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*Source: Ministry of Planning and National Development*

## Annex 3: Income Poverty

		2004	2004	2004	2004	2004	2004	1997	2004
	Atoll / Island name	headcount ratio, percentage of the population with less than Rf.7.5 per person per day	headcount ratio, percentage of the population with less than Rf.10 per person per day	headcount ratio, percentage of the population with less than Rf.15 per person per day	average income of the population with less than Rf.15 per person per day (Rf)	income shortfall of the the population with less than Rf.15 per person per day (%)	poverty gap index of the population with less than Rf.15 per person per day	Human Vulnerability Index	Income Poverty Index
1	<b>Maldives</b>	<b>3</b>	<b>8</b>	<b>21</b>	<b>10.6</b>	<b>29</b>	<b>0.06</b>	<b>0.25</b>	<b>0.10</b>
2	<b>Male'</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>11.0</b>	<b>27</b>	<b>0.01</b>	<b>0.11</b>	<b>0.01</b>
3	<b>Atoll average</b>	<b>5</b>	<b>11</b>	<b>28</b>	<b>10.6</b>	<b>30</b>	<b>0.08</b>	<b>0.29</b>	<b>0.14</b>
4	<b>HAA ALIFU ATOLL</b>	<b>14</b>	<b>23</b>	<b>49</b>	<b>10.1</b>	<b>33</b>	<b>0.16</b>	<b>0.15</b>	<b>0.26</b>
5	Thurakunu	0	17	62	11.4	24	0.15	0.42	0.24
6	Uligamu	24	24	24	4.0	73	0.18	0.39	0.29
7	Berinmadhoo	0	0	15	11.2	26	0.04	0.40	0.06
8	Hathifushi	0	15	49	10.8	28	0.14	0.14	0.22
9	Mulhadhoo	0	0	44	12.1	19	0.08	0.47	0.14
10	Hoarafushi	30	30	40	7.3	52	0.20	0.02	0.33
11	Ihavandhoo	23	40	74	9.5	37	0.27	0.01	0.44
12	Kelaa	4	12	28	11.8	21	0.06	0.14	0.10
13	Vashafaru	8	45	57	9.3	38	0.21	0.44	0.35
14	DHIDHDHOO	8	20	59	11.2	25	0.15	0.11	0.24
15	Filladhoo	3	3	20	11.8	21	0.04	0.19	0.07
16	Maarandhoo	24	24	24	4.9	67	0.16	0.05	0.26
17	Thakandhoo	0	0	27	11.7	22	0.06	0.12	0.10
18	Utheemu	0	0	0			0.00	0.03	0.00
19	Muraidhoo	24	30	48	8.7	42	0.20	0.48	0.32
20	Baarah	7	17	74	11.8	21	0.16	0.24	0.25
21	<b>HAA DHAALU ATOLL</b>	<b>6</b>	<b>22</b>	<b>44</b>	<b>10.3</b>	<b>31</b>	<b>0.14</b>	<b>0.27</b>	<b>0.22</b>
22	Faridhoo	0	0	21	13.8	8	0.02	0.26	0.03
23	Hondaidhoo							0.26	
24	Hanimaadhoo	0	16	55	11.8	21	0.12	0.41	0.19
25	Finney	0	3	47	11.3	24	0.12	0.19	0.19
26	Naivaadhoo	15	32	49	9.1	40	0.19	0.17	0.31
27	Hirimaradhoo	2	32	81	9.6	36	0.29	0.15	0.47
28	Nolhivaranfaru	19	31	48	8.4	44	0.21	0.22	0.34
29	Nellaidhoo	0	0	31	14.4	4	0.01	0.17	0.02
30	Nolhivaramu	11	43	66	9.9	34	0.23	0.53	0.37
31	Kuribi	0	20	82	11.7	22	0.18	0.24	0.29
32	Kuburudhoo	4	11	74	11.7	22	0.16	0.11	0.26
33	KULHUDHUFFUSHI	3	23	36	10.0	33	0.12	0.22	0.19
34	Kumundhoo	0	10	40	12.8	14	0.06	0.21	0.09
35	Neykurendhoo	13	13	41	10.9	28	0.11	0.37	0.18
36	Vaikaradhoo	31	31	65	8.6	43	0.28	0.33	0.44
37	Maavaidhoo	11	11	53	8.6	43	0.22	0.21	0.36
38	Makunudhoo	2	18	18	8.4	44	0.08	0.34	0.13
39	<b>SHAVIYANI ATOLL</b>	<b>3</b>	<b>11</b>	<b>35</b>	<b>11.3</b>	<b>24</b>	<b>0.09</b>	<b>0.35</b>	<b>0.14</b>
40	Kaditheemu	0	0	19	13.2	12	0.02	0.49	0.04
41	Noomaraa	17	40	52	9.0	40	0.21	0.32	0.34
42	Goidhoo	2	10	48	12.2	18	0.09	0.24	0.14
43	Feydhoo	2	18	82	10.7	29	0.24	0.53	0.38
44	Feevah	0	0	0			0.00	0.18	0.00



		2004	2004	2004	2004	2004	2004	1997	2004
	Atoll / Island name	headcount ratio, percentage of the population with less than Rf.7.5 per person per day	headcount ratio, percentage of the population with less than Rf.10 per person per day	headcount ratio, percentage of the population with less than Rf.15 per person per day	average income of the population with less than Rf.15 per person per day (Rf)	income shortfall of the the population with less than Rf.15 per person per day (%)	poverty gap index of the population with less than Rf.15 per person per day	Human Vulnerability Index	Income Poverty Index
45	Bilehffahi	0	2	30	10.5	30	0.09	0.69	0.15
46	Foakaidhoo	0	11	36	11.9	20	0.07	0.69	0.12
47	Narudhoo	10	10	19	8.5	43	0.08	0.38	0.13
48	Maakandoodhoo	0	0	16	13.1	13	0.02	0.29	0.03
49	Maroshi	15	15	42	11.1	26	0.11	0.37	0.17
50	Lhaimagu	0	22	37	9.6	36	0.13	0.28	0.22
51	Firubaidhoo	0	0	24	10.9	27	0.07	0.32	0.11
52	Komandoo	7	33	49	10.3	32	0.16	0.22	0.25
53	Maaugoodhoo	12	12	25	9.1	39	0.10	0.01	0.16
54	FUNADHOO	0	0	22	13.8	8	0.02	0.21	0.03
55	Milandhoo	0	0	49	13.3	12	0.06		0.09
<b>56</b>	<b>NOONU ATOLL</b>	<b>9</b>	<b>24</b>	<b>46</b>	<b>9.9</b>	<b>34</b>	<b>0.16</b>	<b>0.38</b>	<b>0.25</b>
57	Hebadhoo	0	0	39	12.6	16	0.06	0.46	0.10
58	Kedhikolhudhoo	0	7	63	12.3	18	0.11	0.37	0.18
59	Maalhendhoo	5	50	65	9.9	34	0.22	0.57	0.36
60	Kudafari	17	31	31	7.9	47	0.15	0.84	0.24
61	Landhoo	14	26	30	7.7	49	0.15	0.13	0.23
62	Maafaru	46	68	71	7.5	50	0.36	0.03	0.58
63	Lhohi	13	55	64	8.3	45	0.29	0.20	0.46
64	Miladhoo	34	50	50	6.8	55	0.27	0.27	0.44
65	Magoodhoo	0	0	28	12.2	18	0.05	0.20	0.08
66	MANADHOO	0	23	68	10.8	28	0.19	0.47	0.30
67	Holhudhoo	5	6	34	10.8	28	0.09	0.42	0.15
68	Fodhdhoo	0	0	36	11.0	27	0.10	0.52	0.15
69	Velidhoo	0	13	23	9.9	34	0.08	0.43	0.13
<b>70</b>	<b>RAA ATOLL</b>	<b>8</b>	<b>17</b>	<b>41</b>	<b>10.4</b>	<b>31</b>	<b>0.13</b>	<b>0.32</b>	<b>0.20</b>
71	Alifushi	20	33	56	9.7	35	0.20	0.45	0.32
72	Vaadhoo	30	48	80	9.1	39	0.31	0.14	0.51
73	Rasgetheemu	0	0	18	14.4	4	0.01	0.08	0.01
74	Agolhithemu	0	0	36	11.5	24	0.08	0.00	0.14
75	Hulhudhuffaaruu	0	46	50	8.8	41	0.21	0.14	0.33
76	UGUFAARU	0	0	34	12.6	16	0.05	0.33	0.09
77	Kadhohudhoo	0	0	33	12.3	18	0.06	0.16	0.10
78	Maakurathu	31	36	51	8.1	46	0.23	0.23	0.38
79	Rasmaadhoo	28	57	57	7.2	52	0.30	0.15	0.48
80	Innamaadhoo	0	0	17	12.3	18	0.03	0.14	0.05
81	Maduvvari	11	31	68	10.8	28	0.19	0.81	0.30
82	Iguraidhoo	0	14	29	9.8	35	0.10	0.44	0.16
83	Fainu	0	0	36	11.3	25	0.09	0.88	0.14
84	Meedhoo	8	8	22	9.2	39	0.08	0.21	0.14
85	Kinolhas	13	13	65	11.8	21	0.14	0.44	0.22
<b>86</b>	<b>BAA ATOLL</b>	<b>2</b>	<b>9</b>	<b>33</b>	<b>10.9</b>	<b>27</b>	<b>0.09</b>	<b>0.51</b>	<b>0.15</b>
87	Kudarikilu	0	0	27	11.1	26	0.07	0.45	0.11
88	Kamadhoo	0	10	10	9.4	38	0.04	0.72	0.06

		2004	2004	2004	2004	2004	2004	1997	2004
	Atoll / Island name	headcount ratio, percentage of the population with less than Rf.7.5 per person per day	headcount ratio, percentage of the population with less than Rf.10 per person per day	headcount ratio, percentage of the population with less than Rf.15 per person per day	average income of the population with less than Rf.15 per person per day (Rf)	income shortfall of the the population with less than Rf.15 per person per day (%)	poverty gap index of the population with less than Rf.15 per person per day	Human Vulnerability Index	Income Poverty Index
89	Kendhoo	0	3	28	10.9	27	0.08	0.49	0.12
90	Kihaadhoo	0	14	14	7.8	48	0.07	0.70	0.11
91	Dhonfanu	0	0	43	11.6	23	0.10	0.38	0.16
92	Dharavandhoo	0	0	6	14.0	7	0.00	0.15	0.01
93	Maalhos	0	0	26	12.0	20	0.05	0.07	0.08
94	EYDHAFUSHI	0	5	16	10.8	28	0.04	0.60	0.07
95	Thulhaadhoo	10	28	70	9.9	34	0.24	0.49	0.38
96	Hiithaadhoo	0	5	63	12.7	15	0.10	0.61	0.16
97	Fulhadhoo	0	2	2	7.8	48	0.01	0.78	0.02
98	Fehendhoo	0	0	8	11.0	27	0.02	0.73	0.04
99	Goindhoo	0	0	29	13.8	8	0.02	0.61	0.04
<b>100</b>	<b>LHAVIYANI ATOLL</b>	<b>9</b>	<b>17</b>	<b>33</b>	<b>9.7</b>	<b>35</b>	<b>0.12</b>	<b>0.57</b>	<b>0.19</b>
101	Hinnavanu	15	30	49	9.4	37	0.18	0.70	0.30
102	NAIFARU	7	7	16	9.3	38	0.06	0.42	0.09
103	Kurendhoo	0	25	57	10.9	28	0.16	0.68	0.25
104	Olhuvelifushi	6	6	22	9.9	34	0.08	0.67	0.12
105	Maafilaafushi	0	0	0			0.00	0.06	0.00
<b>106</b>	<b>KAAFU ATOLL</b>	<b>5</b>	<b>7</b>	<b>23</b>	<b>10.5</b>	<b>30</b>	<b>0.07</b>	<b>0.11</b>	<b>0.11</b>
107	Kaashidhoo	16	16	47	9.5	37	0.17	0.24	0.28
108	Gaafaru	7	7	22	11.1	26	0.06	0.16	0.09
109	Dhiffushi	0	0	32	12.4	18	0.06	0.22	0.09
110	THULUSDHOO	7	24	37	9.5	37	0.14	0.10	0.22
111	Huraa	0	0	14	11.6	23	0.03	0.00	0.05
112	Himmafushi	0	0	18	14.2	6	0.01	0.00	0.02
113	Gulhi	11	11	11	7.4	51	0.05	0.13	0.09
114	Maafushi	0	0	7	13.1	12	0.01	0.02	0.01
115	Guraidhoo	0	0	0			0.00	0.05	0.00
<b>116</b>	<b>ALIF ALIFU ATOLL</b>	<b>5</b>	<b>12</b>	<b>36</b>	<b>10.8</b>	<b>28</b>	<b>0.10</b>	<b>0.13</b>	<b>0.16</b>
117	Thoddoo	0	15	15	9.4	37	0.06	0.17	0.09
118	RASDHOO	0	0	36	11.8	21	0.08	0.01	0.12
119	Ukulhas	11	11	21	8.5	43	0.09	0.10	0.15
120	Mathiveri	22	22	54	9.5	37	0.20	0.09	0.32
121	Bodufolhudhoo	0	12	39	11.4	24	0.09	0.14	0.15
122	Feridhoo	0	12	32	10.9	28	0.09	0.13	0.14
123	Maalhos	8	12	72	12.5	17	0.12	0.30	0.19
124	Himendhoo	13	20	20	5.0	66	0.13	0.13	0.21
<b>125</b>	<b>ALIFU DHAALU ATOLL</b>	<b>4</b>	<b>7</b>	<b>24</b>	<b>10.5</b>	<b>30</b>	<b>0.07</b>	<b>0.18</b>	<b>0.12</b>
126	Hangnameedhoo	2	2	28	11.8	21	0.06	0.28	0.09
127	Omadhoo	0	0	35	11.3	25	0.09	0.46	0.14
128	Kuburudhoo	10	10	30	11.2	25	0.08	0.35	0.12
129	MAHIBADHOO	12	20	38	9.4	37	0.14	0.16	0.23
130	Mandhoo	6	6	26	10.5	30	0.08	0.23	0.13
131	Dhagethi	0	0	2	12.1	19	0.00	0.00	0.01

## ANNEXES

		2004	2004	2004	2004	2004	2004	1997	2004
	Atoll / Island name	headcount ratio, percentage of the population with less than Rf.7.5 per person per day	headcount ratio, percentage of the population with less than Rf.10 per person per day	headcount ratio, percentage of the population with less than Rf.15 per person per day	average income of the population with less than Rf.15 per person per day (Rf)	income shortfall of the the population with less than Rf.15 per person per day (%)	poverty gap index of the population with less than Rf.15 per person per day	Human Vulnerability Index	Income Poverty Index
132	Dhigurah	7	7	29	10.5	30	0.09	0.01	0.14
133	Fenfushi	0	0	28	10.1	32	0.09	0.12	0.15
134	Dhidhdhoo	0	0	0			0.00	0.08	0.00
135	Maamigili	0	4	12	12.6	16	0.02	0.14	0.03
<b>136</b>	<b>VAAVU ATOLL</b>	<b>4</b>	<b>4</b>	<b>15</b>	<b>11.4</b>	<b>24</b>	<b>0.04</b>	<b>0.33</b>	<b>0.06</b>
137	Fulidhoo	0	0	0			0.00	0.45	0.00
138	Thinadhoo	13	13	13	2.3	85	0.11	0.45	0.17
139	FELIDHOO	0	0	22	13.4	11	0.02	0.29	0.04
140	Keyodhoo	9	9	17	10.0	33	0.06	0.38	0.09
141	Rakeedhoo	0	0	26	11.2	25	0.07	0.10	0.11
<b>142</b>	<b>MEEMU ATOLL</b>	<b>2</b>	<b>4</b>	<b>15</b>	<b>10.5</b>	<b>30</b>	<b>0.04</b>	<b>0.63</b>	<b>0.07</b>
143	Raimandhoo	0	0	0			0.00	0.71	0.00
144	Madifushi	5	5	18	11.0	26	0.05	1.00	0.08
145	Veyvah	0	0	21	12.0	20	0.04	0.81	0.07
146	Mulah	0	10	10	8.7	42	0.04	0.26	0.06
147	MULI	0	0	13	12.2	19	0.02	0.61	0.04
148	Naalaafushi	0	0	23	10.9	27	0.06	0.43	0.10
149	Kolhufushi	0	0	0			0.00	1.00	0.00
150	Dhiggaru	7	7	39	10.5	30	0.12	0.74	0.19
151	Maduvvari	2	2	7	9.4	38	0.03	0.62	0.04
<b>152</b>	<b>FAAFU ATOLL</b>	<b>1</b>	<b>8</b>	<b>36</b>	<b>11.9</b>	<b>21</b>	<b>0.07</b>	<b>0.45</b>	<b>0.12</b>
153	Feeali	0	0	24	13.1	12	0.03	0.36	0.05
154	Biledhdhoo	0	15	65	12.1	19	0.12	0.18	0.20
155	Magoodhoo	0	24	24	8.8	41	0.10	0.37	0.16
156	Dharaboodhoo	0	0	0			0.00	0.38	0.00
157	NILANDHOO	2	2	31	11.7	22	0.07	0.73	0.11
<b>158</b>	<b>DHAALU ATOLL</b>	<b>3</b>	<b>6</b>	<b>16</b>	<b>10.5</b>	<b>30</b>	<b>0.05</b>	<b>0.24</b>	<b>0.08</b>
159	Meedhoo	0	0	0			0.00	0.09	0.00
160	Badidhoo	0	0	0			0.00	0.43	0.00
161	Ribudhoo	0	0	9	14.9	1	0.00	0.34	0.00
162	Hulhudheli	0	0	45	12.0	20	0.09	0.20	0.14
163	Gemendhoo	17	28	36	8.3	44	0.16	0.48	0.26
164	Vaanee	11	11	11	5.6	63	0.07	0.32	0.11
165	Maaeoodhoo	12	20	47	10.8	28	0.13	0.41	0.21
166	KUDAHUVADHOO	0	7	7	8.0	47	0.03	0.03	0.06
<b>167</b>	<b>THAA ATOLL</b>	<b>0</b>	<b>7</b>	<b>17</b>	<b>10.8</b>	<b>28</b>	<b>0.05</b>	<b>0.48</b>	<b>0.08</b>
168	Buruni	0	0	0			0.00	0.45	0.00
169	Vilufushi	0	8	8	7.6	49	0.04	0.59	0.06
170	Madifushi	0	16	39	9.8	34	0.14	0.39	0.22
171	Dhiyamigili	0	11	11	8.0	46	0.05	0.47	0.08
172	Guraidhoo	0	17	17	7.8	48	0.08	0.64	0.13
173	Kadoodhoo	0	0	29	13.4	11	0.03	0.77	0.05
174	Vandhoo	0	0	10	14.2	5	0.01	0.68	0.01
175	Hirilandhoo	0	0	11	13.6	9	0.01	0.63	0.02

		2004	2004	2004	2004	2004	2004	1997	2004
	Atoll / Island name	headcount ratio, percentage of the population with less than Rf.7.5 per person per day	headcount ratio, percentage of the population with less than Rf.10 per person per day	headcount ratio, percentage of the population with less than Rf.15 per person per day	average income of the population with less than Rf.15 per person per day (Rf)	income shortfall of the the population with less than Rf.15 per person per day (%)	poverty gap index of the population with less than Rf.15 per person per day	Human Vulnerability Index	Income Poverty Index
176	Gaadhiffushi	12	12	12	5.3	65	0.08	0.31	0.13
177	Thimarafushi	0	0	8	11.9	21	0.02	0.37	0.03
178	VEYMANDOO	0	0	23	14.9	1	0.00	0.20	0.00
179	Kibidhoo	0	18	18	9.4	38	0.07	0.28	0.11
180	Omadhoo	0	0	38	11.6	23	0.09	0.50	0.14
<b>181</b>	<b>LAAMU ATOLL</b>	<b>2</b>	<b>3</b>	<b>15</b>	<b>11.2</b>	<b>25</b>	<b>0.04</b>	<b>0.26</b>	<b>0.06</b>
182	Isdhoo	0	0	11	14.4	4	0.00	0.00	0.01
183	Dhabidhoo	0	0	23	13.8	8	0.02	0.00	0.03
184	Maabaidhoo	0	0	6	12.7	15	0.01	0.24	0.01
185	Mundoo	0	0	15	14.6	3	0.00	0.19	0.01
186	Kalhaidhoo	24	24	43	7.5	50	0.22	0.47	0.35
187	Gamu	0	5	12	10.8	28	0.03	0.35	0.06
188	Maavah	8	8	29	9.3	38	0.11	0.23	0.18
189	FONADHOO	0	0	11	12.4	17	0.02	0.36	0.03
190	Gaadhoo	0	0	18	13.4	11	0.02	0.12	0.03
191	Maamendhoo	0	0	0			0.00	0.53	0.00
192	Hithadhoo	0	0	0			0.00	0.12	0.00
193	Kunahandhoo	0	0	44	12.3	18	0.08	0.44	0.12
<b>194</b>	<b>GAAFU ALIFU ATOLL</b>	<b>3</b>	<b>4</b>	<b>14</b>	<b>10.8</b>	<b>28</b>	<b>0.04</b>	<b>0.14</b>	<b>0.06</b>
195	Kolamaafushi	3	3	18	12.8	14	0.03	0.01	0.04
196	VILLINGILI	1	1	7	11.9	21	0.01	0.08	0.02
197	Maamendhoo	17	17	43	9.2	39	0.17	0.09	0.27
198	Nilandhoo	0	12	12	9.8	35	0.04	0.30	0.07
199	Dhaandhoo	0	0	11	12.6	16	0.02	0.26	0.03
200	Dhevvadhoo	0	0	0			0.00	0.19	0.00
201	Kodey	0	0	10	11.7	22	0.02	0.17	0.03
202	Dhiyadhoo	24	24	26	5.6	63	0.17	0.18	0.27
203	Gemanafushi	0	0	7	10.8	28	0.02	0.11	0.03
204	Kanduhulhudhoo	0	0	14	12.5	17	0.02	0.32	0.04
<b>205</b>	<b>GAAFU DHAALU ATOLL</b>	<b>3</b>	<b>6</b>	<b>16</b>	<b>10.8</b>	<b>28</b>	<b>0.05</b>	<b>0.29</b>	<b>0.07</b>
206	Madeveli	0	8	21	11.0	27	0.06	0.40	0.09
207	Hoadedhdhoo	0	10	50	11.9	20	0.10	0.58	0.16
208	Nadallaa	14	14	31	11.0	27	0.08	0.77	0.13
209	Gadhoo	0	0	10	12.8	15	0.01	0.09	0.02
210	Rathafandhoo	14	23	23	7.0	53	0.12	0.32	0.20
211	Vaadhoo	19	19	33	8.6	43	0.14	0.19	0.22
212	Fiyoari	0	0	0			0.00	0.23	0.00
213	Maathodaa	0	0	7	13.0	14	0.01	0.19	0.01
214	Fares	0	4	4	10.0	34	0.01	0.38	0.02
215	THINADHOO	0	3	11	11.0	26	0.03	0.24	0.05
<b>216</b>	<b>GNAVIYANI ATOLL</b>	<b>1</b>	<b>1</b>	<b>10</b>	<b>10.9</b>	<b>27</b>	<b>0.03</b>	<b>0.21</b>	<b>0.04</b>
217	FOAMMULAH	1	1	10	10.9	27	0.03	0.21	0.04
<b>218</b>	<b>SEENU ATOLL</b>	<b>0</b>	<b>3</b>	<b>13</b>	<b>11.6</b>	<b>23</b>	<b>0.03</b>	<b>0.18</b>	<b>0.05</b>

## ANNEXES

		2004	2004	2004	2004	2004	2004	1997	2004
	Atoll / Island name	headcount ratio, percentage of the population with less than Rf.7.5 per person per day	headcount ratio, percentage of the population with less than Rf.10 per person per day	headcount ratio, percentage of the population with less than Rf.15 per person per day	average income of the population with less than Rf.15 per person per day (Rf)	income shortfall of the the population with less than Rf.15 per person per day (%)	poverty gap index of the population with less than Rf.15 per person per day	<i>Human Vulnerability Index</i>	<i>Income Poverty Index</i>
219	Meedhoo	0	0	6	13.5	10	0.01	<i>0.18</i>	0.01
220	HITHADHOO	0	5	18	11.0	27	0.05	<i>0.17</i>	0.08
221	Maradhoo	2	2	2	5.4	64	0.01	<i>0.22</i>	0.02
222	Feydhoo	0	0	1	14.1	6	0.00	<i>0.09</i>	0.00
223	Maradhoo-Feydhoo	0	0	15	14.1	6	0.01	<i>0.40</i>	0.02
224	Hulhudhoo	0	0	26	13.1	13	0.03	<i>0.27</i>	0.05

#### **Annex 4:**     *Glossary and Definition of Terms Used*

##### Development – Maldivian Context:

Development is at the core of ICM. Diverse definitions of development exist in the literature. For the purpose of the NSAP the definition by Stern (2005) is most appropriate since it harmonizes with the guiding principles of the 7NDP. Development has to be seen as a process of dynamic change which requires convergence of:

- An appropriate investment climate, and
- Empowerment

The former requires policies, governance and institutions that give confidence and enable people to allocate money and energy towards future betterment (also see under *empowerment*). The latter involves:

- The ability of people to shape their own lives
- Taking decisions that broaden the scope of their lives and those of their families

*Empowerment* as a thematic area in the MFF Strategic planning and implementation process and requires further clarification. The World Development Report 2006 (World Bank, 2005) provides clarity on empowerment in a globalized world. Empowerment means the manner in which people overcome the combined deprivations of power and investment opportunities. Lack of income, lack of access to services, lack of assets – these deprivations go together with lack of voice, lack of power, lack of status. Public action could enhance the investment capabilities of those who have limited opportunities by investing in their human capital and in the infrastructure they use and by ensuring fairness in security in the markets in which they transact. And if public action fails to do that, it is because it has somehow been decided otherwise. ... Observed policies that fail to address inefficient equities are the result of political choices, implicitly or explicitly.

*Institutions:* Two elements omitted from the aforesaid view of development are institutions and governance (Stern, 2005). Institutions have a range of definitions. For this overview the institutional aspects that are important are (Easterly 2002; UNDP, 2006):

- Rule of law, balanced law enforcement for the rich and the poor
- Professional bureaucracy and minimal red tape, accompanied by low corruption
- Freedom from repudiation of contracts, which reduces opportunity for corruption
- Freedom from expropriation, which again reduces corruption

*Governance:* is one of the thematic areas in the MFF Strategic planning and implementation framework. Therefore clarity here is essential. Stiglitz (2007) explains thus “A major factor determining how well a country will do is the *quality* of the public and private institutions, which in turn is related to how decisions get made and in whose interest, a subject broadly referred to as *governance*”

Equitable development occurs where empowerment, institutions and governance combine to reduce or eliminate poverty. Poverty reduction has both macroeconomic and microeconomic implications. In this perspective, the role of ICM in improving human wellbeing has to be assessed with caution because its geographic scope is highly limited and must integrate with wider relationships. However, ICM at selected island ecosystems in the Maldives has the potential to demonstrate models which incorporate both empowerment and governance and support livelihood.

*Employment and Sustainable Livelihood:*

What should be the main focus of investment and development agenda for the next five years, or 10 years or 15 years? In short, it is education, skills and vocational training and creating employment opportunities. In spite of the country’s high literacy rate, having achieved universal primary education and high levels of secondary education, high unemployment rates prevail. The presumed reason for the latter is the mismatch between what is provided through the education system and the skills demanded by the labor market. The existing population and the projected population indicate that the focus of investment, public spending and development agenda should be on human capital development. A special focus on vocational training and skill development is increasingly required, as education and technical skills are vital to the employability of workers. By the same token, focus on the content, quality of education and skills are also crucial. At the same time, to increase employment opportunities, measures to improve productivity and incomes in the rural economy and urban informal sector need to be undertaken. Generating employment and re - employment opportunities through business creation is also important (World Bank, 2007).

**Annex 5: List of stakeholders interviewed (February & March, 2009)**

No	Name	Organisation	Designation
1	Fathmath Shafeega	Department of National Planning	Assistant Director General
2	Mossa Zameer	Ministry of Tourism, Arts and Culture	
3	Zahaa Waheedh	Programme of work on protected areas	Project manager(ERC)
4	Abdulla Naseer	Ministry of Fisheries and Agriculture	Perm. Secretary
5	Hussain Sinan	Ministry of Fisheries and Agriculture	
6	Aishath Najaath	Ministry of Fisheries and Agriculture	Assistant Agriculture Officer
7	Fathmath Shafeega	Live & Learn	Country Manager
8	Marie Saleem	Marine Research Centre	Reef Ecologist
9	Muruthala Mohamed Didi	National Disaster Management Centre	Director
10	Mohamed Naeem	Ministry of Home Affairs	State Minister for Central North Province
11	Ahmed Aseeth	Ministry of Home Affairs	Deputy - Central North Province
12	Umar Jamaal	Ministry of Home Affairs	State Minister for Upper North Province
13	Faarooq Mohamed Hassan	Ministry of Home Affairs	State Minister for Central Province
14	Abdulla Shiba	AEC Project, Ministry of Housing, Transport and Environment	National Project Manager
15	Abdulla Mohamed Didi	AEC Project, Ministry of Housing, Transport and Environment	Atoll Partnership Builder
16	Mohamed Zuhair	Environment, Ministry of Housing, Transport and Environment	Director
17	Hussain Rasheed	Housing, Ministry of Housing, Transport and Environment	Planner
18	Ahmed Raafiu	Vice Chairperson	Society for Development of Addu, NGO, Addu Atoll
19	Ahmed Nadheem	Chair Person	Maavahi, NGO, Addu Atoll
20	Ibrahim Shiyam	General Secretary	Maavahi, NGO, Addu Atoll
21	Mohamed Sharafuddin	Treasurer	Maavahi, NGO, Addu Atoll
22	Ahmed Shiruhan	Member	Maavahi, NGO, Addu Atoll
23	Ahmed Khaleel	Member	Maavahi, NGO, Addu Atoll
24	Abdulla Sodiq	Addu Atoll Councilor	Addu Atoll Office
25	Adham	Deputy State Minister, South Province	South Province Atoll
26	Yoosuf Moosa	Baa Atoll Councilor	Baa Atoll Office
27	Abdul Bagir Ahmed	Senior Assistant to Atoll Councilor	Baa Atoll Office



**Annex 6 :** *The proposed method for impartial selection of inhabited islands for ICM.*

The existing policies that need to be given consideration are:

- Some islands have been already identified as appropriate for major development including expansion and erosion protection engineering. There is little scope for ecosystem-based ICM on such islands. However, some land use zoning guidelines may be useful.
- Some islands affected by the 2004 tsunami are already undergoing reconstruction. Here again little scope may exist for ecosystem-based ICM.
- Some islands are regarded as unsafe in the long-term for human habitation in the face of climate change. There is likelihood that they may eventually be abandoned under the population consolidation programme. These have no significance for ICM.
- The remaining islands become candidates for prioritization for ICM model building.

This annex provides an example of the manner in which weighted scores are to be assigned to inhabited islands to enable prioritization and impartial selection for ICM model building. Table A6.1 provides a sample key for scoring. The key itself has to be further developed, field-tested and finalized by way of brainstorming among a group of representative stakeholders who are familiar with the field conditions. Based upon the key the scoring, assigning of weights and prioritization may be done using a spreadsheet (Table A6.2). The prioritized islands need to be displayed on a map to enable decision makers to (i) to readily identify them, and (ii) to facilitate brainstorming. The challenge is to represent islands which have very high size diversity, situated in seven provinces dispersed across eight latitudes, on appropriate maps.

Provincial grid maps were developed (Annex 7) with spacing that would enable representation of the smallest islands (about 0.2 km<sup>2</sup>). Because of the smallness of the islands, providing adequate information within a grid cell on the map itself is difficult. Therefore the provincial maps are supported by spreadsheets which enable an identification number to be assigned to individual islands. The sample spreadsheet for the Upper North Province serves as an example. The notation 1.1.1 is the identification number of Thuraakunu Island (the first digit represents the province, the second digit refers to the atoll, while the third digit refers to the island). The priority assigned to the island based upon the weighted score is represented by a letter; H: high priority, M: moderate priority, L: low priority, and N: not significant for ICM - see Table A6.1 for further explanation of the scoring key). The grid reference to a particular province map is given by a letter-digit combination, e.g. M3.

**Table A6.1** Key to Island Scoring and assigning weights for Impartial Selection for ICM Model Building as a part of development of the national ICM programme

Attribute	Scoring Rationale
<b>Geomorphology</b>	
1. Area	Larger islands intuitively provide flexibility and scope for land allocation for multiple uses (based on ICM), larger populations and economies of scale. <u>Scoring:</u> 1- small <100 ha - 2: medium 100-200 ha; 3 - large >200 ha.
2. Elevation	Higher elevation enables clear zoning including environmental protection zone (EPZ), drainage zone, settlement zone etc. <u>Scoring:</u> 1 - < 0.5 m; 2 – 0.5 to 1.0 m; 3 - > 1.0 m.
3. Coral reef status (significance for bait fish)	Bait fish yield is a reliable indicator of the complexity, health and extent of a house coral reef. <u>Scoring:</u> 1- <25 kg/night; 2 - <50 kg/night; 3 - > 50 kg/night.
4. Beach dynamics (susceptibility to erosion)	Erosion severity suggests the need for beach protection by interventions including soft and hard approaches. <u>Scoring:</u> 1 – insignificant; 2-moderate; 3-severe)
5. Vegetation status (richness of peripheral vegetation)	Vegetation cover including, coastal vegetation belts, suggest suitability for their enrolment as peripheral EPZs. <u>Scoring:</u> 1 – sparse; 2 – moderate with potential for EPZ; 3: dense with undamaged coastal belts.
6. Beach ridge form (elevation above MSL)	Elevation and beach ridge are interconnected. A clear beach ridge on islands with higher elevation facilitates zoning. <u>Scoring:</u> 1- unclear beach ridge; 2 – clear beach ridge < 1.0 m; 3 – prominent beach ridge > 1.0 m.
7. Drainage zone form (contribution to flood drainage)	To be developed in consultation with technical authorities based upon flooding experienced on representative islands.
<b>Demographics</b>	
8. Population	Large populations suggest the probability of increased loss of life and property in the event of a hazard. At the same time economies of scale may be achieved for investments. <u>Scoring:</u> 1 - < 500 persons; 2 – 500 to 1,000 persons; 3 - > 1,000 persons.
9. Density	High density implies higher stress upon land including the management of EPZs. Consequently high population density warrants integrated land management and zoning based on ICM principles. <u>Scoring:</u> 1 - < 50/ha; 2 – 50 to 100 per ha; 3 - >100/ha.
10. Income poverty index	A low income poverty index suggests higher, average household income. The income poverty index (2004) for Male was 0.01. Intuitively islands with higher income poverty indices require support for poverty reduction. Closing the gap with Male could serve as a target for ICM. Reduced poverty would enable increased organization and capacity building for addressing impacts

	of hazards. For the purpose of scoring the income poverty index of an island relative to Male is used e.g. Maafaru:Male : : 0.58:0.01 = 58. <u>Scoring</u> : 1 - <1; 2 - <2; 3 - >2.
11. Migration status.	High voluntary emmigration suggest that the members of the population, for a variety of reasons, may prefer to live in other islands. In the long term this may mean that investment in an island with higher emigration rates may be unwarranted since it may eventually be abandoned in the face of increasing sea level rise. By implication such islands may be allocated in a planned manner to tourism development where assets are compensated to support voluntary migration. <u>Scoring</u> : 1- high emigration/immigration ratio; 2 – moderate emigration/immigration ratio; 3 - low emigration/immigration ratio.
12. Proportion of female (single parent) headed households	A high incidence of female (single parent) headed households suggest an unduly heavy gender burden with regard to education of children. Islands with a high proportion of such families warrant livelihood support stemming from productive land uses based upon ICM principles. <u>Scoring</u> : to be determined.
<b><i>Livelihood</i></b>	
13. Fishery dependence	
14. Agriculture dependence	
15. Tourism dependence	
<b><i>Education Infrastructure</i></b>	
16. Secondary school	
17. Vocational school	
<b><i>Health Care Infrastructure</i></b>	
18. Distance to nearest island with a General hospital	
19. Emergency care facilities on island	
<b><i>Transportation Infrastructure</i></b>	
20. Status in inter-island/atoll transportation	
21. Fishery harbour	
22. Permanent jetty	
23. Airport (air link)	
<b><i>Resilience</i></b>	
24. Exposure	Based upon the geographic position of an island in an atoll and the history of impacts from regular hazards.
25. Vulnerability	Potential for damage to life and property based upon geographic position of

	an island giving consideration to relevant risk factors.
26. Risk (level of group insurance)	The potential for damage to life and property as the product of: frequency of hazards, exposure and/or vulnerability index and density of inhabitants and property.
27. Emergency responsiveness	Island populations require training and material support to cope with impacts of natural hazards(excluding rare extreme events such as the 2004 Tsunami) to prevent disasters. This is an integral aspect of ICM for a small island population. An island scoring 3 would rank highest for ICM. <u>Scoring</u> : 1: trained and supported; 2: trained but inadequately supported; 3: neither trained nor supported.
<ul style="list-style-type: none"> <li>• Robustness (coping with hazards – training, warning systems, shelters, emergency medical care etc)</li> </ul>	
<ul style="list-style-type: none"> <li>• Resourcefulness (participation, training, – mutual help)</li> </ul>	
<ul style="list-style-type: none"> <li>• Rapid recovery (getting back to regular livelihood activities)</li> </ul>	
<ul style="list-style-type: none"> <li>• Adaptive learning (absorbing lessons from experience)</li> </ul>	
<b>Other</b>	





Annex 7

