MALDIVES

FIFTH NATIONAL REPORT TO THE UNITED NATIONS CONVENTION ON BIOLOGICAL DIVERSITY

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Ministry of Environment and Energy

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FOREWORD

As a small island developing state, the Maldives faces numerous challenges in terms of sustainable management of biological diversity and resource use. However, the country is host to and the custodian of a large marine area that includes globally significant species.

Over the three millennia that people have lived on these islands, they had done so in harmony with nature. This is a creed we need to emulate and pass on to our future generations. For Maldivians, our biological diversity, of which marine resources constitute the overwhelming majority, is central to our everyday life. From the wider economy to the social and cultural sphere, biodiversity remains fundamental. Indeed our entire way of life is entirely dependent on our islands, our reefs, our seas and the biological diversity they hold.

This report, prepared in accordance with our obligations under the Convention on Biological Diversity, constitutes as a key document guiding the national biodiversity policy. It provides an update on the status of biodiversity in the Maldives and includes updates on the revision of National Biodiversity Strategy and Action Plan. The report also provides critical information on the implementation and progress towards the Strategic Plan for Biodiversity 2011-2020 and the Aichi Targets and relevant MDG targets. This exercise has provided a unique opportunity to not only gauge the status of biodiversity in the country, but has also provided critical information towards consolidating gains made in the area and inform the policy directions and interventions necessary to address the threats and emerging challenges.

I would like to thank the Global Environment Facility and the Secretariat of the Convention on Biological Diversity for the support provided in producing this report. I also note the efforts of Fifth National Report team in compiling the report. Finally I wish to thank all the stakeholders who took the time and effort to contribute to the consultative process, which forms the basis of this report.

Thoriq Ibrahim
Minster of Environment and Energy

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Ministry of Fisheries and Agriculture
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Local Government Authority
Department of National Planning

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ABBREVIATIONS AND ACRONYMS

AEC	Atoll Ecosystem Conservation
BACP	Baa Atoll Conservation Programme
CBD	Convention on Biological Diversity
DNP	Department of National Planning
EEZ	Exclusive Economic Zone
EIA	Environment Impact Assessment
EPA	Environment Protection Agency
EPPA 4/93	Environment Protection and Preservation Act 4/93
GDP	Gross Domestic Product
GEF	Global Environment Facility
IOTC	Indian Ocean Tuna Commission
IUCN	International Union for Conservation of Nature
MDG	Millennium Development Goals
MEE	Ministry of Environment and Energy
MEEW	Ministry of Environment, Energy and Water
MHAHE	Ministry of Home Affairs, Housing and Environment
MoFA	Ministry of Fisheries and Agriculture
MPA	Marine Protected Area
MRC	Marine Research Centre
MSC	Marine Stewardship Council
MVR	Maldivian Rufiyaa
NBSAP	National Biodiversity Strategy and Action Plan
NCRMA	National Coral Reef Management Authority
NEAP III	Third National Environment Action Plan
NSDS	National Sustainable Development Strategy
SAP	Strategic Action Plan
SST	Sea Surface Temperature
T-GST	Tourism Goods and Services Tax
TMP IV	Fourth Tourism Master Plan
UNESCO	United Nations Educational, Scientific and Cultural Organization
VLD	Vessel Locating Device
VMS	Vessel Monitoring Systems

INTRODUCTION

This is the Fifth National Report of the Maldives to the United Nations Convention on Biological Diversity (CBD). This report has been prepared by the Ministry of Environment and Energy (MEE), Government of the Maldives, and submitted to the Executive Secretary of the CBD.

The United Nations CBD (the Convention) is an international treaty opened for signature at the United Nations Conference on Environment and Development (the Earth Summit) held in Rio de Janeiro, Brazil, in June 1992. The Convention came into force on 29 December 1993. The primary objectives of the Convention is the conservation of biological diversity, sustainable use of its components, and the fair and equitable sharing of benefits arising out of the utilization of genetic resources.

The Government of Maldives signed the Convention in June 1992 and ratified the Convention on 28 October 1992. There are altogether 193 countries that are Parties to the Convention as of March 2014.

Article 26 of the CBD states that:

> Each Contracting Party shall, at intervals to be determined by the Conference of the Parties, present to the Conference of the Parties, **reports on measures** which it has taken for the implementation of the provisions of this Convention **and their effectiveness** in meeting the objectives of this Convention.

The Maldives prepared the First National Report to the CBD in 2002. This was followed by the Fourth National Report of the Maldives to the CBD, which was submitted to the Convention Secretariat in March 2010.

At the 10th Conference of the Parties to the CBD held in 2010, Parties decided that fifth national reports to the Convention should be submitted by 31 March 2014 and provided guidelines for reporting through its Decision X/10. At the 12th Conference of the Parties to the CBD, Parties further agreed that the fifth national reports should facilitate the provision of essential information for a mid-term review of progress towards the implementation of the Strategic Plan for Biodiversity 2011-2020 and progress towards the Aichi Biodiversity Targets.

This Fifth National Report of the Maldives to the CBD is composed of three main parts:

Part I - An update on the status of biodiversity, trends, as well as threats and implications for human well being.

Part II - The National Biodiversity Strategy and Action Plan (NBSAP), its implementation, and mainstreaming of biodiversity.

Part III - Progress towards the the Strategic Plan for Biodiversity 2011-2020 and the Aichi Targets and contributions to the relevant Targets of the MDGs.

An extensive stakeholder consultation process was carried out for the preparation of this report. Seven sub-national consultations were held covering 20 administrative atolls of the Maldives and two national workshops were conducted. Elected local councils, Non-Government Organizations (NGOs), civil society, women's development committees, government ministries, and businesses participated and actively contributed through the workshops. The MEE team also worked closely with national focal points responsible for implementation of the United Nations Framework Convention on Climate Change, the Kyoto Protocol, the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, the Vienna Convention for the Protection of the Ozone Layer, the Montreal Protocol on Substances that Deplete the Ozone Layer, and the Cartagena Protocol on Biosafety. The national focal points shared data and provided analysis that improved the quality of this report.

EXECUTIVE SUMMARY

Biodiversity and ecosystems directly benefit the health, well-being and economic prosperity of the Maldives and are an integral part of the cultural and social lifestyle of Maldivians, who inhabit these small tropical islands located in the Indian Ocean. From coral reef and island-based tourism, to tuna fishery, the Maldives is highly dependent on biodiversity for employment, food security, quality of life, aesthetics, recreation, and sustainable livelihoods. As such, the Government of Maldives fully recognizes the need for the conservation of biological diversity.

The Maldives is a nation of 1,192 small low-lying tropical islands in an archipelago of 26 tropical coral atolls. The total land area is estimated to be approximately 227 km2, and more than 90% of the islands are less than 0.5 km2 in area. The islands of the Maldives are flat and low-lying. Over 80% of the total land area of the country is less than one meter above mean sea level.

Maldives has a tropical monsoon climate. The mean daily maximum temperature is 30.7 ^{0}C with an annual average rainfall of 2,124 mm. Rainwater percolates through the highly porous coral sand and forms a freshwater lens above the seawater.

There are no rivers in the Maldives and surface freshwater is generally lacking throughout the archipelago. Some of the larger islands have small fresh-water lakes, with some containing swampy depressions, and some having brackish water ponds with mangroves along the edges. The soils in the Maldives are geologically young and consist of substantial quantities of the unweathered coral parent material, coral rock and sand. The soils are alkaline with pH values between 8.0 and 8.8.

Despite the poor and infertile soils, Maldives has a diverse vegetation cover. The flora of the country consists of 583 vascular plants. Of these, 323 (55%) are cultivated plant species while 260 are native and naturalized plants. Mangrove ecosystems in the Maldives consist of 14 species belonging to 10 genera. The mangroves also have 37 species of fungi associated with them.

In comparison to the rich terrestrial faunal diversity of the region, the Maldives is not known for abundant wildlife. In a study conducted on fruit bats and birds of the Maldives, specimens of insects, arachnids and mollusk were collected. It was found that Maldives is particularly rich in species of spiders. Some 130 insect species such as scorpions, centipedes, rhinoceros beetle and paper wasps have been identified in the Maldives. The only native mammals endemic to the country are the two subspecies of fruit bats, *Pteropus giganteus ariel* and *Pteropus hypomelanus maris*. The latter is very rare and has been recorded only once in Addu City.

Over 167 species of birds have been recorded in the Maldives comprising of seabirds, shorebirds and terrestrial birds. They include breeding residents, southern winter visitors (shearwaters and storm-petrels), and northern winter visitors (mostly waders, raptors and passerines as well as some terns).

The coastal and marine ecosystems of the Maldives, in particular, the coral reef ecosystems are globally significant. They form the seventh largest reef system in the world and the coral reefs of Maldives represent as much as 3.14% of the world's reef area. In the 26 natural atolls of the Maldives there are 2,041 distinct coral reefs. The marine biological diversity is outstandingly rich, especially within the coral reefs, making them one of the world's most diverse marine ecosystems. In the Maldives, 258 species of hermatypic corals and 36 species of sponges are found. Altogether 285 species of algae, five species of sea grass, 400 species of molluscs, 350 species of crustaceans and 80 species of echinoderms have been documented.

The Maldivian waters have a high diversity of cetaceans with 20 species having been sighted. Over 1,090 species of fish have been recorded in the Maldives, with the most diverse group of fishes being gobies (90 species), followed by wrasses and groupers (70 and 40 species respectively). Nearly 40 species of sharks and 16 species of skates have been recorded. Five species of marine turtles occur in the Maldives: the green turtle *(Chelonia mydas)*, the hawksbill turtle *(Eretmochelys imbricata)* the olive ridley *(Lepidochelys olivacea)*, the leatherback turtle *(Dermochelys coriacea)* and the loggerhead turtle *(Caretta caretta)*.

The reef ecosystem of the Maldives has internationally threatened populations of hawksbill and green turtles and is reported to be one of the most important feeding areas for hawksbill turtles in the Indian Ocean. The atolls of the Maldives are also home to globally significant populations of whale shark *(Rhincodon typus)*, manta rays *(Manta birostris)*, reef sharks and more than 20 species of whales and dolphins. Other globally significant coral reef species include the Napoleon wrasse (*Cheilinus undulatus)*, giant grouper *(Epinephelus lanceolatus)*, giant clam *(Tridacna squamosa)* and black coral *(Antipatharia)*. The Maldives Blenny *(Ecsenius minutus)* has so far been identified only in the Maldives, while the distribution of certain species, like the Maldivian anemone fish *(Amphiprion nigripes)* is restricted to the Maldives, Laccadives and Sri Lanka.

Coral reef ecosystems play a key role in enabling human settlements in the Maldives through climate regulation, storm buffering, and coastal protection. The reef functions as natural sea defences for islands highly vulnerable to climate change. The cost of artificial replacement of coral reef to provide protection for the perimeter of the 193 inhabited islands in the Maldives is estimated to be between MVR 20 billion and MVR 34 billion.

Fish, particularly tuna, is the primary source of dietary protein for the Maldivians. Tuna is served with almost every meal. The fresh tuna supplied from the Maldives account for more than 15% of fresh tuna imported to the European Union.

The country relies heavily on the direct benefits to the economy from marine and coastal biodiversity. It is estimated that biodiversity based sectors contribute to 98% of exports, 89% of Gross Domestic Product (GDP), 71% of national employment, 62% of foreign exchange and 49% of public revenue. Biodiversity makes a significant contribution to government revenue through both tax and non-tax revenue from economic sectors dependent on biodiversity.

The target catch of Maldivian fishermen are the commercially important skipjack tuna (*Katsuwonus pelamis)* and yellow fin tuna *(Thunnus albacares)*. From 35,942 mt in 1970, the total fish catch doubled to 76,374 mt by 1990. The fish catch reached a record high of 186,000 mt in 2005 and since then has declined. There is concern over the decline in skipjack tuna catch in the Maldives, and fish catch data for the last twenty years show a declining trend in skipjack tuna catch since 2006. Following the peak skipjack tuna catch of 138,458 mt in 2006, skipjack tuna catch reached a twenty-year low of 53,392 mt in 2012.

The stakeholders who attended the consultations for this report identified an increase in the number of sharks sighted, particularly during fishing trips. All together 40 species of sharks belonging to 17 families have been recorded in the Maldives. The eight most common reef-associated sharks in the Maldives are the whitetip reef shark *(Triaenodon obesus)*, blacktip reef shark *(Carcharhinus melanopterus*), grey reef shark *(Carcharhinus amblyrhynchos)* scalloped hammerhead shark *(Sphyrna lewini)*, silvertip shark

(*Carcharhinus albimarginatus),* tawny nurse shark *(Nebrius ferrugineus),* variegated shark *(Stegostoma fasciatum), a*nd whale shark *(Rhincodon typus).* The stakeholders attributed this increase in sightings to the ban on shark fishing in the Maldives.

Recent studies have been published on the size of manta ray *(Manta alfredi*) populations in the Maldives, which are a major tourism attraction. The economic value of manta ray watching by divers and snorkelers is estimated to be worth more than US$ 8.1 million per year in direct revenue. It is estimated that tourists make more than 143,000 dives annually for manta ray watching.

Targeted grouper fishery in the Maldives began in the early 1990s and intensified quickly due to the huge demand from the export market. High market value species such as *Epinephelus fuscoguttatus, Plectropomus areolatus, Plectropomus laevis* and *Plectropomus pessuliferus* have been favourites. The most recent assessment of grouper fishery shows a declining trend, indicating that lack of management has resulted in an unsustainable fishery. Live exports of high value grouper species are on a continual decline. Live grouper exports show a decreasing trend, which is compensated by increasing export of fresh/chilled groupers (low value species and smaller sized individuals).

Reef reclamation is a major threat to marine biodiversity in the Maldives. More than 1,000 ha of reef have been reclaimed in some 98 inhabited islands. Reefs are being reclaimed to provide land for population settlement and economic uses mainly in inhabited islands with high population density. The population of Maldives has increased by four fold since 1911 and overcrowding is a significant problem in smaller inhabited islands. Hulhumale' is the largest land reclamation project where approximately 430 ha were reclaimed to reduce population pressure on Male'.

Dangerous climate change such as increase in Sea Surface Temperature (SST), increasing ocean acidity, increased frequency of extreme weather events, and altered rainfall patterns pose serious risk to biodiversity in the Maldives. The global average surface temperature is projected to increase by 1.4 to 5.8 ºC by 2100. For the Indian Ocean region, temperature is expected to increase by 2.1 ºC by the 2050s and 3.2 ºC by the 2080s. For Maldives, the annual maximum daily temperature is projected to increase by around 1.5 ºC by 2100.

Corals are highly sensitive to changes in temperature, and some species of corals live at or near their thermal limits. The incidence of bleaching is expected to increase in frequency and intensity with the projected rise in SST. The evidence from the reefs of the Maldives supports findings that warming of the ocean surface leads to significant coral bleaching.

Coral reefs of the Maldives are also vulnerable to the projected rise in sea level. Most reefs of the Maldives appear to be at a point where they are limited by sea levels and with no potential for upward growth. Reefs appear to be now growing outwards laterally and filling up inside.

Coastal marine pollutants, particularly in the form of waste, sewage, oil and fertilizers adversely impact the marine biodiversity. These pollutants originate from land-based activities such as food consumption, lifestyle changes, housing and agriculture and from marine transport. Waste, sewage, oil and fertilizers cause degradation of coral reef habitats, change the distribution and density of species, and decrease the capacity of corals to withstand and recover from coral bleaching events.

The terrestrial biodiversity of Maldives continues to be under threat from vegetation clearance activities, leading to loss and fragmentation of habitat. The Regulation for the Felling, Uprooting, Removing and

Transfer between islands of Palms and Trees helps biodiversity conservation, soil protection and water quality. Although the government has introduced land clearance controls, there has been a significant increase in vegetation cleared for agriculture, housing development, and recreation. Vegetation loss due to housing and agriculture is reducing species diversity and abundance, degrading habitats and disrupting ecological processes.

A decline in the biodiversity of medicinal plants has also been identified by stakeholders. The Maldives has a rich tradition of local medicinal practices with many locally growing plants being used in the preparation of medicines. Plant derivatives are also used as pest repellents to protect crops. Though traditional forms of medicine have not been completely documented, some 122 species of plants with medicinal properties were recorded by the Ministry of Fisheries and Agriculture in 1992.

In line with the Aichi Biodiversity Targets of the Strategic Plan for Biodiversity 2011-2020, the Maldives has identified 26 targets for biodiversity conservation in six different areas. At present, these goals and targets are undergoing final stages of approval. Biodiversity conservation targets are also found in National Sustainable Development Strategy (NSDS), and the Third National Environment Action Plan (NEAP III).

The Maldives ratified the CBD on 28 October 1992. Ten years later in 2002, the Maldives developed the first NBSAP. The vision of the first NBSAP was:

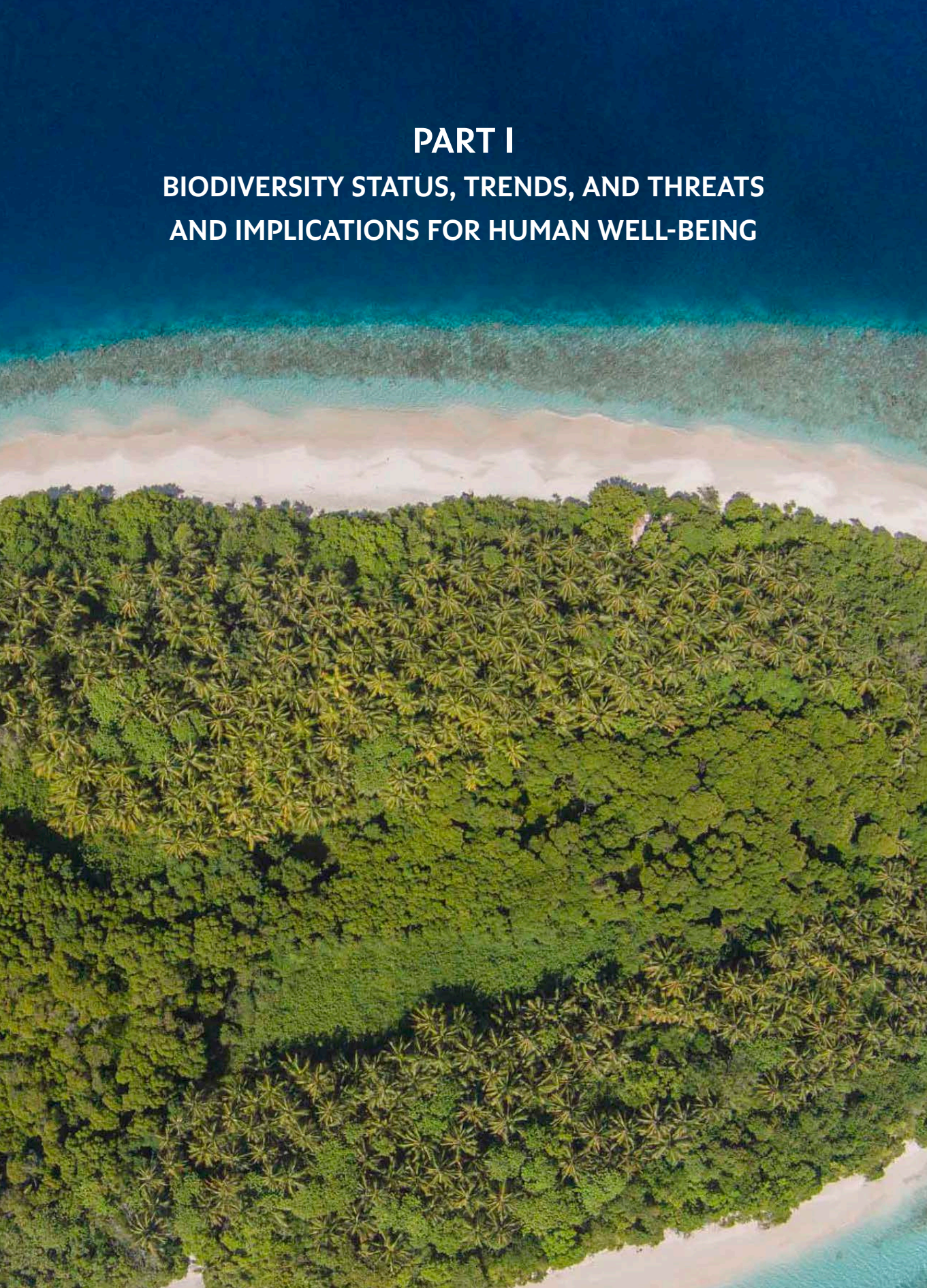
> a nation which appreciates the true value of the natural environment, utilizes its natural resources in a sustainable manner for national development, conserves its biological diversity, shares equitably the benefits from its biological resources, has built the capacity to learn about its natural environment and leaves a healthy natural environment for future generations (2002, p. 20).

The Government has formulated a second NBSAP to address biodiversity issues, and developed an implementation plan with achievable targets. The new NBSAP is in line with the CBD targets for 2010-2020.

The Government of the Maldives has developed and adopted planning procedures and processes that take into account biodiversity conservation. The incorporation of biodiversity conservation in the Fourth Tourism Master Plan, the Strategic Action Plan 2009-2013, the NSDS and NEAP III are particularly noteworthy.

PART I

BIODIVERSITY STATUS, TRENDS, AND THREATS AND IMPLICATIONS FOR HUMAN WELL-BEING



1.1 GEOGRAPHIC PROFILE

The Maldives is a nation of coral atolls located on the Laccadives-Chagos submarine ridge in the Indian Ocean (Ministry of Home Affairs, Housing and Environment, 2001a). The atolls of the Maldives stretch between Minicoy Island (the southernmost part of Lakshadweep, India) and the Chagos Archipelago (British Indian Ocean Territory). The chain of coral atolls that comprise the Maldives is 820 km long (from latitude 7o6'35"N to 0o42'24"S) and 80 to 120 km wide from longitude 72o33'19"E to 73o46'13"W (Department of National Planning, 2013; Ministry of Environment and Energy, 2012). The northern most atoll of the Maldives, Ihavandhippolhu, lies about 130 km south of Minicoy Island while Addu, the southernmost atoll, lies north of the Chagos Archipelago at a distance of about 450 km.

Historically the Maldives is divided into 26 natural atolls (Luthfee, 1995). However, based on a scientific study of the features of the coral atolls Naseer and Hatcher (2004) classifies the Maldives into 16 complex atolls, five oceanic faros and four oceanic platform reefs. The 2008 Constitution of the Maldives, in its Schedule Two, divides the Maldives into 20 administrative atolls, and the capital Male' (Table 1).

There are 1,192 islands in the coral atolls of the Maldives (DNP, 2013). In a land study conducted in 2006, Shaig (2008) states that there are 1,074 vegetated islands and approximately 450 un-vegetated islands in the Maldives. Vegetated islands comprise both natural vegetated islands and artificial vegetated islands. The un-vegetated islands include natural sand banks (Finolhu), natural coral conglomerates above High Tide Level (Huraa) and artificial un-vegetated islands.

Table 1:

Distribution of islands by administrative atolls

#	Administrative Atolls	Atoll Code	Vegetated Islands	Unvegetated Islands	Total
1	North Thiladhunmathi	Haa Alifu	38	5	43
2	South Thiladhunmathi	Haa Dhaalu	34	4	38
3	North Miladhunmadulu	Shaviyani	49	8	57
4	South Miladhunmadulu	Noonu	64	13	77
5	North Maalhosmadulu	Raa	79	21	100
6	South Maalhosmadulu	Baa	66	48	114
7	Faadhippolhu	Lhaviyani	50	31	81
8	Male' Atoll	Kaafu	99	54	153
9	North Ari Atoll	Alifu Alifu	30	28	58
10	South Ari Atoll	Alifu Dhaalu	45	32	77
11	Felidhe Atoll	Vaavu	18	21	39
12	Mulakatoll	Meemu	35	28	63
13	North Nilandhe Atoll	Faafu	16	19	35
14	South Nilandhe Atoll	Dhaalu	42	27	69
15	Kolhumadulu	Thaa	64	33	97
16	Hadhdhunmathi	Laamu	77	22	99
17	North Huvadhoo Atoll	Gaafu Alifu	85	24	109
18	South Huvadhoo Atoll	Gaafu Dhaalu	154	25	179
19	Fuvammulah	Gnaviyani	1	-	1
20	Addu Atoll	Seenu	28	6	34
		Total	1074	449	1523

(Source: Shaig, 2008)

Although Maldives has a total area of 115,300 km2 including sea and Exclusive Economic Zone (EEZ) that covers an area of 859,000 km2 (DNP, 2013) it is the sixth smallest sovereign state in terms of land area (Ministry of Environment, Energy and Water, 2007). Based on calculations using satellite and aerial imagery, the total land area of the Maldives including the beach areas and non-vegetated sand banks is estimated to be approximately 227.30 km2, while land area within the vegetation line of the islands is 204.05 km2 (Shaig, 2008).

More than 90% of the 1,074 vegetated islands in the Maldives are less than 0.5 km2 in area (Shaig, 2007). Only 10 islands have an area of more than 2.5 km2. The largest island, Gan in Laamu Atoll, has an area of about 6 km2. Land is extremely scarce and the 358 islands that were in use in 2006 accounted for 176 km2 while the 834 unutilized islands make up 59 km2 (Shaig, 2006)

Table 2:

Largest inhabited islands of Maldives

#	Island	Atoll	Area (km2)
1	Gan	Laamu	6.13
2	Hithadhoo	Seenu	5.26
3	Fuvahmulah	Gnaviyani	5.01
4	Isdhoo	Laamu	3.73
5	Hanimaadhoo	Haa Dhaalu	3.04
6	Kaashidhoo	Kaafu	2.81
7	Filladhoo	Haa Alifu	2.70
8	Baarah	Haa Alifu	2.68
9	Kendhikolhudhoo	Noonu	2.15
10	Nolhivaramu	Haa Dhaalu	2.10

(Source: (MEEW, 2007)

Table 3:

Largest uninhabited islands of Maldives

#	Island	Atoll	Area (km2)
1	Gan	Seenu	2.89
2	Gan	Gaafu Dhaalu	2.51
3	Kaadehddhoo	Gaafu Dhaalu	1.87
4	Madidhoo	Shaviyani	1.07
5	Kadhdhoo	Laamu	1.03
6	Kalhufahalafushi	Thaa	1.03
7	Maafahi	Haa Alifu	1.02
8	Maavaarulu	Gaafu Dhaalu	0.98
9	Keylakunu	Haa Dhaalu	0.91
10	Farukolhu	Shaviyani	0.88

(Source: (MEEW, 2007)

The islands of the Maldives are flat, with topographic variations generally less than two meters (Ali, 2000). Over 80% of the total land area of the country is less than one meter above mean sea level (MEEW, 2007). The highest point recorded in the country is a beach storm ridge at Fuvahmulah, with an elevation of four meters above mean sea level (Ministry of Home Affairs, Housing and Environment, 2001b; Commerce, Development and Environment, 2006).

Freshwater resources are scarce in the Maldives. There are no rivers or streams in the islands. Some of the larger islands have small freshwater lakes, some contain swampy depressions, and some have brackish water ponds with mangroves along the edges. The main source of freshwater in the islands is the groundwater aquifer. Rainwater percolates through the porous coral sand and forms a freshwater lens above seawater. The freshwater lens lying beneath the islands are shallow, no more than a few meters thick. The freshwater being lighter than saline water, the lens floats atop saline water. The aquifers change in volume with season and rise and fall with the tide. This freshwater is easily obtained by sinking shallow wells. Increased extraction exceeding natural recharge through rainfall, has dramatically depleted the freshwater lens in Male' and other densely populated islands.

The soils in the islands of the Maldives are geologically young. They consist of substantial quantities of the unweathered coral parent material, coral rock and sand. Soils are coarse in texture and shallow in depth with a top layer of brown soil (0 to 40 cm in depth) followed by a transition zone on top of the underlying parent material of coral reef limestone (Ministry of Fisheries, Agriculture and Marine Resources, 1995). In some low-lying areas and areas subjected to significant mechanical breakdown from human activity, fine deep soils are found with accumulated deposits of clay. In the wetland environment called kulhi the depth of the clay is substantial due to the accumulation of material from marine and biological sources over a long period of time (Ministry of Environment, Energy and Water, 2006). In many places, top layers of the soils have a weakly developed structure and at times a 30 cm thick hard-pan layer cemented with calcium carbonate is present, preventing penetration of the roots of most plants except large trees. The water-holding capacity of the soil is very poor due to high porosity and very high infiltration rates.

The soils of the Maldives are generally alkaline with pH values between 8.0 and 8.8 (Sevlam, 2007). The high alkalinity is due to the presence of excess calcium. The soils that contain higher levels of humus, as found in depressions and wetlands, are less alkaline. The quality of the soils in the small islands is generally poor with marked deficiency in nitrogenous nutrients, potassium and several micronutrients particularly iron, manganese and zinc. Though the phosphorus content of the soils is high it is unavailable to plants as it is present mostly in the form of calcium phosphate.

Maldives has a tropical monsoon climate. The southwest monsoon is from May to November and northeast monsoon is from January to March. The mean daily maximum temperature recorded for Male' during the period 1974 to 2013 is 30.7 ºC and mean daily minimum temperature is 25.8 ºC for same period. Humidity levels range from 70% to 87%.

The annual average rainfall for Maldives is 2,124 mm. Southern atolls on average receive 2,277 mm while northern atolls receive 1,786 mm of rainfall annually. Lowest annual rainfall recorded in the last 30 years is 1,333 mm in 2011 at Hulhule International Airport Weather Station and the highest is 3,185 mm in 1978 at Gan International Airport Weather Station. The highest rainfall recorded within 24 hours to date is 220 mm on 9 July 2002 at Kaadedhdhoo (Department of Meteorology, 2006).

1.2 DEMOGRAPHIC PROFILE

The current population of the Maldives according to the Census of 2014 is 341,256. Population of the Maldives passed the 300,000 mark for the first time in July 2006. During the census period 2000- 2006, the population growth rate was 1.8 per annum (Ministry of Planning and National Development, 2008) while in the 2006- 2014 period the population growth rate declined to 1.56 per annum. Of the 20 atolls, the population declined in 13 and three atolls respectively during the periods 2000- 2006, and 2006- 2014. More than a third of the total population, numbering 133,019 persons, live in the capital Male'. There are only three islands that have a population greater than 5,000. They are Hithadhoo (Seenu Atoll) with 9,894; Fuvahmulah (Gnaviyani Atoll) with 8,055; and Kulhudhufushi (Haa Dhaalu Atoll) with 8,011 persons (National Bureau of Statistics, 2014).

1.3 TERRESTRIAL FLORA

There has been very limited research on terrestrial flora in the Maldives. The first source of botanical information on the Maldives is a study by Gardiner (1903) based on an extensive journey through the Maldives archipelago. Other noteworthy investigations include Fosberg (1957), Fosberg et al (1966), Groves (1966), and Adams (1984).

Despite the poor and infertile soils, and lack of different habitats, the Maldives has a relatively diverse vegetation cover. The plant communities in the islands are physiographically classified as foreshore or lower beach; beach crest; and inner island (Mörner et al, 2004). Based on published plant species lists and vegetation description, the flora of the country consists of 583 vascular plants of which 323 (55%) are cultivated plant species (Adams, 1984), while 260 are native and naturalized plants (Ministry of Home Affairs, Housing and Environment, 2002). Of the 260 native or naturalised plant species, fewer than 100 are truly indigenous (Adams, 1988). Over 300 species of the plants are used in traditional medicine (MHAHE, 2002).

According to the *Catalogue of Plants* published by the Ministry of Fisheries and Agriculture (MoFA) that lists 429 plants, the distribution of different plant species is fruits (50); vegetables (53); cereals (10); spices (16); trees used as timber (40); flowers and ornamental plants (62); medicinal (122); and others (76) (Kanivinde, 1999).

1.4 WETLANDS

There are at least 75 islands with wetland or mangroves in the Maldives (Annex II). The wetland or mangrove areas cover a total area of approximately 8.01 km2 (Ministry of Planning and National Development, 2007). Fuvahmulah has the largest area of wetland or inland lakes with 1.41 km2 (Table 4). The highest numbers of wetlands are found in the islands located on the eastern rim of Thiladhunmathi.

Table 4:
Largest wetland areas in the islands of Maldives

#	Island	Atoll	Atoll Code	Area (km2)
1	Fuvahmulah	Fuvahmulah	Gnaviyani	2.89
2	Hithadhoo	Addu Atoll	Seenu	2.51
3	Kendhikulhudhoo	South Miladhunmadulu	Noonu	1.87
4	Hulhu-Meedhoo	Addu Atoll	Seenu	1.07
5	Baarah	North Thiladhunmathi	Haa Alifu	1.03
6	Ekasdhoo	North Miladhunmadulu	Shaviyani	1.03
7	Kulhudhuffushi	South Thiladhunmathi	Haa Dhaalu	1.02
8	Maakan'doodhoo	North Miladhunmadulu	Shaviyani	0.98
9	Gan	Hadhdhunmathi	Laamu	0.91
10	Bodulhaimendhoo	South Miladhunmadulu	Noonu	0.88

(Source: Ministry of Planning and National Development (2007))

PLANT COMMUNITIES IN THE MALDIVES

The islands can be divided physiographically into three zones namely: i) the foreshore or lower beach, ii) the beach crest (beach top) and iii) the inner island (Mörner et al. 2004). Each of these zones provides relatively uniform environment with its own associated plant community.

i) Plant communities of the foreshore:

The foreshore or lower beach zone, which includes the beach area between the high tide line and the beach crest, is totally exposed to wave action, wind and salt spray. It is unstable and composed mainly of coarse coral sand in the lower portion and shingle. As a result of the harsh environmental condition, this zone supports no vegetation except occasional creeping sand-binders such as *Ipomoea littoralis* and *I. biloba* along with a few individuals of *Launaea pinnatifida* and *Portulaca alata* in the upper portion.

ii) Plant communities of the beach crest

The beach crest or beach top rises gradually and sometimes abruptly to a height of 0.8 to 1 m above the high tide line and includes a stable beach frontage composed of coral sand and rubble. It is exposed to winds and salt spray and its lower margin is occasionally or, in the case of an eroding beach, regularly inundated by seawater during spring tides. The beach crest may extend 5 to 20 m inland and provides a suitable environment for strand plant communities including a distinct association of trees and shrubs and a few sand-binding creepers and herbaceous plants. These strand plant communities include: a) the *Scaevola taccada* scrub community (the most common scrub community found on beach crests of both northern and southern islands of the Maldives), b) the *Pemphis acidula* scrub community, which is commonly found on elevated reef rock, coral conglomerate beach rock or hard pan coral in open sites at or above the high tide level and can also be seen growing in association with a similar looking plant, *Suriana maritima*; c) the *Tournefortia argentea* community is found as a dominant strand community of the beach crest particularly in drier places in some of the northern islands. It is sometimes associated with *Pandanustectorius* and *Scaevola taccada*, d) the *Guettarda speciosa* community is normally found only on highly elevated beach crests and is characterized by the presence of other species such as *Scaevola taccada*, *Pandanus tectorius* and a scattering of *Pisonia grandis* and *Cordia subcordata* trees.

iii) Plant communities of the inner island

The microclimate of the inner islands, protected by the beach-crest communities, supports the growth of a number of trees and shrubs, which occur either in pure stands or as a mixed forest (Fosberg, 1957). In many islands coconut plantations are present immediately adjacent to beach crest vegetation and in moist areas the shelter provided by a complete coconut tree canopy supports the growth of under story tree species such as *Morinda citrifolia* and *Guettarda speciosa*. In some places, *Pandanus odoratissimus, Calophyllum inophyllum* and *Hibiscus tiliaceus* are also found in low numbers within coconut groves (Forsberg, 1957). In some other, particularly moist, areas small pure stands of *Hernandia nymphaeifolia, Cordia subcordata and Barringtonia asiatica* are present. In drier places including the northern group

of islands, pure stands of *Hisbiscus tiliaceus* and *Premna serratifolia* are also seen. Where extensive coconut plantations are not present mixed species forest is the most common vegetation type found next to beach-crest scrub community. The principal tree species in these forests are *Pandanus, Hibiscus tiliaceus, Cordia subcordata, Hernandia nymphaeifolia, Calophyllum inophyllum, Barringtonia asiatica, Ochrosia oppositifolia, Guettarda speciosa, Adenanthera pavonina* and *Terminalia catappa*. These mixed forests also support good growth of under story species such as *Allophylus cobbe, Morinda citrifolia* etc.

1.5 MANGROVES

Mangroves grow on about 150 of the islands of the Maldives (Saleem and Nileysha, 2003). In these islands, mangroves are found in enclosed or semi-enclosed brackish water (kulhi) or in muddy areas without standing water (chas bin). The mangrove vegetation in both of these two habitats is known locally as faa. Saleem and Nileysha (2003) classify mangroves found in the Maldives to pond-based, marsh-based, fringing, and embayment mangrove ecosystems.

In the first study of mangroves in the Maldives in 1991, after evaluating 19 islands that belong to four atolls in the Maldives, Jagtap and Untawale (1999) report 12 species of mangroves belonging to seven genera. The mangroves also have 37 species of fungi associated with them (Jagtap and Untawale, 1999). At the turn of the century, Saleem and Nileysha (2003) report that at least 14 mangrove species are known to grow in the Maldives that belong to ten genera (Table 5).

The largest and richest mangrove stands occur on the northernmost atolls, and there is some cultivation and management, particularly of *Bruguiera – Kandoo (Bruguiera cylindrica), bodavaki (Bruguiera gymnorrhiza), ran'doo (Rhizophora mucronata), kulhlhavah (Sonneratia caseolaris), burevi (Lumnitzera racemosa), karamana (Ceriops tagal) and thela (Excoecaria agallocha).*

Table 5:
Mangrove species found in the Maldives

#	Local Name	Common Name	Scientific Name	Sighted At
1	Ran'doo	Red mangrove	*Rhizophora mucronata*	*Huraa,Baarah*
2	Karamana	Yellow mangrove	*Ceriops tagal*	
3	Burevi	Black Mangrove	*Lumnitzera racemosa*	*Hoadehdhoo, Hithadhoo, Kulhudhuffushi*
4	Thakafathi	Tall-stilted mangrove	*Rhizophora apiculata*	*Huraa*
5	Baru	Grey Mangrove	*Avicennia marina*	
6	Kandoo	Small-leafed orange Mangrove	*Bruguiera cylindrica*	*Hoadehdhoo, Baarah, Filladhoo, Huraa*
7	Bodavaki	Large-leafed Orange Mangrove, Oriental mangrove	*Bruguiera gymnorrhiza*	*Hoadehdhoo, Filladhoo, Gan, Huraa*
8	Thela	Milky Mangrove, Blind-your eye Mangrove	*Excoecaria agallocha*	
9	Kaharuvah	Looking glass Mangrove	*Heritiera littoralis*	
10	Kulhlhavah	Mangrove apple	*Sonneratia caseolaris*	*Kulhudhuffushi*
11	Marugas	Puzzlenut tree/ Canonball tree	*Xylocarpus moluccensis*	
12	Maakeha	Mangrove Fern	*Acrostichum aureum*	
13	-	Mangrove Vine/Climber	*Derris heterophylla*	
14	-	Burma Family	*Bruguiera sp*	

(Source: Educational Development Centre (2008)

1.6 TERRESTRIAL FAUNA

The islands of the Maldives are not known for their abundant wildlife (Webb, 1988) and demonstrate a rather small proportion of the representatives in comparison to the rich terrestrial faunal diversity of the region.

Webb (1988) describes some constituents of the Maldivian reptilian fauna including: two gecko *(Hemidactylus spp)* commonly seen throughout the country; two agamid lizard including the common garden lizard or blood sucker *Calotes versicolar;* the snake skink*, Riopa albopunktata;* and two species of snakes including the common wolf snake *Lycodon aulicus,* and *Typhlops braminus*. One species of frog is known, the short-headed *Rana breviceps*, and a larger toad, *Bufo melanostictus* has also been found.

Among the reptiles of the Maldives, the Maldivian Black Turtle *(Melanochelys trijuga thermalis)* is a species of turtle listed on the International Union for Conservation of Nature (IUCN) Red List as 'near threatened'. The Maldivian black turtle is currently found in only three islands: Kaashidhoo (Kaafu), Muli (Meemu) and Kunburudhoo (Haa Dhaalu).

In a study undertaken by Holmes et al (1994) on fruit bats and birds of the Maldives, specimens of insects, arachnids and mollusk were collected. In this study it was found that Maldives was particularly rich in spider species. Some 130 insect species including scorpions, centipedes, rhinoceros beetle and paper wasps were identified. In addition four species of bumblebees, which were very much a feature of the islands, were also collected (Holmes et al, 1994).

The only native mammals endemic to the country are the two subspecies of fruit bats, *Pteropus giganteus ariel* and *Pteropus hypomelanus maris*. The latter is very rare and has been recorded only once in the Maldives, in Addu Atoll (Holmes et al, 1994). Other mammals, all likely to have been introduced, are the house mouse, black rat, Indian house shrew and cats (Webb, 1988). In the homestead, the domesticated animals reared are chickens and goats.

1.7 AVIFAUNA

Over 167 bird species have been recorded in the Maldives including seabirds, shorebirds and terrestrial birds (Ash and Shafeeg, 1994; Anderson and Baldock, 2001). They include breeding residents, southern winter visitors (shearwaters and storm-petrels), and northern winter visitors (mostly waders, raptors, passerines, as well as some terns). For some of the latter, the Maldives lies at the southern end of the major Indus-Valley – West Indian flyway. A few are introductions, and imported as pets. Very few reside in the country, most of which are seabirds. Terrestrial birds are very minimal compared to other tropical islands and most are likely to be introductions. A complete study on the ornithology of the Maldives has not been undertaken, however, from research undertaken by foreign and local experts some information is available regarding the distribution and status of a few species.

At least 40 to 50 species of seabirds are seen in the Maldivian waters, of which only 13-15 are known to nest and breed in the country. Some of them are terns including *Sterna sumatrana, S. albifrons, S. anaethetus, S. dauglli, S. bergi, S. bengalensis, and S. fuscata, S. saundersi; others include two species of noddies, Anous stolidus and A. tenuirostris,* as well as the white tern *Gygis* alba monte which is known to breed only in Addu Atoll (Anderson, 1996). Others such as frigate birds, white-tailed tropic birds, boobies and some shearwaters are also known to breed in the Maldives (Shafeeg, 1993). Most of the shorebirds found are common winter visitors to the Maldives; however, there are some resident and immigrant species.

Five subspecies of bird have been identified as endemic to the Maldives (MHAHE, 2002). The bird subspecies endemic to the Maldives are Maldivian pond heron (*Ardeola graii phillipsi),* Maldivian little heron *(Butorides striatus albidulus),* central Maldivian little heron *(Butorides striatus didii phillipsi)*, Maldivian water hen *(Amouronis phoenicurus maldivus)* and Asian koel *(Eudynamys scolopacea scolpacea).*

1.8 MARINE BIODIVERSITY

In contrast to the terrestrial biological diversity found in the country, marine biological diversity shows an outstanding richness, especially in the coral reefs, making the area one of the world's most diverse marine ecosystems (Pernetta, 1994). However, documented information on the species diversity is limited (Ahmed and Saleem, 1999). Available literature record relatively few species compared to the high diversity that exists in the marine environment.

Since the first reported study of the reefs of the Maldives in the 1840s (Darwin, 1842) there have been noteworthy expeditions and research activities. These include Gardiner (1903), Agassiz (1903), Sewell (1934), Hass (1965), Stoddart (1966), Woodroffe (1992), Purdy and Bertram (1993), and Naseer and Hatcher (2004).

Pillai and Scheer (1976) listed for the first time the stony corals found in the Maldives from samples collected in 1957 and 1958 during the *Xarifa* expedition (Wallace and Zahir, 2007). Sheppard (1987) provided an updated list of scleractinian species. Pichon and Benzoni (2007) provide the most up to date taxonomic census based on field observations in 2002 and 2003 from 34 sampling stations in Ari, South Male', Vattaru and Felidhe Atoll. Bigot and Amir (2012) conducted a survey of scleractinian corals for 21 stations in Baa Atoll in June 2009.

#	Hard Corals	Soft Corals
1	Astrocoeniidae	Elioporidae
2	Pocilloporidae	Elisellidae
3	Acroporidae	Helioporidae
4	Poritidae	Clavuriidae
5	Sidestreidae	Tubiporidae
6	Agariciidae	Alyoniidae
7	Fungidae	Nephtheidae
8	Oculinidae	Nidaliidae
9	Pectiniidae	Subbergorgiidae
10	Mussidae	Melithaeidae
11	Merulinidae	Acanthogorgiidae
12	Faviidae	Plexauridae
13	Trachyphillidae	
14	Caryphyllidae	
15	Dendrophyllidae	

Table 6: Families of hard and soft coral found in the Maldives

The total number of hermatypic corals recorded in the Maldives by mid 1990s was 209 and represented over 62 genera (Zahir and Naeem, 1996). The highest species diversity was within the family Acroporidae, with the genus Acropora being the most abundant. A recent review of published sources reported a total of 258 species and 57 genera (Pichon and Benzoni, 2007).

Marine algae including some 21 species of *Cyanophyceae* (blue-green), 163 *Rhodophyceae* (red), 83 *Chlorophyceae* (green) and 18 *Phaephyceae* (brown) have been recorded in the country (Hackett, 1977). In the Maldives, 36 species of sponges have been recorded, in addition to over 400 species of molluscs (Smith, 1906; Coleman, 2000), some 350 species of marine crustaceans (Borradaile, 1906; Borradaile, 1903a; Borradaile, 1903b; Borradaile, 1903c; Wolfenden, 1906; Walker, 1906; Alcock, 1906; Nomura, 1996), and over 80 species of echinoderms (Joseph, 1991; Coleman, 2000; Ahmed and Saleem, 1999; MHAHE, 2002). The knowledge on other marine invertebrate groups in the Maldives, such as Chaeognatha (arrow worms), Plathelminthes (flat worms), Nematoda (round worms), Annelida (segmented worms), Bryozoa (moss animals), Sipuncula (peanut worms) and Brachipoda (lamp shells) is mainly based on expeditions 50 to 100 years ago, with samples taken patchily. Therefore, the knowledge on and understanding of their biodiversity and ecology remains fragmentary (Anderson, 2003).

The Maldivian waters have a high diversity of cetaceans, with all the expected pantropical species being represented (Anderson, 2005). Altogether 20 different species are positively identified from sightings. Spinner dolphins are the most abundant species seen, and they show a clear diurnal pattern of behavior, with many schools entering the atolls in the early morning, and leaving in the late afternoon. Spinner dolphins regularly occurred with pantropical spotted dolphins and both species are associated with yellow fin tuna. Bryde's whales also associated with yellow fin tuna and appeared to be most common in Maldivian waters during El Niño Southern Oscillation events. Blue whales were only recorded during November to April. Dwarf sperm whales were especially difficult to locate in rough weather but relatively common, making up one sixth of all sightings in flat-calm conditions. Melon-headed whales were particularly common in the south of the Maldives, but rare in the center and north. Other species recorded were humpback whale, sperm whale, rough-toothed dolphin, Risso's dolphin, bottlenose dolphin, striped dolphin, Fraser's dolphin, pygmy killer whale, false killer whale, killer whale, short-finned pilot whale, Blainville's beaked whale, Longman's beaked whale and Cuvier's beaked whale (Anderson, 2005).

To date, a total of 1,090 fish species have been officially recorded (Randall and Anderson, 1993; Randall and Goren, 1993; Anderson, Randall, & Kuiter, 1998; Adam, Anderson, & Shakeel, 1997). The most diverse group of fishes are gobies (90 species), followed by wrasses and groupers (70 and 40 species respectively).

Over 40 different species of baitfish have been recorded, but less than a dozen dominate catches. The single most important bait species is the silver sprat *(rehi)*. Other important varieties, in approximate order of catch include several species of fusiliers *(muguraan)*, an anchovy *(miyaren)*, cardinal fishes *(boadhi)* and the blue sprat *(hondeli)*.

Table 7:
Major varieties of Maldivian bait fish

English Name	Species	Maldivian Name
Silver sprat	*Spratelloides gracilis*	*Rehi*
Blue sprat	*Spratelloides delicatulus*	*Hondeli*
Anchovy	*Encrasicholina heteroloba*	*Miyaren*
Fusiliers	*Caesionidae*	*Muguraan*
Cardinal fishes	*Apogonidae*	*Boadhi, fathaa*
Blue-green damsel	*Chromis viridis*	*Nilamehi*
Fusilier damselfish	*Lepidozygous tapeinosoma*	*Bureki*
Silversides	*Atherinidae*	*Thaavalha, hithiboa*

Maldives has approximately 40 species of groupers (Randall and Anderson,1993) out of over 100 species worldwide (Heemstra and Randall, 1993). Groupers belong to the subfamily Epinephelinae of the family Serranidae. The species of groupers found in the Maldives belong to the genera *Aethaloperca, Anyperodon, Cephalopholis, Epinephelus, Gracila, Plectropomus* and *Variola.*

Nearly 40 species of sharks have been recorded in the Maldives (MHAHE, 2002). Divers and snorkelers see about 15 shark species in the Maldivian waters (Kuiter, 2014). The whale shark *(Rhincodon typus)* - the largest shark in the ocean is seen year round by divers in the southern tip of Ari Atoll. Species that live mainly near the bottom such as the small sliteye shark *(Loxodon macrorhinus)* are rarely seen by divers and fishermen.

About 16 species of rays (Batoids) are known in the Maldives. These include the oceanic manta ray *(Manta birostris*) - the largest ray, and reef manta ray *(Manta alfredi).* The Maldives is home to about 10,000 individual manta rays. Of them the oceanic manta ray accounts for less than 1% of the population (Kitchen-Wheeler, 2013). In addition to manta rays, eagle rays, stingrays, electric rays, and guitarfishes have been recorded in the Maldives (Kuiter, 2014).

Five species of marine turtles occur in the Maldives: the green turtle *(Chelonia mydas)*, the hawksbill turtle *(Eretmochelys imbricata)* the olive ridley *(Lepidochelys olivacea),* the leatherback turtle *(Dermochelys coriacea)* and the loggerhead turtle *(Caretta caretta)* (Frazier, Salas, & Didi, 2000). The green turtle (vela) and the hawksbill turtle *(kahambu)* occur in globally significant numbers in the Maldives. The number of nests and eggs of the green turtle exceed the ones of the hawksbill turtle, but adults of the latter are more often observed near coral reefs of uninhabited islands (Frazier, Salas, & Didi, 2000).

1.9 IMPORTANCE OF BIODIVERSITY

Intrinsic value

The coastal and marine ecosystems of the Maldives, in particular the coral reef ecosystems, have exceptionally rich marine biodiversity (MHAHE, 2002). They form the seventh largest reef system in the world, and coral reefs of Maldives represent as much as 3.14 % of the world's reef area (Spalding et al. 2001). The total area of the atolls, including the atoll lagoons, is approximately 21,372 km2 and the total reef area is close to 4,500 km2, representing 20% of the total area of the atolls (Naseer, 2006). The coral reef system of the Maldives has two of the largest natural atolls in the world, Thiladhunmathi Atoll with a total surface area of 3,788 km2 and Huvadhoo Atoll with a total surface area of 3,278 km2 (Naseer, 2006).

Table 8:
The largest natural Atolls in the World

Feature	Thiladhunmathi Atoll	Huvadhoo Atoll
Surface Area	3,788.71 km2	3,278.59 km2
Reef Area	500.70 km2	437.90 km2
Land Area	68.70 km2	33.45 km2
Number of reefs	164	210
Number of islands	167	238

There are 2,041 distinct coral reefs in the 26 natural atolls of the Maldives (Naseer, 2006). About 529 reefs are found on the rims of the 16 complex atolls, five make up ocean faros and four are oceanic platform reefs. The rest are found as patch reefs within the lagoons of the complex atolls. Faros are ring shaped reefs emerging during tidal low water, with their own sandy lagoon and a rim of living coral consisting of branched and massive type of corals (MHAHE, 2002). The faro formation is unique to the Maldives (Woodroffe, 1989). The North Maalhosmadulu Atoll, one of the 11 atolls on the western line of islands has an area of high faro density within its lagoon. Thiladhunmathi Atoll has the largest reef area with approximately 500 km2 while Ari Atoll has the second largest with 489 km2.

The Maldives consists of five oceanic faros, and four oceanic platform reefs, which together with all coral reef and lagoon habitat cover an area of approximately 20% of the Maldives' Territorial Sea (Naseer and Hatcher, 2004). The extensive deep and shallow lagoons, deep slopes, sand banks, and sandy beaches are habitats unique to the small coral reef island ecosystem.

Table 9:

Reef area statistics for the Maldives

Major Coral Reef Structures	Total Surface Area (km2)	Number of Reefs	Reef Area (km2)	Reef Island Area (km2)
Complex Atolls				
Ihavandhippolhu	289.81	30	119.50	5.70
Thiladhunmathi	3,788.71	164	500.70	68.70
North Maalhosmadulu	1,184.31	155	223.50	12.90
South Maalhosmadulu	1,126.95	105	262.90	5.50
Faadhippolhu	701.42	84	158.00	7.20
North Male'	1,568.18	189	349.00	9.40
South Male'	536.33	112	175.60	2.00
Ari	2,271.75	268	489.40	8.30
North Nilandhe	597.15	86	151.30	2.20
South Nilandhe	736.46	98	179.40	4.40
Felidhe	1,090.97	203	251.10	0.92
Mulaka	983.92	111	197.30	4.20
Kolhumadulu	1,695.79	154	243.70	9.30
Hadhdhunmathi	884.63	56	203.70	23.10
Huvadhoo	3,278.59	210	437.90	34.30
Addu	157.22	7	70.32	15.00
Oceanic Faroes (5)				
Makunudhoo	142.48	1	142.48	0.96
Goidhoo	112.61	1	112.61	2.20
Gaafaru	88.05	1	88.05	0.19
Rasdhoo	61.84	1	61.84	0.62
Vattaru	46.72	1	46.72	0.01
Oceanic Platform Reefs (4)				
Alifushi	4.38	1	4.38	0.71
Kaashidhoo	9.54	1	9.54	2.89
Thoddoo	4.75	1	4.75	1.62
Fuvahmulah	10.18	1	10.18	5.13
MALDIVES TOTAL	**21,372.72**	**2,041**	**4,493.85**	**227.45**

Source: (Naseer and Hatcher, 2004)

The Maldives support a great diversity of coral reefs, with at least 258 species of stony coral, and associated coral reef organisms (Wilkinson, 2008). Coral reef coverage in the Maldives is 4,513 km2. This includes rim and oceanic reefs (3,701.93 km2 or 82.5% of total reef area), as well as patch reefs inside of atoll lagoons (791.92 km2 or 17.5% of total reef area) (Naseer and Hatcher, 2004). Other important habitats include sea grass beds, mangrove habitats and sandy lagoons.

The reef ecosystem of the Maldives has internationally threatened populations of hawksbill *(Eretmochelis imbricata)* and green turtles *(Chelonia mydas),* and is reported to be one of the most important feeding areas for hawksbill turtles in the Indian Ocean. Hawksbill turtles are ranked in the Red List of Threatened Animals by IUCN as 'Critically Endangered', while green turtles are ranked as 'Endangered' (Baillie and Groombridge 1996). Furthermore, all five marine turtles occurring in the Maldives are listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) as 'Most Endangered Species' since 1977, recognizing the threat of extinction that is, or may be, affected by trade. Green turtles are also listed as 'Endangered' in Appendices I and II of the Convention on Migratory Species.

The atolls of the Maldives are also home to globally significant populations of whale shark *(Rhincodon typus),* manta rays *(Manta birostris),* reef sharks and more than 21 species of whales and dolphins. Other globally significant coral reef species include the Napoleon wrasse *(Cheilinus undulatus)*, giant grouper *(Epinephelus lanceolatus),* giant clam *(Tridacna squamosa)* and black coral *(Antipatharia)*.

Grouper species such as *Epinephelus fuscoguttatus, Plectropomus areolatus, Plectropomus laevis and Plectropomus pessuliferus* have always been favourites due to their high market value. Unfortunately these are species are listed in the IUCN Red List as either 'Near threatened' or 'Vulnerable', thus stressing the vulnerability of groupers to intense fishing effort.

The Maldives Blenny *(Ecsenius minutus)* has so far been identified only in the Maldives, while the distribution of certain species, like the Maldivian anemone fish *(Amphiprion nigripes)* is restricted to the Maldives, Laccadives and Sri Lanka (MHAHE, 2002).

Seabirds are widely seen throughout the country and are extremely important to the local communities, which have been keeping a very close relationship with them. Most of them are directly related to fishing in the Maldives. Tuna schools chase small fish and other marine life such as shrimps up to the surface where they are preyed on by several species of seabirds (Anderson, 1996).

Ecosystem services

Maldives is one of the most biodiversity dependent countries in the world, and biodiversity is fundamental to the well-being of Maldivians. The ecosystems play a key role in enabling human settlements in the Maldives through climate regulation, storm buffering, and coastal protection. Reef functions as natural sea defences for islands highly vulnerable to climate change. The cost of artificial replacement of coral reef to provide protection for the perimeter of the 193 inhabited islands in the Maldives is estimated to be between MVR 20 billion and MVR 34 billion (Emerton et al 2009). The mangroves and wetlands serve as natural drainage systems against flooding.

The marine and coastal biodiversity and ecosystems also provide food and medicines that are consumed by the Maldivian population and others. Fish, particularly tuna, is the primary source of dietary protein for the Maldivians and tuna is served daily with every meal (Adam, 2006). The fresh tuna supplied from the Maldives account for more than 15% of fresh tuna imported to the European Union.

The sea grass provide home for many reef fish and sea creatures. The coastal ecosystems also provide building materials. The reefs are the source of coral sand that is used as a construction material in many islands of the Maldives.

Economic value

The country relies heavily on the direct benefits to the economy from marine and coastal biodiversity. It is estimated that biodiversity based sectors contribute 98% of exports, 89% of GDP, 71% of national employment, 62% of foreign exchange and 49% of public revenue (Emerton et al. 2009).

The beautiful blue coral atoll seascape and the low-lying white green coral island landscape with its rich biodiversity is essential for tourism, the mainstay of the economy. Tourism is the main contributor to GDP at 28.7% and tourism receipts stood at US$ 2.2 billion in 2013 (Maldives Monetary Authority, 2014). Tourism serves as a link and stimulus to almost all other sectors of the economy such as transport, construction, trade, and financial services. The direct and indirect contributions to GDP by tourism are estimated at more than 75% (Ministry of Tourism, 2013). In 2013, the Maldives recorded 1,125,202 tourist arrivals (Ministry of Tourism, 2014), approximately 0.1% of global tourist arrivals (Figure 1).

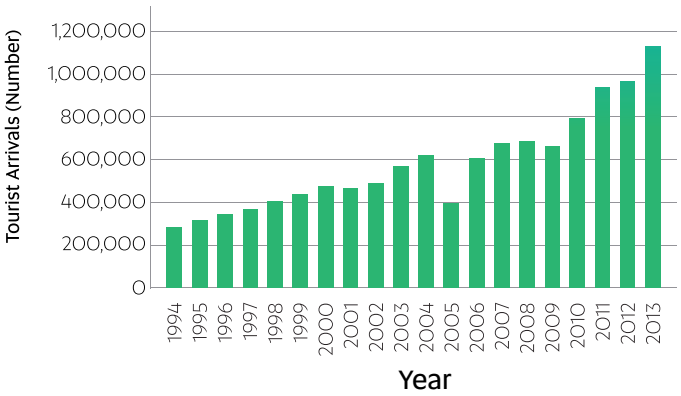


Figure 1
Tourist arrivals in the Maldives (1994 – 2013)

Biodiversity makes a significant contribution to government revenue through both tax and non-tax revenue from economic sectors dependent on biodiversity. Tax revenue, the largest component of total revenue to the Government in 2013 accounting for 75%, reached MVR 8.6 billion; mostly fuelled by sizable increases in Tourism Goods and Services Tax (T-GST) and Business Profit Tax receipts (Table 10). Revenue from T-GST made up 28% of total tax revenue in 2013; this is an increase of 54% compared to 2012. The Goods and Services Tax (GST) receipts are also linked to sectors relating to tourism. Receipts from Business Profit Tax totaled MVR 1.7 billion. Non-tax revenue, which accounted for 24% of total revenue, reached about MVR 2.8 billion in 2013. Resort lease rent (40% of non-tax revenue) reached about MVR 1.2 billion in 2013.

Table 10:
Components of public revenue and their share in 2013

Source of Revenue	Millions (MVR)	% of Revenue
Tax Revenue	**8,643.5**	**75 %**
Tourism Goods and Services Tax	2,390.7	21%
Business Profit Tax	1,732.7	15%
Import duty	1,620.4	14%
Goods and Service Tax	1,169.7	10%
Tourism tax	882.8	8%
Bank profit tax	349.4	3%
Non tax Revenue	**2776.0**	**24 %**
Royalties, land and resort rent	1,197.4	10%
Net sales to public enterprises	724.8	6%
Capital Revenue	**108.0**	**24 %**
Total Revenue	**11,527.5**	**100 %**

(Source: Maldives Inland Revenue Authority 2014)

Snorkeling and diving are the two main tourist activities. At any resort at any given time 70 to 80% of tourists are snorkelers while 25 to 35% of tourists visit the Maldives primarily for diving (Westmacott, 1996). Assuming 1.5 dives for every tourist arrival (Anderson, 1998) the total number of annual dives in 2013 is estimated at more than one and a half million. The earning from a single dive ranges from US$ 45 to 55.

A recent study estimated the contribution of manta tourism in the Maldives. The report by Anderson et al. (2011) identifies 91 manta sites throughout the Maldives where an estimated 143,000 dives and 14,000 snorkels were made annually during 2006-2008. These were valued at about US$ 8.1 million per year in direct revenue derived from US$ 45 or US$ 70 per scuba dive (depending on the site) and US$ 20 per snorkeler.

A study conducted in the 1990s estimated that US$ 2.3 million was earned in 1992, solely from shark watching dives in the Maldives (Anderson and Ahmed, 1993). The same study also showed that a live shark generates US$ 3,300 in revenue per year.

The marine ecosystems also provide the basis for fisheries. The EEZ of the Maldives is well known for high diversity of marine species and commercially important tuna species. Although fisheries sector contribution to GDP and employment has fallen over the last three decades, fisheries remain an important economic activity for the Maldives and there are signs of revival in recent years. The peak annual fish catch of 186,000 mt was recorded in 2005 while the highest export performance was in 2012 with total export value of US$ 156.1 million.

Most of the marine environment of the country remains unsurveyed, species remain undiscovered and/or are not described. The lack of adequate scientific information is a major challenge for biodiversity conservation in the Maldives.

2.1 SKIPJACK & YELLOWFIN TUNA

The stakeholders who attended the regional consultations for this report expressed concern over the decline in skipjack tuna catch in the Maldives. The target catch of Maldivian fishermen are the commercially important skipjack tuna *(Katsuwonus pelamis)* and yellow fin tuna (*Thunnus albacares).* From 35,942 mt in 1970, the total fish catch doubled to 76,374 t by 1990. Fish catch reached a record high of 186,000 mt in 2005 and since then has declined (Figure 2). The lowest fish catch over the last ten years was in 2009. However, there was an increase in fish catch from 120,001 mt in 2012 to 140,200 in 2013.

The fish catch data for the last twenty years shows a declining trend in skipjack tuna since 2006 (Figure 3). The peak skipjack tuna catch was 138,458 mt in 2006 and since then skipjack tuna catch has reached a twenty-year low of 53,392 mt in 2012. On the other hand, the twenty-year fish catch data for yellow fin tuna shows an increasing trend. The record highest landing of yellow fin tuna (44,977 mt) was in 2012 (Figure 4).

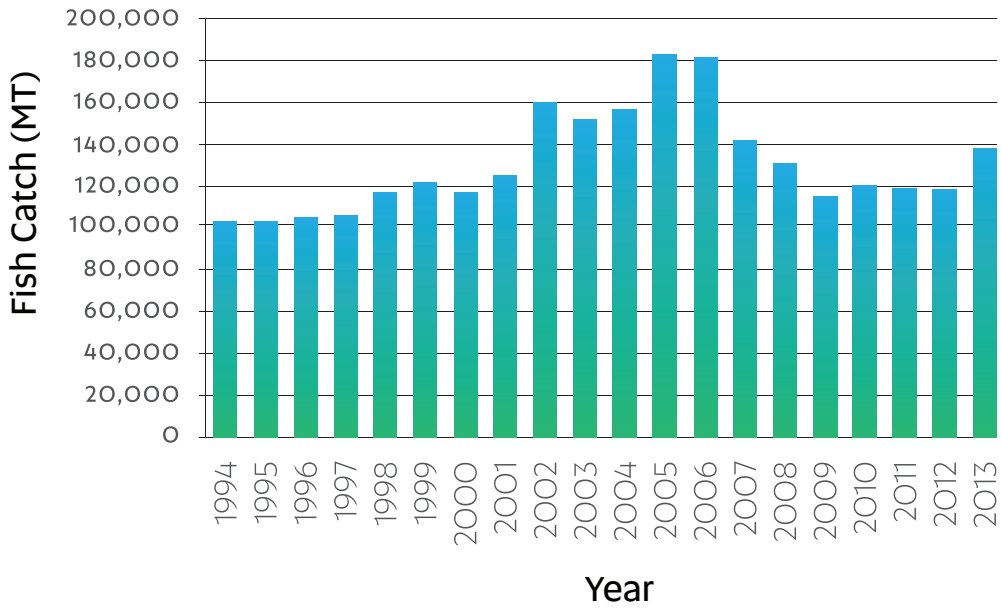


Figure 2

Trends in total fish catch 1994 to 2013

(Source: Department of National Planning)

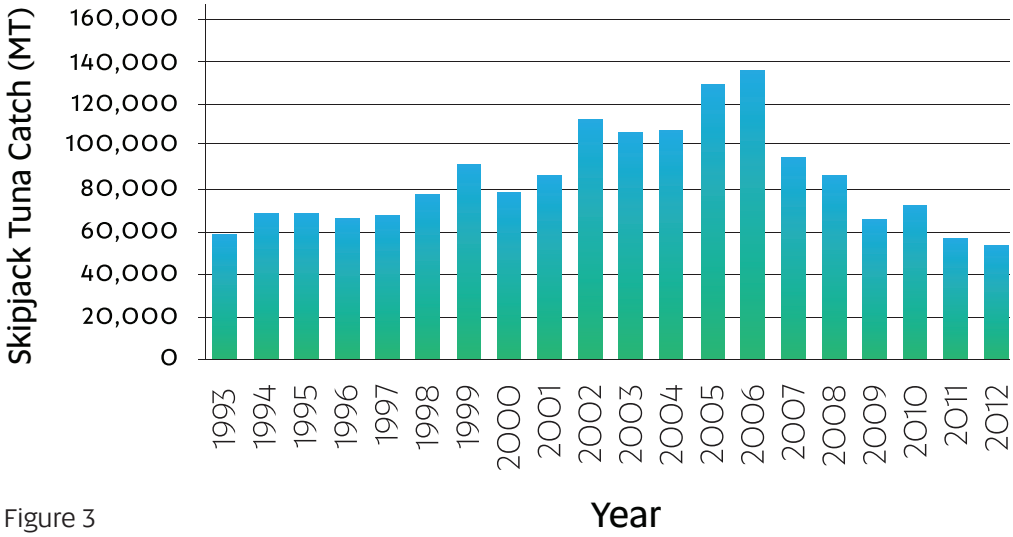


Figure 3
Trends in skipjack tuna catch 1993 to 2012
(Source: Department of National Planning)

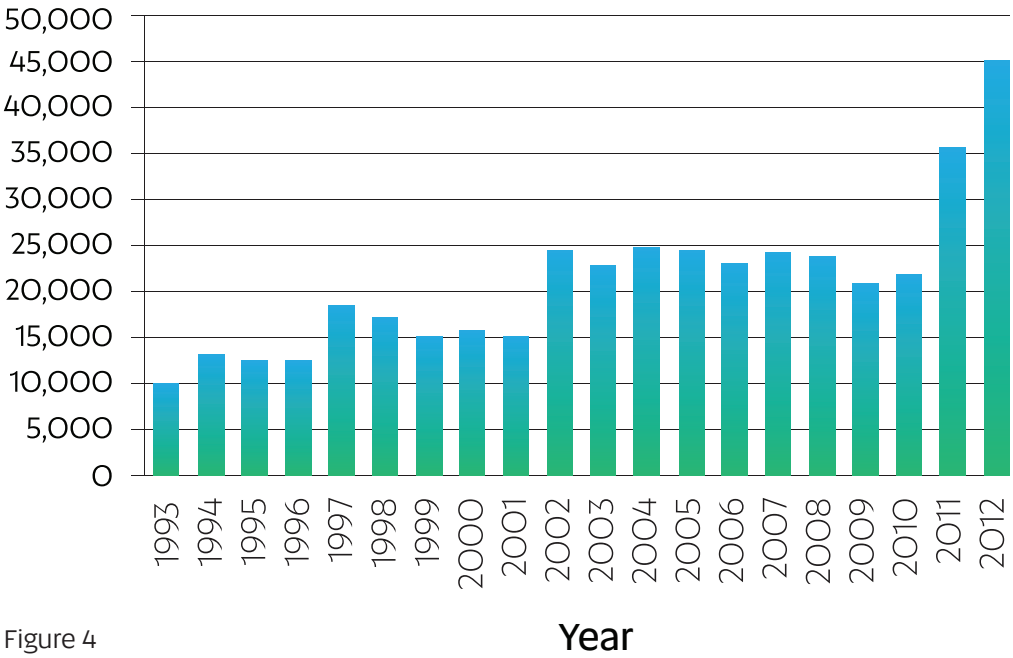


Figure 4
Trends in yellow fin tuna catch over the last twenty years (1993-2012).

2.2 SHARK POPULATION

The stakeholders consulted for this report identified an increase in the number of sharks seen in the Maldives, particularly during fishing trips. All together 40 species of sharks belonging to 17 families have been recorded in the Maldives. The eight most common reef-associated sharks in the Maldives are the whitetip reef shark *(Triaenodon obesus)*, the blacktip reef shark *(Carcharhinus melanopterus)*, the grey reef shark *(Carcharhinus* amblyrhynchos) scalloped hammerhead shark *(Sphyrna lewini)*, silvertip shark *(Carcharhinus albimarginatus)*, tawny nurse shark *(Nebrius ferrugineus)*, variegated shark *(Stegostoma fasciatum*), and whale shark *(Rhincodon typus)*. The stakeholders linked their observation to the ban on shark fishing in the Maldives.

Shark and ray fishing were first banned in 1995 in atolls where tourist resorts were located (Male', Ari, Baa, Lhaviyani) to protect the elasmobranchs for the enjoyment of sport divers (Anderson, 1998). On 1 March 2009, the government announced a ban on all reef shark fishing activities (Sinan et al., 2011). Under the regulation it was prohibited to kill, capture or extract any species of shark within 12 miles from the outer rim of all Maldivian atolls. A year later, from 15 March 2010, a total ban on all shark fishing, capture, killing or extraction from Maldivian territorial waters was enforced.

A program titled 'Sharkwatch' was launched in July 2009 as part of the Darwin Reef Fish Project, a four-year collaborative project between the Marine Research Centre (MRC) of Maldives and the Marine Conservation Society of UK. The aim of the program is to collect baseline information on shark populations and assess the effectiveness of the shark-fishing ban in terms of changes to the shark populations in Maldivian waters. In the one year period from July 2009 to June 2010, a total of 1,661 surveys were carried out at 196 sites and sharks were sighted in 85% of the sights surveyed. The researchers identified the need for increased participation in the survey and highlighted the importance of continuing the program over the long term to accurately observe the changes to shark population. There is a need for an assessment of the status of sharks in the Maldives to validate the observations of fishermen and stakeholders.

Despite the numerous studies on fishes in the Maldives, there is a lack of monitoring of fish stocks and their distribution. The community of reef fish is highly diverse and appears not significantly different after the coral bleaching event of 1998 (Naseer et al., 1997). The abundance of herbivorous fishes (surgeonfish, wrasses, rabbit fishes) is thought to have increased over the past years due to the high algal cover on coral reefs, but no comprehensive study has been conducted so far.

White tipped reef shark, grey reef sharks and tawny nurse sharks are considered very rare, even in those places where they have been previously abundant (such as at Dhigaali Haa, Angu Faru). Tawny nurse sharks were listed as 'Endangered' on the Red List of Threatened Animals by IUCN in 2001.

The Maldives is home to globally significant populations of whale sharks. The whale shark is listed as 'Vulnerable' on the Red List of Threatened Animals by IUCN (2015). The main threats to the whale sharks in the Maldives are collision with vessels and disturbance to their natural behavior by unregulated tourism.

2.3 MANTA RAYS

Recently studies have been published on the size of the *Manta alfredi* population in the Maldives after more than ten years of observation (Kitchen-Wheeler, 2013). *Manta alfredi* is economically important in the Maldives due to the large number of tourists attracted to scuba dive and snorkel with them. It is important to understand the status and trends of this species to ensure manta-based tourism is sustainable. Using natural markings to identify individual mantas, Petersen and Jolly-Seber probabilistic estimators were used to assess population size for main dive sites and the central atolls of North Male', Ari and Baa. Between 2000-2009 1,835 individual mantas were identified from 3,373 sightings. Only 24.7% of mantas were re-sighted between one and 34 times with a maximum gap of seven years and 11 months between sightings. The results from atoll estimations were extrapolated to obtain an estimate of *Manta alfredi* population for the entire Maldives of 6,442 individuals.

The manta observations also provided support for the hypothesis that mantas are seen on the leeside of atolls. That 99.78% of manta encounters are on the leeward side versus 0.28% on the windward side strongly supports the leeside hypothesis. Exceptions were located on the north and south margins of atolls, but none were on the windward margin of the atolls chain. Since mantas feed on zooplankton, which in turn feeds on phytoplankton supported by nutrient upwelling, mantas are expected to be absent or rare from the extreme windward side of the Maldives which would have lower food availability.

2.4 GROUPER FISHERY

Targeted grouper fishery in the Maldives began in the early 1990s and intensified quickly due to huge demand from the export market. High market value species such as *Epinephelus fuscoguttatus, Plectropomus areolatus, Plectropomus laevis* and *Plectropomus pessuliferus* have been favourites.

Research on the grouper fishery of the Maldives has been conducted by the MRC since the early 1990s (Van Der Knaap et al., 1991; Anderson et al., 1992; Shakeel et al., 2005) and in 2010 in collaboration with the Marine Conservation Society through the Darwin Reef Fish Project (Sattar et al. 2011). The MoFA has tried to establish schemes for long term continuous catch data of groupers, but these have proved ineffective both in terms of type of data collected and cooperation from fishermen.

The most recent assessment of the grouper fishery (Sattar et al., 2012) shows that lack of management of this fishery has resulted in an unsustainable fishery showing a declining trend. Live exports of high value grouper species are on a continual decline. Live grouper exports show a decreasing trend, which is compensated for by increasing export of fresh/chilled groupers (low value species and smaller sized individuals). Due to difficulties in catching large quantities and larger sized individuals of high valued species (eg. *E Fuscoguttatus, E. polyphekadion, P. areeolatus, P. pessuliferus and P. laevis),* now they are mainly caught from breeding grounds during spawning period. This has resulted in all species and sizes of groupers being targeted, leading to low value species now being paid much higher prices by exporters.

Preliminary estimates of biomass is approximately 15,OOO mt of groupers found in all reef habitats of Maldives. Preliminary Maximum Sustainable Yield is 2,118 mt annually.

Table 11:
Grouper species commonly utilised for exports.

Scientific Name	English Name	Maldivian Islands
Aethaloperca rogaa	Red mouth grouper	Ginimas faana
Anyperodon leucogrammicus	Slender grouper	Boalhajehi faana
Cephalopholis argus	Peacock hind	Mas faana
Cephalopholis miniata	Coral hind	Koveli faana
Epinephelus areolatus	Areolate grouper	Thijjehi faana
Epinephelus fasciatus	Black tip grouper	Raiygalhi faana
Epinephelus flavocaeruleus	Blue and yellow grouper	Dhonnoof aana
Epinephelus fuscoguttatus	Brown marbled grouper	Kas faana
Epinephelus macrospilos	Big spot grouper	Fijjehi faana
Epinephelus merra	Honey comb grouper	Lah faana
Epinephelus polyphekadion	Camouflage grouper	Kula faana
Epinephelus spilotoceps	Four saddled grouper	Asdhaanu faana
Plectropomus areolatus	Squaretail coral grouper	Olhu faana
Plectropomus laevis	Black saddled coral grouper	Kulaolhu faana
Plectropomus pessuliferus	Roving coral grouper	Dhonolhu faana
Variola albimarginata	White edged lyretail	Kanduraiyhaa
Variola louti	Moontail sea bass	Kanduhaa

Decrease in size, a classic sign of over-fishing is observed for the commonly exploited species. The majority (70%) of individuals belonging to the 10 most in-demand species are currently being caught prior to reaching their theoretical maturity lengths. These include the high valued species such as those belonging to the Epinephelus genus, *Plectropomus laevis* and *P. pessuliferus* which are exported live in large numbers.

Commonly caught species now are the same species as in 2003, however, high value species have decreased in quantity. The size composition of individuals is smaller than those taken in 2003, and is especially significant for high value species. In Sattar et al's (2012) assessment, the most commonly encountered species were *Cephalopholis argus*, *Variola louti* and *Cephalopholis miniata*. High value species were rarely encountered; and were mostly found on house reefs of tourist resorts rather than in areas which are open to fisheries. Preliminary estimates of biomass is approximately 15,000 mt of groupers found in all reef habitats of Maldives. Preliminary Maximum Sustainable Yield is 2,118 mt annually.

Napoleon wrasses *(Cheilinus undulates)* are ranked as 'Endangered' and giant groupers (*Epinephelus lanceolatus*), ranked as 'Vulnerable' by IUCN (2015).

2.5 BAIT FISHERY

Fishermen report an overall decline in the stock of bait fish, but especially for the blue damselfish *(Chromis viridis)*.

2.6 SEA BIRDS

The major threats to seabirds include: (1) destruction of habitat, e.g., cutting down trees or removing sand from sandbanks, (2) taking of eggs, juveniles and adult birds for food or as pets, and (3) disturbance by people of roosting and nesting birds on islands and sandbanks (Anderson, 1996).

Pressure on birds has always been high in the Maldives. In the past, the harvesting of eggs and chicks as food presumably took place to supplement the diet (Ash and Shafeeg, 1994). Keeping a wide range of species of captured birds as pets has long been very popular in the Maldives. White herons, noddies, and falcons are kept in captivity.

Seabirds also suffer considerably from increased disturbances by tourists. Particularly noteworthy is the loss of all breeding ground of Bodu Gaadhooni (Great Crested Terns – *Sterna bergii)* from Nelivarufinolhu (a sandbank adjacent to Kunfunadhoo Sonevafushi Resort and much used by resort guests).

Colonies of some nesting terns and noddies are likely to have suffered complete loss of chicks and eggs due to the tsunami of 2004; some nesting islands may have completely disappeared, but these species are generally able to adapt to such losses and can be expected to re-nest or seek out new nesting sites.

2.7 MEDICINAL PLANTS

The stakeholders consulted for this report also identified a decline in the biodiversity of medicinal plants. The Maldives has a rich tradition of local medicinal practices. Many of the plants growing locally are used in the preparation of medicines. Plant derivatives are also used as pest repellents to protect crops. Though traditional forms of medicine have not been completely documented, some 122 species of plants with medicinal properties were recorded by the MoFA in 1992. The stakeholders identified human settlement in small islands as the major cause of medicinal plant biodiversity decline through the degradation and destruction of native habitat and introduction of invasive species. Disregard of traditional management practices is also identified as cause of the decline.

2.8 VEGETATION

Vegetation in the Maldives has changed both quantitatively and qualitatively over time due to overexploitation by increasing human populations, unsound land use practices, poor land tenure policies and intentional and unintentional introduction of exotics and commercial species. Such changes have made the islands of the Maldives, their ecosystems and human populations more vulnerable to natural calamities such as cyclones, tidal waves and tsunami and man-made calamities such as rising sea levels.

The islands are characterized by tall coconut palms and white sandy beaches. In many islands the original distribution of trees and shrubs have been greatly disturbed by the establishment of extensive coconut plantations. As a result, beach-crest scrub communities and mixed forests are only found up to a short distance from the shoreline in many of the islands before merging into coconut plantations. Most of the trees and shrubs present in the beach scrub community and mixed forests are tolerant of salt-laden winds, salt spray, soil salinity and shallow, nutrient-poor soils. Due to depletion of the 15 species traditionally used for dhoni construction, timber for housing and boat building is now largely imported.

Crops cultivated include coconut, fruits, vegetables, tubers, and coarse cereals. Vegetable production includes beans, cabbage, gourds and pumpkins. Of the fruit trees, breadfruit is an important component of the traditional diet in the islands whilst banana, papaya, water melon, mango and lime, amongst other fruits are grown on a small scale in the country.

Citrus and coconut production have been adversely affected by pests and diseases. Productivity is also low due to poor genetic stock, close planting and lack of use of fertilizers or manures. Coarse cereals including finger millet, Italian millet, and maize were widely cultivated in the past. Yam, cassava and taro *(Colocasia escuelenta)* production have declined as the import and distribution of rice and wheat flour increased.

3.1 REEF RECLAMATION

Reef reclamation is a major threat to marine biodiversity in the Maldives. Reefs and lagoons are being reclaimed to provide land for both population settlement and economic uses. The reef reclamation in inhabited islands is often to provide land for housing while lagoons are now being reclaimed to develop tourist resorts. The population of the country has increased by fourfold since 1911 and overcrowding is a significant problem in small inhabited islands. Of the 196 inhabited islands of Maldives, 22 have a population density of more than 50 persons per hectare. The five most densely populated islands in the Maldives are: Male' with 537 persons per hectare; Villingili (219); Hinnavaru (136) Komandoo (129); and Dhiggaru (92).

More than 1,300 hectares of reef have been reclaimed in some 98 inhabited islands. Hulhumale' is the largest land reclamation project where approximately 430 hectares were reclaimed to reduce population pressure on Male' (Table 12).

Table 12:

Major reef reclamation activities in inhabited islands.

Atoll	Island	Area Reclaimed (ha)
North Thiladhunmathi (Ha)	Dhidhdhoo	35.4
South Thiladhunmathi (Hdh)	Kulhudhuffushi	44.2
South Miladhunmadulu (N)	Velidhoo	17.9
South Maalhosmadulu (B)	Dharavandhoo	15.3
South Maalhosmadulu (B)	Eydhafushi	29.4
South Maalhosmadulu (B)	Thulhaadhoo	28.2
Faadhippolhu (Lh)	Hinnavaru	40.5
Faadhippolhu (Lh)	Naifaru	34.4
Male' Atoll	Hulhumale'	200.9
Male' Atoll	Hulhumale' Phase 2	226.95
Male' Atoll	Male'	94.7
Male' Atoll	Hulhule	76.0
North Ari Atoll (Adh)	Maamigili	73.8
South Nilandhe Atoll (Dh)	Meedhoo	20.0
South Nilandhe Atoll (Dh)	Kudahuvadhoo	69.7
Kolhumadulu (Th)	Vilufushi	40.2
Kolhumadulu (Th)	Thimarafushi	26.5
North Huvadhoo Atoll (Ga)	Villingili	55.0
North Huvadhoo Atoll (Ga)	Dhaandhoo	13.8
South Huvadhoo Atoll (Gdh)	Gadhdhoo	14.9
South Huvadhoo Atoll (Gdh)	Thinadhoo	71.4
South Huvadhoo Atoll (Gdh)	Fares-Maathoda	19.2
Addu Atoll (S)	Hithadhoo	53.0
Addu Atoll (S)	Meedhoo	11.5
Addu Atoll (S)	Gan	32.5

(Source: Ministry of Housing and Infrastructure 2014)

There is also an emerging trend to reclaim reefs for tourist resort development. The Ministry of Tourism has to this date leased eight reefs to develop tourism products.

The causes of habitat loss due to reef reclamation include: lack of information and appreciation of reef ecosystem, lack of planning guidelines at the atoll/island level, lack of understanding of carrying capacity, and non-compliance with environmental regulations and guidelines.

Individual impact and risk assessments are conducted for reef reclamation projects. These assessments all conclude that each individual project or activity poses a low or manageable risk. The cumulative (over time) or combined (simultaneous) impacts of these activities on an ecosystem or species need to be assessed. Also, risk assessments are often undertaken for specific species rather than overall marine biodiversity.

3.2 CLIMATE CHANGE

Dangerous climate change such as increase in SST, increasing ocean acidity, and altered rainfall patterns pose serious risk to biodiversity. The global average surface temperature is projected to increase by 1.4 to 5.8 ºC by 2100. For the Indian Ocean region, temperature is expected to increase by 2.1 ºC by the 2050s and 3.2 ºC by the 2080s (Nurse and Sem, 2001). For Maldives, the annual maximum daily temperature is projected to increase by around 1.5 ºC by 2100.

The present average monthly SST in the Maldives ranges from 28 ºC to 29 ºC, rarely increasing above 30 ºC. Mean monthly SST is lowest in December and January while reaching highest in April and May. An increasing trend in SST has been observed in the Maldives (Singhet al., 2001; Khan et al., 2002). Large seasonal variations in the SST trends were observed at Gan International Airport in Addu Atoll. The annual mean SST trends in Male' and Gan are ±0.2 ºC and 1.1 ºC to 1.6 ºC per decade respectively. During May 1998 mean monthly SST was 1.1 ºC above the highest mean monthly SST expected in any 20-year return period (Edwards et al., 2001).

Many marine species are at risk from rapid climate change in the Maldives. Corals are highly sensitive to changes in temperature and some species of corals live at or near their thermal limits (Goreau, 1992). The incidence of bleaching will increase in frequency and intensity with the projected rise in SST. The evidence from the reefs of the Maldives supports that warming of the ocean surface leads to significant coral bleaching. Unusually warm sea surface temperatures caused serious damage to the coral reefs of the Maldives in 1998 and 2002. During the 1998 El Nino event monthly mean SST was 1.2±4 SD above the 1950-1999 average, with the greatest anomaly in May of +2.1 ºC (Edwards et al., 2001). Significant reductions in live coral cover were seen at reefs in the central atolls (Zahir, 2000), with average live coral cover decreasing from about 42% to 2%, a 20-fold reduction from pre-bleaching levels. Almost 98% of branching corals died whereas the majority of massive corals survived the bleaching (Edwards et al., 2001).

Estimates of mean monthly SST for April suggest a rise of 0.16 °C per decade. If this trend continues, by 2030 mean SST during April in the central atolls will normally exceed the anomaly level at which corals appear susceptible to mass bleaching (Edwards et al., 2001). As mass spawning and recruitment in the reef ecosystems is cued to environmental conditions, coral reef biodiversity is particularly vulnerable to climate

change. After spawning, coral larvae usually drift with the currents for at least four days before settling on nearby reefs. Many reef fish are also known to have seasonal spawning cycles which may be disrupted by changes in environmental conditions resulting in recruitment failure. In addition, reef fishes have a pelagic larval phase ranging from days to few weeks. Survival of larvae depends on favourable conditions of the pelagic environment as well (Adam, 2006).

Coral reefs in the Maldives are also vulnerable to the projected rise in sea level. Most reefs of the Maldives appear to be at the point where they are sea level limited and with no potential for upward growth. Reefs appear to be now growing outwards laterally and filling up inside (Naseer, 2006). It is predicted that sea level rise would induce reefs to grow vertically upwards. However, increased SST and oceanic carbon dioxide concentrations may alter the calcification potential of coral reefs resulting in slow growth. The calcification rate of corals is expected to decline by 14-30% by 2050 (Intergovernmental Panel on Climate Change, 2001).

Climate change is happening in the context of other pressures such as coastal reclamation, increased fisheries effort and marine pollution. Climate change is likely to worsen effects of these pressures. The atoll ecosystem based approach adopted in Baa Atoll has shown benefits through consideration of ecological systems along with social systems.

One of the major challenges in building resilience to climate change is the Lack of information. Enough information could drive new and effective ways of building resilience of coral reef ecosystems to climate change.

3.3 VEGETATIVE CLEARENCE

Loss and fragmentation of habitat due to vegetation clearance activities continues to be a threat to terrestrial biodiversity. The Regulation on felling of trees helps biodiversity conservation, soil protection and water quality. Although the government has introduced land clearance controls, there has been a significant increase in vegetation cleared for agriculture, housing development, and recreation. Vegetation loss due to housing and agriculture is reducing species diversity and abundance, degrading habitats and disrupting ecological processes.

3.4 MARINE POLLUTANTS

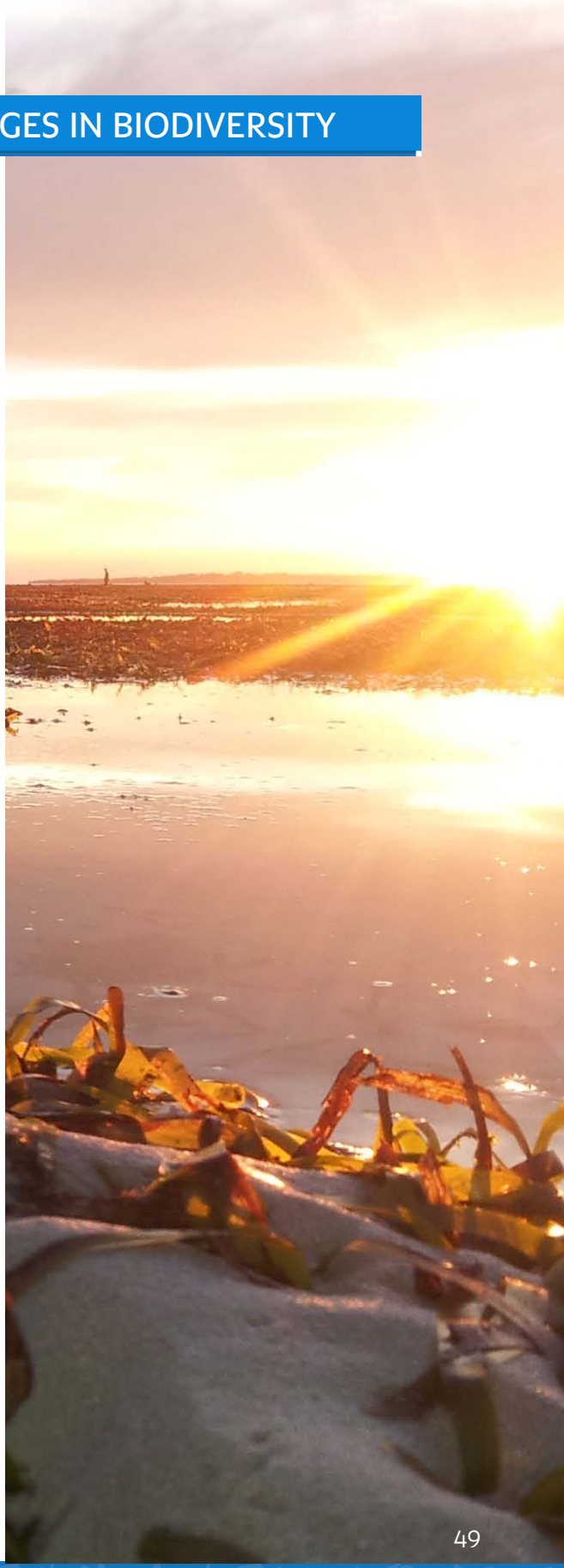
Coastal marine pollutants, particularly in the form of waste, sewage, oil and fertilizers adversely impact the marine biodiversity. These pollutants originate from land-based activities such as food consumption, lifestyle changes, housing and agriculture and from marine transport. Waste, sewage, oil and fertilizers cause degradation of coral reef habitats, change the distribution and density of species, and decrease the capacity of corals to withstand and recover from coral bleaching events.

4.0 IMPACTS OF THE CHANGES IN BIODIVERSITY

Loss of biodiversity and related ecosystems services could affect the quality of life and human wellbeing significantly. This will occur at a time when the economic and social value of these assets and services are increasingly recognised.

Since biodiversity forms the basis of tourism, the main economic activity, negative changes in biodiversity could bring serious shocks to the economy. In 2013, more than a million tourists visited the Maldives. The natural coral reef or aquatic systems are the basis for recreational activities such as snorkelling, diving and fishing in the Maldives. The Maldives Visitor Survey 2014 showed that 40% of the visitors choose the Maldives as their holiday destination because of its natural beauty. The coral reefs of the Maldives are becoming a must visit place. According to the World Travel Awards 2006, Maldives was the World's Leading Dive Destination and Indian Ocean's Leading Destination (World Travel Awards, 2006). The key changes that could impact coral reef ecosystems and tourism include lagoon reclamation, building construction in the lagoon, high visitor numbers in popular dive sites, and waste disposal.

The long-term future of tourism in the Maldives is intricately linked to biodiversity conservation and the sustainable management of marine resources. Biodiversity resources are a fundamental building block of the tourism industry. A viable, diverse and competitive tourism industry cannot be developed without protection and proper management of the coral reef and small island ecosystems. The strong support of the tourism sector for biodiversity conservation is evident in the strategic thrusts outlined in the Fourth Tourism Master Plan (TMP IV).



Biodiversity also underlies the success of primary industries such as fisheries and agriculture. Decline in fisheries poses serious risk for food security in the Maldives as tuna is the primary source of protein for the local population. Biodiversity also plays a significant role in the production of other important human services such as traditional medicine or environmental medicine.

Vector-borne diseases such as dengue and chikungunya are on the increase. The emergence and re-emergence of vector borne diseases create mortality, morbidity and economic impacts. The vectors enjoy the tropical climate and rainfall patterns of the atolls. Higher population density, migration and more travel are among the socio-economic factors that drive these diseases. Dengue fever is the most common mosquito-borne viral disease in the Maldives. To prevent dengue fever, the breeding habitats of its carrier, the Aedes mosquitoes need to be removed. These mosquitoes are identified by black and white stripes on their body.

One of the important emerging issues is introduced species. There are three main pathways for introduced species: as home pets, through mariculture, and agriculture. Introduced species are a significant threat to biodiversity conservation in the Maldives. Recent media reports covered an endangered species that was traded and imported to the Maldives as an exotic pet. Invasive species introduced through agriculture have the potential to become widespread, with significant populations, and can cause land degradation. Mariculture needs to be carefully monitored and evaluated to ensure that the introduced species do not move beyond the project sites.

Table 13:

Summary of Biodiversity status, trends and threats and implications for human well-being

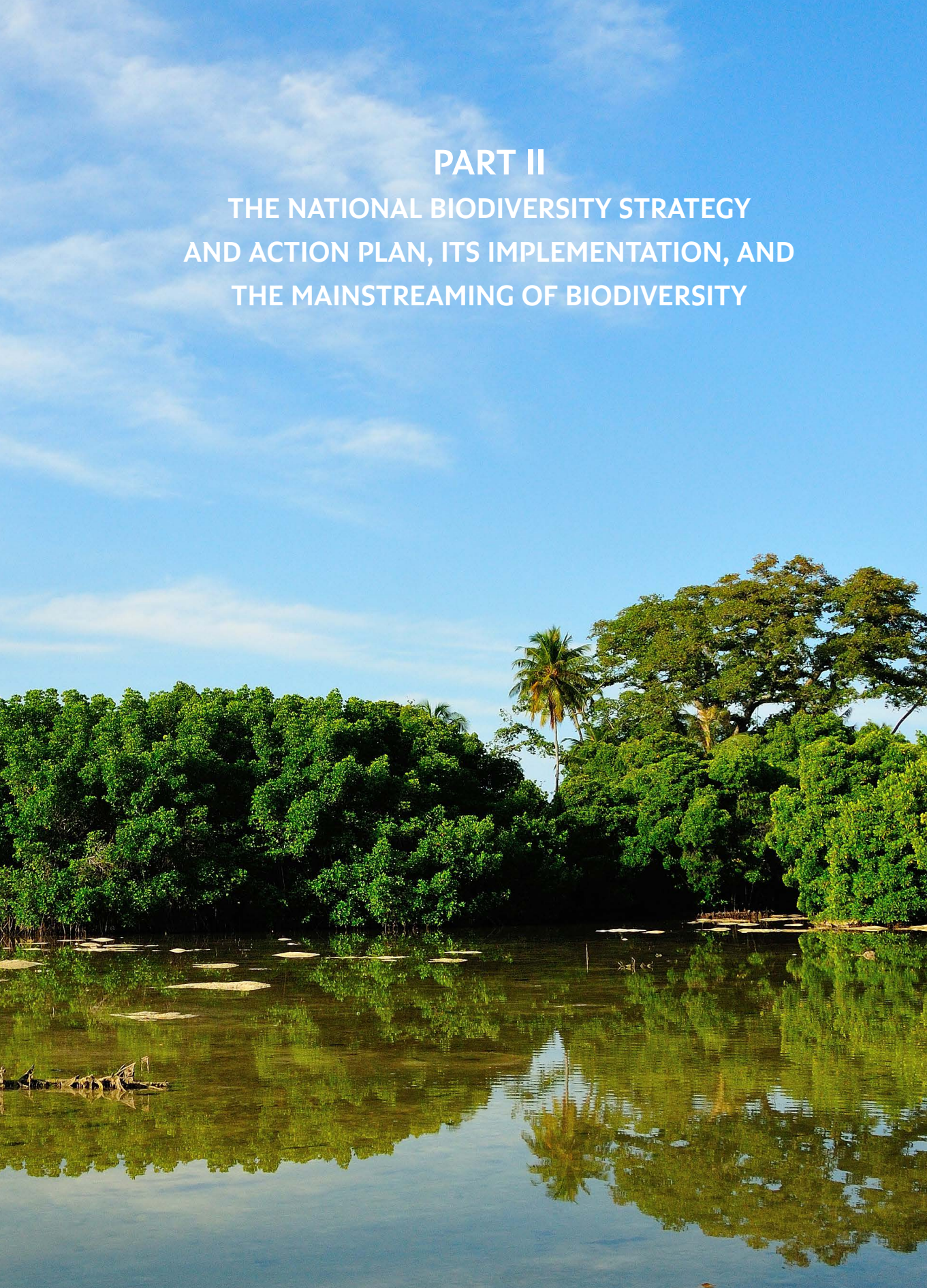
Aichi Biodiversity Target	Biodiversity Status, Trends, and Threats and Implications for Human well being	
	State of relevant biodiversity component or pressure	Impacts on or implications for human wellbeing
Target 1- people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	The MEE has been conducting programs for awareness on biodiversity and this is increasing the awareness level of young people and general public on biodiversity. The environmentally conscious tourism industry of the Maldives is also creating awareness on biodiversity, particularly through dive schools and marine biologists.	Increased awareness on biodiversity will lead to conservation and sustainable use of biodiversity resources. This will have positive implications for human wellbeing though better health, higher incomes, increased knowledge, as well as more opportunities for recreation.
Target 2 - biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	Biodiversity values are integrated in national development plans, sectoral master plans, atoll development plans, and island development plans. There is a significant increase in the coverage of biodiversity conservation in development plans formulated in the Maldives.	The conservation and sustainable use of biodiversity resources will have positive implications for the key economic sectors of the Maldives: tourism, construction, fisheries, and agriculture. Sustainable economic development is critical to the Maldives as the nation has very few natural resources.
Target 3 – incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.	The Government has initiated a subsidy scheme for farmers. Farmers can access fertilizers and chemicals through the subsidy scheme. This has potential to increase significantly the use of imported fertilizers and chemicals.	The excessive use of fertilizers and chemicals has implications for both water security and food security in the Maldives. The islands have a very fragile and limited freshwater lens which is susceptible to pollution from chemicals and fertilizers. Excessive use of chemicals for farming is a serious threat to human health through residues left in the produce.
Target 4 – governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	With the limited resources in the Maldives the key production activities are focused on fish, with canning, drying and smoking of fish. There is also significant production of thatch from coconut fronds. Both of these production activities have been sustainable and are considered eco-friendly. The increase in consumption in the Maldives is fuelled by imports into the country. Imports have been increasing steadily and the impacts of over consumption are becoming very visible in the Maldives.	The major implication of increase in consumption is the generation of wastes in the Maldives. The solid waste problem in the Maldives has significant implications for human health and natural beauty of the Maldives.
Target 5 – the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	Increase in population and high population density in small islands creates need for land reclamation and dredging. Fragmentation of habitats. Climate change and ocean acidification. Coral bleaching.	Reduced availability of bait fish causing negative impact on tuna fishery, and as a result, on food security. Reduced reef fisheries, with implications on livelihoods of families dependent on reef fishery. Impact on tourism caused by decrease in reef fish available for tourist resorts. Decline in aesthetic value of coral reef would have implications on diving and snorkelling resulting in impacts on tourism and the national economy.
Target 6 – all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that over fishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	Decline in skipjack tuna catch. Increase in recreational fisheries (night fishing). Increase in demand on reef fish. Mariculture projects in mangroves.	Negative impacts on livelihood of fishermen. Food security implications as most Maldivians depend on tuna as the main source of protein in their diets. Negative impacts on export value of marine products. Impact on tourism caused by decrease in reef fish available for tourist resorts. Reef fish is a key attraction for snorkelling in the house reefs and decline in reef fish species will have negative impacts on tourism.

Target 7 – areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	Extensive use of chemicals and fertilizers for farming. Low fertility of soil pushing farmers to extensive use of fertilizers. Use of chemical pesticides escalating due to increase in pest outbreaks. . Limited land for agriculture and aquaculture.	Serious implications for human health as well as ground water contamination from extensive use of chemicals and fertilizers. Although there is no reported increase in diseases due to extensive use of fertilizers this is an emerging concern for human health.
Target 8 – pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	Improper waste management. Improper sewage disposal. Extensive use of fertilizers and pesticide.	Increase in vector borne diseases with implications for human health. Risk of water borne diseases due to impact of sewage and chemicals on groundwater.
Target 9 – invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	Increase in import of plants and animals.	Loss of native species and species diversity Negative impacts on agriculture and food security. Impacts on aesthetic value of reefs and lagoons.
Target 10 – the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.	Lack of awareness on vulnerable ecosystems and how to manage them. Increase in population, demand for housing for new households, and urbanization. Increase in demand for agricultural land. Climate change. Improper waste and sewage disposal. Increasing number of visitors.	Negative impacts on livelihood of fishermen and farmers. Negative impacts on aesthetic and recreational value. Loss of soil fertility. Human health implications due to increase in dengue and chikungunya. Significant decline in species used as medicinal plants.
Target 11 – 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	No proper management plans. Geographical dispersion of islands and protected areas. No financial mechanism to monitor protected areas. Conflict in bait fishery and recreational diving. Limited technical expertise.	Decline in value of protected areas. Threats to sustainable diving and tourism. Potential impacts on keystone species such as manta ray and whale sharks. Unsustainable resource use affecting livelihood and food security.
Target 12 – the extinction of known threatened species has been prevented and their conservation status, particularly of those mostin decline, has been improved and sustained.	Habitat destruction such as loss of natural sandy beach for turtles. Trade in endangered species as pets and souvenir items. Catching of birds for pets and as a hobby. Lack of awareness. Recreational fishing (especially of protected species). Limited law enforcement. Conflicting and unclear mandates between resource use and conservation. No national red list of species developed.	Loss of keystone species. Negative implications for food security. Imbalance in ecosystem web. Genetic diversity loss.
Target 13 – the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	Lack of awareness. No baseline data on the existing genetic diversity. Import of foreign crops which are more productive than local breeds.	Impacts on local breed and future food security.

Target 14 – ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.	Improper waste and sewage disposal.	Water security with implications for human health. Increase in vector borne diseases and implications for human health.
Target 15 – ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	The vegetation cover in the islands is in decline due to land clearance for housing development, agriculture, and development of recreational facilities such as football grounds. Few vegetation restoration projects exist.	Loss of species with implication for human health due to loss of medicinal plants. Loss of mature trees makes islands warmer and cause human health issues.
Target 16 - the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.	The Maldives has not yet ratified the Nagoya Protocol	Loss of economic benefits to the country due to weak legal framework on access to genetic resources.
Target 17 - each Party has developed, adoptedas a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	The Maldives has updated its NBSAP. The process adopted was participatory and consultations were undertaken in all the regions with active participation from all atolls.	The commitment for biodiversity conservation at island level is expected to improve significantly through awareness and proper management and planning at island and community level.
Target 18 - the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.	There is significant traditional knowledge in the areas of environmental medicine, fisheries, food, and farming in the islands of Maldives. However, very little has been done to maintain and archive the knowledge.	The present generation may lose access to traditional knowledge as global news media and social media capture the attention of young people. As a result, the understanding of the value of biodiversity could decline.
Target 19 - knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied	There are very few new research activities relating to biodiversity in the Maldives.	This affects informed decision making by policy makers at different level.
Target 20 - the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.	Since 2008, the Government of Maldives has faced fiscal challenges and as a result government spending on biodiversity conservation has declined.	There is a need to engage the private sector in mobilization of financial resources and more innovative models such as crowd sourcing are needed. There is also a need to expand the user fee model for protected dive sites.

PART II

THE NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN, ITS IMPLEMENTATION, AND THE MAINSTREAMING OF BIODIVERSITY



5. BIODIVERSITY TARGETS SET BY THE MALDIVES

5.1 NBSAP II TARGETS

Maldives is developing a draft set of measurable targets that are in line with the Aichi Biodiversity Targets of the Strategic Plan for Biodiversity 2011-2020. These goals and targets are currently undergoing final stages of approval.

The targets set in the NBSAP needs to be specific and measurable. During the combined consultative process for the Fifth National Report and NBSAP, stakeholders identified that while some of the targets are very clear and specific, others are less so. It is likely that the identification of indicators and baseline data would require further engagement with stakeholders.

The goals and targets set by the Maldives are cross-sectoral in nature and implementation would happen at atoll and island level. Hence it would be important to establish a system to measure and report progress. The co-operation and collaboration of key economic sectors and the support of island councils and atoll councils would be critical for the success of implementation of actions as well as to review progress.

Indicators are proposed for each target along with the targets and actions to support implementation. The indicators will be useful for measuring progress and will be reviewed and refined through future consultations with key stakeholders.

5.2 NATIONAL SUSTAINABLE DEVELOPMENT STRATEGY (NSDS) TARGETS

The following targets for biodiversity conservation were set in the NSDS (2009):

Give protected status to five percent of the coral reef areas.
Ban reclamation of reef areas and fish breeding grounds.
Ban export of reef fish.

The following indicators were included for monitoring and assessment in NSDS:

- Percentage of reef area under protected status.
- Number of reef reclamation projects undertaken.
- Area of reef reclaimed.
- Quantity of reef fish catch.
- Quantity of reef fish exported.
- Value of reef fish exported.

6. NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

The Maldives ratified the Convention on Biological Diversity on 28 October 1992. Ten years later, in 2002, the then Ministry of Home Affairs, Housing and Environment developed the first NBSAP. The vision of the first NBSAP was:

> A nation which appreciates the true value of the natural environment, utilizes its natural resources in a sustainable manner for national development, conserves its biological diversity, shares equitably the benefits from its biological resources, has built the capacity to learn about its natural environment and leaves a healthy natural environment for future generations (2002, p. 20).

The three goals of the first NBSAP were:

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.

The major objectives and actions of the first NBSAP were:

1. Integration of biodiversity conservation into the national development process
2. Adoption of policies and management systems for sustainable use
3. Establishment of measures for in-situ and ex-situ conservation
4. Management of threatening processes
5. Adoption of economic incentives
6. Improvement of knowledge and understanding
7. Increasing awareness
8. Strengthening legal framework
9. Strengthening institutional framework and development of human resoruces
10. Building financial capacity
11. Increasing community participation
12. Role of NCPE and establishment of technical committee

The NBSAP was first reviewed in 2006 through which the government assessed the extent to which the strategy's objectives had been achieved. The review found that advances have been made in the areas of protected areas designation, environmental impact assessment, and integration of biodiversity conservation in development planning. However, several of the strategy's objectives were found not to have been fully met. A key challenge for biodiversity conservation was the lack of cross-sectoral collaboration.

A National Biodiversity Technical Group was established for a second review of the NBSAP in 2013. The technical group consisted of members from key government ministries and the relevant departments of MEE. The review noted that the first NBSAP did not provide quantifiable and measurable targets. Hence, implementing the NBSAP and measuring achievements had remained a challenge. It was also found necessary to include responsible agencies, monitoring mechanisms and estimated costs to achieve the biodiversity targets.

As a result, the government has formulated a new NBSAP to address all these issues and developed an implementation plan with achievable targets. The new NBSAP is in line with the Strategy for Biodiversity 2011-2020 and the Aichi Targets.

In developing the goals and targets for the Maldives, MEE, in collaboration with atoll and island councils, conducted consultations with stakeholders. Some of the comments received through the consultation process called for clearer goals and targets. The stakeholders also called for identification of who would be responsible for the actions and accountability mechanisms for achieving the targets. Comments were also received on how targets would be measured, assessed and evaluated over time, and the usefulness of the indicators.

7. MAINSTREAMING OF BIODIVERSITY INTO STRATEGIES, PLANS AND PROGRAMS

The Government of the Maldives has developed and adopted planning procedures and processes that take into account biodiversity conservation. The incorporation of biodiversity conservation in the TMP IV, the Strategic Action Plan (SAP) 2009-2013, the NSDS and the NEAP III are particularly noteworthy in this context.

7.1 TOURISM MASTER PLAN

The TMP IV of the Maldives was launched on 29 September 2013. The TMP IV recognizes that the entire tourism industry depends on a wholesome environment and the conservation of nature. The Plan emphasizes that the tourism sector has strong interest in helping the agencies responsible for environment and conservation, both for the sake of the tourism industry itself, as well as for the sake of future generations of Maldivians.

The strategies and actions specific to biodiversity conservation in the TMP IV (2013) are:

Strategy 2.1.
Improving waste management practices of local communities.

Action 2.1.1.
Assist inhabited islands near resorts to establish a self-sustaining waste management system.

Action 2.1.2.
Support government in establishing a proper waste management system on Thilafushi Island.

Action 2.1.3.
Work with local councils to establish proper waste management facilities in selected inhabited islands for live-aboard vessels.

Strategy 2.2.
Developing and enforcing management plans for sensitive environments.

Action 2.2.1.
Develop management plans for marine protected areas and designated sensitive environments.

Action 2.2.2.
Establish a Tourism Planning Committee at national level with a mandate to assist the preparation and enforcement of MPA management plans and to settle grievances over natural resource use involving the tourism.

Strategy 2.3.
Establishing marine managed areas in resort house reefs.

Action 2.3.1.
Help to drive the 'biosphere reserve' programme by setting up marine reserves with in house reefs or boundaries of resorts.

Strategy 2.4.
Implementing a "Responsible Visitor Programme."

Action 2.4.1.
Implement a "responsible visitor programme", combining environmental and marketing motives.

Strategy 2.5.
Implementing climate change adaptation programme for tourism industry.

Action 2.5.1.
Initiate a national programme of long-term climate change adaptation in the tourism sector.

Strategy 2.6.
Implementing a low carbon programme for tourism industry.

Action 2.6.1.
Initiate a national low-carbon programme for the tourism sector.

Strategy 2.7.
Strengthening environmental monitoring for evidence based decision-making.

Action 2.7.1.
Partnership to strengthen evidence-based decision-making.

7.2 STRATEGIC ACTION PLAN

The SAP 2009- 2013 set the policies and strategies for the government elected in November 2008. The foremost principle of the Government is to view the natural environment as the key to socio-economic development. Under the theme of environmental protection, its Policy Two is directed at biodiversity conservation:

> Policy 2: Conserve and sustainably use biological diversity and ensure maximum ecosystem benefits.

The specific strategies for biodiversity conservation identified under SAP (2009) Policy Two are:

> Mainstream biodiversity conservation into all national development and sectoral policies.
>
> Define national government, province/ atoll office and community responsibilities for biodiversity conservation.
>
> Ensure biodiversity conservation as a core component in all provincial development strategies, atoll development plans and island land use plans.
>
> Introduce formal agreements and market based instruments for biodiversity conservation.
>
> Establish a fully functional Protected Areas system in the Maldives that provides adequate protection to terrestrial, marine, and mangrove ecosystems threatened species.

The following seven policies were identified in the SAP (2009) for sustainable fisheries development in the Maldives:

> **Policy 1:** Expand the scope of the fisheries sector in the economy and diversify fish and marine products in a sustainable manner.
>
> **Policy 2:** Regulate the market to ensure that changes in the buying price of fish in international markets are passed through to local fishermen.
>
> **Policy 3:** Facilitate business development, trade and export promotion in fisheries.
>
> **Policy 4:**Provide training and capacity building opportunities in the sector.
>
> **Policy 5:** Promote research in fisheries and introduce fish breeding and productivity.
>
> **Policy 6:** Establish modern fisheries infrastructure in different regions of the country.
>
> **Policy 7:** Enhance the regulatory framework to ensure sustainable fishery development and management.

The following seven policies were included in SAP (2009) to reduce dependence on imports, improve national food security and promote agriculture for economic diversification and poverty reduction:

Policy 1: Strengthen commercial agriculture to reduce reliance on importedfood and attain food security.

Policy 2: Facilitate the availability of agricultural inputs and accessibility to appropriate and environment friendly technology in all regions to promote sustainable agriculture farming systems.

Policy3: Develop systems, networks and physical infrastructure for strengthening marketing and trade of agriculture produce and to encourage commercial agriculture.

Policy 4: Expand the use of technology in the agriculture sector to help develop and diversify the sector and ensure gender disparities are not created due to these technologies.

Policy 5: Strengthen the institutional capacity to support the growth of agricultural sector.

Policy 6: Strengthen legal framework to regulate the use of agriculture natural resources and develop services related to agriculture development.

Policy 7: Strengthen agricultural statistics for results-based planning.

7.3 NATIONAL SUSTAINABLE DEVELOPMENT STRATEGY

The NSDS was adopted in April 2009. The following policies and measures were identified for implementation of NSDS (2009):

Synthesize and enhance the knowledge on Maldivian reef biology and ecology.

Conduct research on how human induced stresses such as reef fishery, tourism, land reclamation and other developmental activities affect growth and functioning of coral reefs to facilitate informed decision-making on coral reef management.

Develop a Geographical Information System-based national coral reef database to enable the management and analysis of ecological and socioeconomic data on coral reefs.

Develop the coral reef management framework that enables the relevant institutions to designate zones, uses and marine protected areas systems. Review the existing institutional framework to identify gaps and barriers in coral reef management and recommend roles and responsibilities for custodians, users and managers.

Review the existing institutional framework to identify gaps and barriers in coral reef management and recommend roles and responsibilities for custodians, users and managers.

Develop regulations and conflict resolution mechanisms for resource use among competing industries such as fishing and tourism to ensure balance between resource protection and resource usage.

Develop standards and guidelines for high impact coastal development activities, especially land reclamation and island access infrastructure development.

Sensitize public infrastructure contracting agencies and contractors on coral reef protection regulations relating to design and construction of coastal developments.

Strengthen the capacity of island and provincial offices to enforce regulations including training on coral reef management and designation of staff responsible for enforcement and monitoring.

Organize an information dissemination campaign to inform public on all regulations related to coral reef management.

Identify the criteria for the selection of MPAs.

Review the effectiveness of designated MPAs and recommend ways and means to strengthen MPA management.

Develop guidelines on different reef resource uses, and establish best practice guidelines on snorkeling, diving and water sports activities.

Develop quotas and control methods to prevent over-exploitation of specific species, ban destructive fishing practices such as use of chemicals and explosives and regularly monitor status of fish stock.

Develop monitoring plans for reef fishery stock.

Investigate the effectiveness of mooring buoys, navigation aids and signs in preventing boat damage on reefs.

Develop the terms of reference, organizational structure and staffing needs for a National Coral Reef Management Authority (NCRMA) with nodal agencies in selected islands.

Undertake training needs assessment to determine the training requirements for the NCRMA and nodal agencies and a strategy for human resource development.

Develop a comprehensive training package on coral reef science and management to be integrated into the existing Coastal Zone Management Training Course.

Conduct appropriate training programs for atoll and island office staff on coral reef management.

7.4 THIRD NATIONAL ENVIRONMENT ACTION PLAN (NEAP III)

The NEAP III (2009-2013) was launched in 2009 after government agencies worked together for nearly two years to agree on the key actions necessary to protect the fragile environment of the Maldives. Six results and corresponding goals and targets that all the government agencies would work together to achieve are set out in NEAP III. There are six goals for biodiversity conservation set out in NEAP III (2009):

Goal 8:
Improve scientific knowledge and access to information for biodiversity conservation.

8.1: Improve the knowledge base for biodiversity conservation by identifying and monitoring status of biodiversity; identifying the economic value of biodiversity; understanding threats to biodiversity; and monitoring effectiveness of management.

8.2: Verify, and make accessible existing knowledge and information on biodiversity.

8.3: Increase the public awareness and understanding of the concept of biodiversity and the actions that can be taken to conserve species, ecological communities and ecosystems.

Goal 9:
Bring institutional and legislative reforms to enable biodiversity conservation.

9.1: Recognize biodiversity conservation as a core business of island and atoll offices.

9.2: Remove legal impediments to biodiversity conservation.

9.3: Introduce formal agreements and market based instruments for biodiversity conservation.

9.4: Achieve substantial progress in the implementation of the international commitments of the Maldives to conserve globally significant biodiversity.

Goal 10:
Protect and restore coral reefs

10.1: Establish and manage MPAs.

10.2: Policy and legal framework to protect and manage coral reefs.

10.3: Enable the enforcement of existing coral reef management regulations.

10.4: Reduce human induced and natural stress on reef environment.

10.5: Develop the capacity of national organizations and communities to manage coral reef environment.

Goal 11:
Protect and restore vegetation, terrestrial ecosystems and islands.

11.1: Reverse the decline in natural vegetation, ecological communities and the ecosystem services they provide.

11. 2: Protect a representative sample of the islands of the Maldives and their terrestrial ecosystems.

11.3: Protect threatened species and ecological communities.

Goal 12:
Protect and restore wetlands and mangrove ecosystems.

12.1: Manage threats, prevent degradation and maintain the ecological character of the nationally significant wetland dependent, water dependent and mangrove ecosystems.

12.2: Protect significant habitats for migratory water-birds.

Goal 13:
Control invasive species.

13.1: Prevent or control the introduction and spread of invasive species.
The biodiversity conservation specific goals, objectives and targets in NEAP III are provided in Appendix III.

8. ACTIONS TO IMPLEMENT CBD

Maldives has undertaken several actions to implement the CBD since submitting the Fourth National Report. Several of these actions are mentioned elsewhere in this report. Some of the actions to implement the CBD in the Maldives are given below.

8.1 SECOND NATIONAL STRATEGY FOR BIODIVERSITY CONSERVATION

The MEE has been leading the development of the new NBSAP and the 2020 goals and targets of the Maldives under the Convention. This has resulted in six draft goals and 26 related draft targets covering a range of important measures for the implementation of the CBD. These include creation of protected areas and sustainable use of biodiversity through sustainable fisheries and sustainable agriculture. However, most of the targets need to be made more specific and key actions for achieving the targets needs to be developed. Work is underway to identify the key actions that need to be taken to meet the biodiversity targets by 2025.

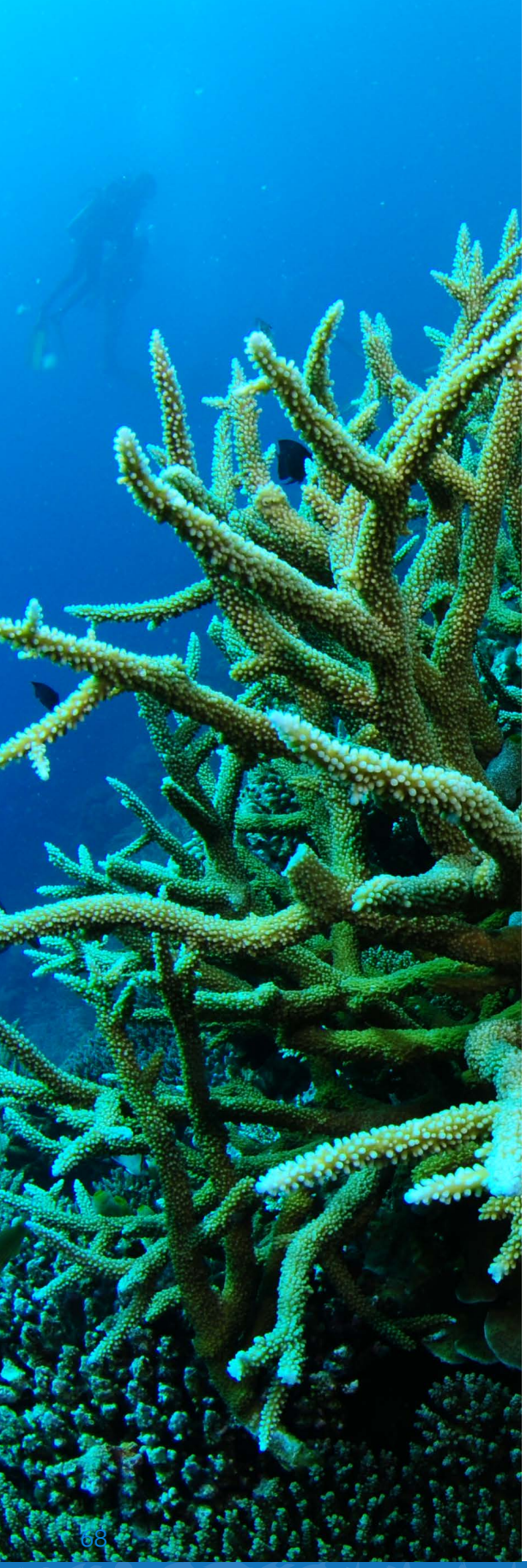
8.2 INTEGRATION INTO SECTORAL PLANS MAINSTREAMING

Biodiversity concerns have been integrated in the TMP IV, SAP 2009-2013, the NSDS and the NEAP III. Biodiversity concerns are also included in Heavenly Huvadhoo (Gaafu Alif Atoll Development Plan) and Fuvahmulah Vision developed at the atoll level.

8.3 IDENTIFICATION AND MONITORING

The Maldives is yet to produce the first formal ecosystems status and trends report. The desk assessment completed for the First National Report to the CBD was a positive first step in addressing the lack of comprehensive biodiversity reporting, an issue that was highlighted in the consultations on biodiversity. There is no single agency responsible for comprehensively reporting on biodiversity and no agency to lead the initiative. As a result, the identification and reporting of biodiversity status is a major challenge.

Recent work related to identification and monitoring include research on coral, whale sharks, manta rays, bait fish, and shark population. The MRC has continued an annual National Coral Reef Monitoring Programme under the Global Coral Reef Monitoring Network at 15 sites across the Maldives over the last 12 years to determine the recovery of the coral cover and benthic communities. Systematic quantitative surveys for coral reef monitoring organized by the MRC began in 1997 using the Reef Check monitoring protocol. Since then a number of reports have been published based on systematic monitoring using standard protocols (Zahir et al., 1998; Zahir, 2000; Zahir, 2002; Zahir et al., 2006; Zahir et al., 2002; Zahir et al., 2010; Zahir, 2006; Lasagna et al., 2009; Lasagna et al., 2008)



In order to strengthen coral reef monitoring capacity at national level, a coral reef monitoring project was initiated through the Maldives Environmental Management Project, implemented by MEE.

This initiative was further developed as a coral component of Wetland Conservation and Coral Reef Conservation project through funding by Climate Change Trust Fund. The European Union and the Government of Australia provided financial assistance for the Climate Change Trust Fund. The coral component is operated by MRC and tourist resorts of the Maldives are asked to monitor and collect minimum one data set annually from a fixed reef in their resort. The main components of the project are: the development of protocols for various monitoring components, development of a web enabled database to enter the data collected by resorts, training of participating resorts to collect the data on the given protocols and resorts submitting at least one data set from each protocol annually. The monitoring protocols for various monitoring components were peer reviewed through independent consultants.

Lasagna et al (2009) have proposed a synthetic Coral Condition Index based on the proportional abundance of coral colonies belonging to six ordinal categories which represent their condition: recently dead, bleached, smothered, upturned, broken, and healthy. The performance of this index was tested in Maldives, which suffered from coral mass mortality following bleaching in 1998 and mechanical damage due to the tsunami of 2004.

Whale sharks in the Maldives have been studied in South Ari Atoll from 2006 through 2013. The observations to date suggest that a large number of the sharks that are observed in the Maldives may be year-round or perhaps permanent residents of the archipelago, at least until they mature (Riley et al., 2010). The Maldives Whale Shark Research Programme, a

registered charity that exists to conduct whale shark research and foster conservation initiatives throughout the Maldives and the Indian Ocean, coordinates the research.

As mentioned in section 2.3, studies have recently been published on the size of the *Manta alfredi* population in the Maldives. Petersen and Jolly-Seber probabilistic estimators were used to assess population size in dive sites and the central atolls of the Maldives, using natural markings to identify individual mantas.

The MRC in collaboration with Darwin Reef Fish Project initiated an assessment of groupers in 2010. The aim was to collect baseline information necessary to assess the current status of the fishery and the stock for the formulation of a grouper fishery management plan. The review collected both qualitative and quantitative data of the fishery and export industry as well as conducting underwater surveys to estimate grouper biomass.

As mentioned in section 2.2 above, the 'Sharkwatch' program has collected baseline data on the distribution and abundance of reef sharks throughout the Maldives, and is monitoring changes in populations following introduction of the reef shark fishing ban on 1 March 2009.

8.4 PROTECTED AREAS

There are 42 protected areas totaling more than 24,494 hectares (0.2% of the national territory) designated under the Environment Protection and Preservation Act 4/93 (EPPA 4/93).

In order to prevent over exploitation, and improve conservation and preservation, Marine Protected Areas (MPAs) were first established in the Maldives in 1995 under the EPPA 4/93. The Government designated 15 MPAs as the country's first in 1995. A further 10 areas were declared in 1999. These initial sites were established at the request of the tourism industry for the explicit purpose of dive tourism. Other reasons for protection include banning export of important baitfish as aquarium fish; banning fishing from the 'house' reefs of tourist resorts; and the protection of threatened marine species such as sharks, sea turtles, giant clams, and black coral.

Table 14:

List of protected areas in the Maldives

#	Protected Area	Type	Area (ha)	Date	Atoll / Location
1	Fushifaru Thila/ Fushivaru Kandu	Reef	30	1 October 1995	Faadhippolhu
2	Makunudhoo Kandu Olhi	Reef	358	1 October 1995	Male'Atoll
3	Thanburudhoo Thila (H.P Reef)	Reef	57	1 October 1995	Male' Atoll
4	Dhekunu thilafalhuge miayaruvani (Lions Head)	Reef	142	1 October 1995	Male' Atoll
5	Gulhee falhu kollavaani (Hans Hass Place)	Reef	102	1 October 1995	Male' Atoll
6	Embudu Kan'duolhi Channel	Reef	117	1 October 1995	Male' Atoll
7	Guraidhoo Kanduolhi	MPA	194	1 October 1995	Male' Atoll
8	Maayaa Thila	Reef	81	1 October 1995	North Ari Atoll
9	Mushimasmigili Thila (Fish Head)	Reef	87	1 October 1995	North Ari Atoll
10	Orimas Thila (Magau Thila)	Reef	225	1 October 1995	North Ari Atoll
11	Kudarah Thila (Pink Shark Thila)	Reef	200	1 October 1995	South Ari Atoll
12	Miyaru Kandu	Reef	110	1 October 1995	Felidhe Atoll
13	Rasfari Lagoon	Island, Reef	2,484	1 October 1995	Male' Atoll
14	Gaathu giri/Adhdhashu giri (Banana Reef)	Reef	50	1 October 1995	Male' Atoll
15	Giraavaru Kuda Haa	Reef	200	1 October 1995	Male' Atoll
16	Dhigali Haa and Dhigali Giri	Reef, Giri	83	21 October 1999	South Maa Atoll
17	Fushi Kandu	Reef	2,000	21 October 1999	Dhaalu Atoll
18	Filitheyo Kandu	Reef	167	21 October 1999	Faafu Atoll
19	Kuredhu Kanduolhi	Reef, Channel	126	21 October 1999	Lhaviyani Atoll
20	Lhazikuraadi (Hakura Thila)	Reef	200	21 October 1999	Meemu Atoll
21	Karibeyru Thila	Reef	75	21 October 1999	North Ari Atoll
22	Lankan/Nassimo Thila (Paradise Rock)	Reef	200	21 October 1999	Male' Atoll
23	Villingili Thila (Anemone City)	Reef	200	21 October 1999	Raa Atoll
24	Faruhuravalhi beyru (Madivaru Rangali)	Reef	900	21 October 1999	South Ari
25	Vattaru Kan'du	Reef	1,000	21 October 1999	Felidhe Atoll
26	Eidhigali Kilhi and Koattey Area	Mangrove, Island, Reef and Lagoon	858	7 December 2004	Addu Atoll
27	Hurasdhoo	Island, Reef and Lagoon	600	14 June 2006	South Ari
28	Olhugiri	Island, Reef and Lagoon	430	14 June 2006	South Maalhosmadulu
29	Hithaadhoo	Island, Reef and Lagoon	645	14 June 2006	North Huvadhoo
30	Huraa mangrove area	Wetland and Water body	4	14 June 2006	Male' Atoll
31	Angafaru area	Reef, Lagoon and Sand Bank	404	5 June 2009	South Maalhosmadulu
32	Hanifaru Area	Island, Reef, and Lagoon	303	5 June 2009	South Maalhosmadulu
33	South Ari Atoll MPA	Reef	4,000	5 June 2009	South Ari Atoll
34	Mendhoo Region	Island and Reef	998	5 June 2011	South Maalhosmadulu
35	Bathalaa Region	Island and Reef	891	5 June 2011	South Maalhosmadulu
36	Mathifaru Huraa Region	Island and Reef	55	5 June 2011	South Maalhosmadulu
37	The wreck of Corbin	Dive Site/ Historical Value	3.14	5 June 2011	South Maalhosmadulu
38	Goidhoo Koaru Area	Wetland and Water body	13	5 June 2011	South Maalhosmadulu
39	Maahuruvalhi Reef Region	Reef	1,654	5 June 2011	South Maalhosmadulu
40	Thundi Area - Fuvahmulah	Beach and Lagoon	14.8	21 June 2012	Fuvahmulah
41	Bandaara kilhi and wetland	Mangrove and Wetland	41.2	21 June 2012	Fuvahmulah
42	Dhandimagu kilhi	Mangrove and Wetland	69.4	21 June 2012	Fuvahmulah
43	Baa Atoll	Biosphere Reserve	121,521	21 June 2012	Baa Atoll

Furthermore, the Environmental Protection Agency (EPA) has developed a 'Sensitive Areas List' of 274 environmentally significant areas. These areas are given careful consideration to ensure that no or minimal developmental practices are allowed within them.

On 28 June 2011, United Nations Educational Scientific and Cultural Organization (UNESCO) declared the whole of South Maalhosmadulu (Baa Atoll) as a World Biosphere Reserve. The designation of Baa Atoll as a World Biosphere Reserve demonstrates the world-class nature of the marine area and the commitment of local people to manage it sustainably for the future. Biosphere Reserves have three functions: conservation, sustainable development and learning. They provide opportunity for knowledge sharing, research and monitoring, education and training, and participatory decision-making.

The Baa Atoll Conservation Programme (BACP) is the biodiversity conservation program for the Biosphere Reserve. It encompasses all the islands, waters and resources (biological and non-biological) of Baa Atoll with an outer perimeter that extends one nautical mile from the outer reef zone of the atoll. The BACP has been developed through a comprehensive stakeholder consultative process and is being implemented in line with the Ecosystem Approach of the CBD. This is '[a] strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way'. The long term goal of the BACP is to ensure the ecosystem and all resources of Baa Atoll remain healthy, productive and resilient into the future.

Through an intensive stakeholder consultative process it was agreed to adopt and utilize the UNESCO protocols for a World Biosphere Reserve to develop the zonation strategy for the BACP. The BACP is a multiple use marine and terrestrial area that provides for a wide range of anthropogenic uses (e.g. commercial, artisanal, subsistence, recreational and tourism) and is based on an overriding conservation objective to ensure long term ecological sustainability. Therefore, the atoll and its biological and non-biological resources are protected and managed through a zonation system that provides for different uses and activities to be undertaken in the different zones whilst minimizing detrimental threats and user conflicts. The BACP also provides mechanisms that actively support the development of sustainable livelihoods.

The development of the Baa Atoll zonation system included a combination of biological knowledge (scientific and anecdotal) and stakeholder (community, government and private sector) involvement. The zonation system like the BACP is a 'living' system and requires regular evaluations and modifications to ensure that long-term objectives are met.

The zonation system developed for Baa Atoll has adopted the UNESCO World Biosphere Reserve zonation criteria and protocols. This includes a three-tiered zonation approach, which includes:

Core Areas
highly protected and managed areas where only non-damaging, non-extractive use is allowed, i.e. 'Look, See, Don't touch';

Buffer Zones
managed areas where some types of activities are allowed, and;

Transitional Areas:
multiple use areas where sustainable activities are allowed.

A number of specific Atoll Wide Resource Bans have been incorporated into the BACP to prohibit unsustainable resource (biological and non-biological) extraction activities. These bans have been adopted to ensure all non-biological and biological resources of Baa Atoll are sustainably managed.

Ten Core Areas and associated Buffer Zones have been designated for Baa Atoll. Due to the importance of these sites they require specific management plans to be developed to ensure their long-term sustainable protection and management. One of these sites is Hanifaru reef, which has been protected because it is a unique seasonal feeding aggregation site for manta rays and whale sharks.

8.5 GUIDELINES FOR PROTECTED AREAS

Out of the 42 protected areas, only one area is managed with an effective management regulation; the EPA issued the Management Plan for Hanifaru Marine Protected Area in July 2011. Hanifaru reef and its resources were designated as a MPA in 2009 and is a Core Area of the Biosphere Reserve. Therefore, this reef and its living and non-living resources are allocated the highest level of protection in the Maldives. The site is a 'Look, See, Don't touch' zone. The designation was specifically made to ensure the protection of the bay, its resources, and the mega fauna that visit the site.

The legal responsibility for the Hanifaru Management Plan rests with the national government, specifically EPA. EPA has the right to appoint parties to manage the Hanifaru MPA. Following extensive stakeholder discussions EPA has mandated the Baa Atoll Council to manage the Hanifaru MPA through use of on the ground rangers. Any party who breaches the Hanifaru Management Plan shall be subjected to penalties as defined in Environmental Liability Regulation (regulation number R-9/2011).

8.6 PLEDGE TO MAKE ENTIRE MALDIVES A BIOSPHERE RESERVE

In June 2012, the government of Maldives pledged to make the entire Maldives a UNESCO Biosphere Reserve by end of 2017 to ensure sustainable conservation of biological resources. As a first step towards implementation of this commitment, MEE convened a national conference on 8 November 2012 to consult stakeholders from across the country on how to achieve this ambitious target. The conference reviewed the advantages as well as implications of Maldives becoming a Biosphere Reserve, and discussed experiences from the recent designation of Baa Atoll as a UNESCO Biosphere Reserve. A key outcome of the Conference was the decision to develop an Implementation Plan to drive the process forward. An Implementation Plan was formulated in 2013 to set out the vision and strategies to make the Maldives a biosphere reserve.

8.7 PROTECTION OF THREATENED SPECIES

Since the Maldives ratified the CBD, 103 bird species and 13 marine species have been declared protected under the EPPA 4/93. The government designated Kanzu Kahanbu, the Maldivian black turtle (*Melanochelys trijuga thermalis)* as a protected species in the Maldives on 22 May 2003. On 23 August 2013, the government designated 33 birds as protected species. On 9 June 2014 the government declared Batoidea, a superorder of cartilaginous fish commonly known as rays and skates, as protected in Maldivian waters. The capture, killing, injury to, and sale of all species belonging to Batoidea is therefore illegal in the Maldives.

Maldives imposed a 10-year moratorium on catching or harming of turtles in 1998. The moratorium was renewed in 2008 extending further 10 years with ban on egg harvesting. Maldives became a signatory to the Indian Ocean-Southeast Asian Marine

Turtle Memorandum of Understanding in April 2010. A second 10-year turtle moratorium is in force from 2008-2018 that includes banning of hunting, taking, or harming turtles, including harvesting of eggs. The Regulation on Fishing and Export of Large Yellow fin Tuna describes turtle mitigation measures in longline fishing operations, including release of live turtles, and having de-hookers and line cutters on vessels.

Shark fishing is banned in Maldivian waters including its EEZ. The ban has been effective from May 2010. However, with the introduction of longline fishing between 100 nm to 200 nm in the EEZ of Maldives, there is a possibility of shark by-catch. Provisions are in place under the Regulation on Fishing and Export of Large Yellow fin Tuna to minimise the by-catch of sharks in adherence to Indian Ocean Tuna Commission (IOTC) Resolution 05/05. The Regulation requires shark by-catch to be reported, released if alive, and landed intact to be destroyed if dead. Currently 14 longline vessels are in operation in Maldivian EEZ. Total number and weight of sharks by species retained and discarded will be known once the logbooks data are analysed.

Table 15:

Marine species which the killing of, catching, collection or extraction is prohibited in Maldives

Species / Product	Date	Relevant Legistlation
Black coral	1 January 1995	FA-A1/29/95/01
Napoleon Wrasse	24 June 1995	FA-A1/29/95/39
Turtles	24 June 1995	FA-A1/29/95/39
Whale Shark	24 June 1995	FA-A1/29/95/39
Conch (triton) shell	15 May 1993	FA-A1/29/93/14
Whales	15 May 1993	FA-A1/29/93/14
Giant Clams	15 May 1993	FA-A1/29/93/14
Dolphins	15 May 1993	FA-A1/29/93/14
Lobster	15 May 1993	FA-A1/29/93/14
White Tern	5 June 1996	1-96/34
Rays and skates	9 June 2014	(IUL)438-ECAS/438/2014/81

Table 16:

List of export prohibited species and products

#	Species / Product
1	Bait fish (for pole and line fishing)
2	Big eye scad (less than six inches)
3	Black coral
4	Napoleon wrasse
5	Turtles
6	Whale shark
7	Branching coral
8	Conch (triton) shell
9	All types of coral
10	Whales
11	Giant clams
12	Dolphins
13	Eels
14	Lobsters and lobster meat
15	Skates and rays
16	Pearl oyster
17	Parrot fish
18	Puffer fish

8.8. LEGISLATION AND POLICY

In order to comply with the EU Illegal, Unreported and Unregulated Fishing Regulation, a new 'Regulation for Fishing Licensing, Fish Processing for Exports and Aquaculture' was introduced in January 2010. Vessels fishing for tuna must have a fishing license if the catch is to be sold to a collector for export. Similarly a "Regulation on Fishing and Export of Large Yellow fin Tuna" was introduced that targets handline and longline fishing operations for yellow fin/big eye tuna. A draft regulation on aquaculture was also formulated in 2009 (Van Houtte, 2009).

8.9. SUSTAINABLE USE

The economy and the livelihoods of the people of Maldives are largely dependent on the biological resources of the country. Industries that directly benefit from biological resources include fisheries, agriculture and tourism. Maldives has continued its traditional environment friendly pole and line tuna fishery and has recently received the Marine Stewardship Council (MSC) certification for skipjack tuna. To ensure sustainable grouper fishery, the government has enforced a ban on fisheries in five grouper breeding areas. Additionally a licensing system for fishing vessels was introduced in 2012. Further, a thousand meter no-fishing radius is enforced around each resort that ensures reef resources around resorts are protected from intensive fishing. While coral and sand mining are controlled around the country, it still continues to be one of the core materials used for construction. Introduction of modern methods of agriculture such as hydroponics has not only increased productivity, but has also contributed to deriving maximum benefit from the limited land, while reducing impacts from chemicals and on natural vegetation.

9.1 PLANNING PROCEDURES

The planning procedures and processes take into account biodiversity conservation in the Maldives. The TMP IV, the SAP 2009-2013, the NSDS, the NEAP III and the atoll development plans and island development plans incorporate biodiversity conservation.

Biodiversity concerns are also integrated in land use plans. Guidelines developed by the Ministry of Housing and Infrastructure have stipulations for buffer zones. Furthermore, the MEE is represented in the Land Use Plan Approval Committee.

9.2 REVIEW AND STRENGTHEN IMPACT ASSESSMENTS

The Government of the Maldives has formulated a new regulation for Environmental Impact Assessment (EIA) in 2012. Biodiversity forms a significant component of the scope of EIA studies and due attention is given to assess the impact on ecosystems, particularly sensitive ecosystems. The EIA process also provides a good baseline of biodiversity resources in the Maldives.

The First Amendment to the EIA Regulations 2012 was published on 9 April 2013, detailing the mechanism for penalizing proponents who do not adhere to the 2012 Regulations.

With funding from the Bay of Bengal Large Marine Ecosystem Project, a study was undertaken in 2013 on the socio-economic impact of the ban on former shark fishermen. The survey was conducted in seven islands previously known for shark fishing. During April and May 2013, more than 100 shark fishermen were interviewed. In addition to this survey, a perspective survey on reef shark abundance is underway. During February and March of 2013 questionnaires were sent to all the dive centres of tourist resorts, and 37 resorts responded.

9.3 NATIONAL RESOURCE MANAGEMENT PLANS

Tuna Fishery Management

The Maldives' pole and line skipjack fishery achieved MSC status in November 2012. It was the first large pole and line fishery and the first Indian Ocean fishery to achieve MSC certification. Skipjack from members of the client group Maldives Seafood Processors and Exporters Association is now eligible to be marketed with the MSC's eco-label.

Live bait is critical for the skipjack pole-and-line fishery and considered as retained species. The species exploited by tuna fleet are characterized by short generation times and high intrinsic rates of population growth. These are species that are not easily overexploited. Maldives has recently intensified monitoring of this fishery and is developing a live bait fishery management plan.

As mentioned in section 8.8 above, two important regulations were adopted in January 2010: the 'Regulation for Fishing Licensing, Fish Processing for Exports and Aquaculture' mandating licensing of vessels selling catch to collectors for export, and the 'Regulation on Fishing and Export of Large Yellow fin Tuna' targeting handline and longline fishing operations for yellow fin/big eye tuna.

The Maldives has introduced fishing licenses; and by 2013 there were about 750 registered vessels (excluding long line vessels) that have a valid fishing license. Since virtually all vessels would be selling their catch to exporters it is unlikely there will be many active tuna vessels without a fishing license. The MoFA is currently revising the licensing scheme that would deal more clearly with the emerging multi-gear (hand line and pole and line) fishing operations.

Logbook data collection was introduced in 2006. Data collection through logbooks was introduced for the second time in January 2010. The introduction was preceded by a revision of the fishery regulation which required licensing of fishing vessels among others and making data reporting mandatory. Experience from the past two and a half years shows that this has not been easy for fishermen to implement. Part of the problem was asking for too much information from fishermen, as well as the size of the logbook. Based on the experience from the first two years, the logbooks were re-revised and re-introduced in 2013 in adherence of IOTC Resolution 13/03.

For the first time, in 2012, logbook data was used as the primary source of data to compile national statistics, supplemented by the data from the island councils and fish collectors. The logbook data would also allow Maldives to report data by the required one-degree by one-degree resolution and separated by the catch around Fish Aggregating Devices and free schools. The plan is to withdraw the island reporting system.

A web-enabled fishery information system is now online, and is being further developed to improve the current database. The system will allow integrating vessel registry, fishing licenses, fish collection and logbook data to provide a comprehensive system of compilation and reporting.

Logbook data verification may only be done through an observer system. The preparatory work to start an observer system has been completed. Funding is required for training and deployment of observers.

Vessel monitoring was established in early 2012, but was not fully functional until August 2013. From November 2011 Maldives started trials of the systems by installing Vessel-Locating Devices (VLDs) on two long line vessels. For various reasons the trail period went on for a year, until eventually the contract with the service provider was terminated. A new service contract was successfully negotiated and signed in August 2013, which allowed resumption of the installation of the VLDs on the vessels. At the time of writing there are nine long line vessels with the VLDs, which are monitored round the clock.

Under the current regulations, the following arrangements have been made.

1. All long line fishing vessels should have the Vessel Monitoring Systems (VMS) on board.

2. Vessels licensed for hand line yellow fin tuna fishing should install VLD.

3. Pole and line fishing vessels holding a valid license should install VLD in the fishing vessel.

Grouper management plan

As mentioned in section 8.3 above, in 2010 MRC in collaboration with Darwin Reef Fish Project initiated an assessment of the current status of grouper fishery and the stock for the formulation of a grouper fishery management plan.

The Maldivian Grouper Fishery Management Plan 2011 was formulated and finalized through a participatory approach. The plan is based on the findings of the 2010 review and earlier surveys of the fishery as well as abundance and spawning aggregation identification interviews. The plan introduced size limits, recommended closure of spawning aggregation sites, regulated fishery, mandated logbooks and data collection, long term monitoring of catch, abundance and spawning aggregation sites, and national level awareness programmes.

Recently, on December 25, 2012, Maldives launched its Grouper Fishery Management Plan. The biological nature of groupers such as their longevity, late maturity, characteristic change of sex from females in their early life stages to become mature males, and formation of spawning aggregations make them extremely vulnerable to overfishing. Their management was a response to a need to manage the Maldivian grouper fishery to ensure sustainability of the resource for future generations.

Reef fishing logbooks have been recently introduced and is being enforced slowly. This arrangement is expected to improve the landings of billfishes in the Maldives.

Plan for conservation and management of sharks

Reef shark fishery and oceanic shark fishery have always been in conflict with the two main industries, the tourism and the pole and line tuna industries respectively. As a result, many management decisions taken on shark fisheries were to minimize these conflicts. One such measure was the 1998 moratorium on shark fishing imposed in seven tourism zones. By the end of the moratorium in 2008, the reef shark numbers were still in decline. With huge lobbying from the tourism industry, on 1 of March 2009, the government declared a ban on reef shark fishing within 12 nautical miles from outer rims of all atolls of Maldives. As it was seen that shark fishing could have adverse effects on the two main industries of tourism and tuna fisheries, a year later, on 15 of March 2010, a total ban on shark fishing was imposed in all Maldivian waters.

MoFA is presently working on the development of the first National Plan of Action on Conservation and Management of Sharks. The first draft of the Action Plan was completed in 2015.

Under the Bay of Bengal Large Marine Ecosystems project, training on taxonomy of sharks was conducted on 21 January 2013. The fishermen were briefed on the Code of Conduct for Responsible Fisheries, and on the importance of logging of catch including by-catch. This was followed by a detailed presentation on the taxonomy of the most common sharks found in Maldives, giving particular importance to oceanic sharks. The new long line log-book was also presented to the fishermen.

Long line fishing

Following the cessation of EEZ long line foreign licensing in May 2010, the MoFA is working to introduce a Maldivian long line fleet. A total of 14 Maldivian-owned vessels have been registered and licensed since the fishery officially began in November 2011. However, vessels did not start operating until May 2012. Most of these vessels are steel-hulled with capacities ranging from 15 to 700 GRT. Similar to the foreign long-line licensing programme, vessels are allowed to operate in the outer EEZ of 100 nautical miles and beyond. Vessels are mandated to carry VMS with strict logbook reporting conditions. Maldives maintains an active vessel registry updated and informed to IOTC on a regular basis.

9.4 FINANCIAL RESOURCES

From 2005 to 2012, the Government of Maldives undertook the United Nations Development Programme/Global Environment Facility (GEF) Atoll Ecosystem Conservation (AEC) project. This aimed to pilot a system for integrated conservation and sustainable development in Baa Atoll, which could then serve as a model for other atolls. A three-pronged strategy was followed which led to: integrating biodiversity conservation into institutions and policies at both national and atoll level; conserving biodiversity 'in the water and on the ground' by establishing protected and managed areas and managing them through innovative national-local and public-private partnerships in Baa Atoll; and by supporting alternative sustainable livelihood development strategies to relieve pressure on biodiversity.

The AEC project created the Baa Atoll Conservation Fund through an innovative Public Private Partnership with the tourism sector that provides financial resources for management of the Biosphere Reserve, as well as grants for conservation, livelihoods and outreach activities.

Since the total shark fishery ban would have a huge impact on shark fishermen, to reduce their loss, the government initiated a MVR five million gear buy-back scheme a few months after the ban. About 200 fishermen took part in the scheme. Compensation for gear has been awarded to 70% of the fishermen who applied, and for another 20%, compensation has been deposited to their respective island councils. At present, few islands have not received compensation. In addition to the gear buy-back scheme, and to facilitate alternative income generation for former shark fishermen, on 2 June 2010 MoFA opened a Shark Trust Fund. The tourist resorts, the main beneficiaries of the shark ban were invited to contribute to the trust fund.

PART III

PROGRESS TOWARDS 2020 AICHI BIODIVERSITY TARGETS AND 2015 MILLENNIUM DEVELOPMENT GOALS

10.PROGRESS TOWARDS AICHI BIODIVERSITY TARGETS

The following table shows progress towards each of the 2020 targets of the Strategic Plan for Biodiversity 2011-2020, and its Aichi Biodiversity Targets as well as towards the overall mission of the Plan. Progress towards the proposed national targets is also included.

Aichi Target	Actions undertaken	Indicators of progress	Assessment of progress from a score of 10
Target 1- people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	Regional level workshops held for decision makers, women's development committees and Non Government Organizations. School awareness programs held. Radio programs broadcasted. Television Program (Fehivina) broadcasted.	Level of awareness among school children. Level of awareness and understanding of biodiversity concepts for island and atoll councillors	2/10
Target 2 - biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	Integrated in various plans (Millennium Development Goals, Strategic Action Plan, Tourism Master Plan).	Number of island/ atoll/ sectoral development plans with Biodiversity integrated.	4/10
Target 3 – incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.	Incentives and subsidies to fishermen and farmers given. Buy back of fisheries gear for shark fishery implemented.	Budgetary allocation on subsidies (positive and negative separately).	2/10
Target 4 – governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	Research on mariculture undertaken. Regulatory framework for mariculture developed.	Agricultural production. Mariculture value. Fish export (by species).	4/10
Target 5 – the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	Environment Impact Assessment regulation implemented. Land use plan regulation and guidelines implemented. Land reclamation regulation implemented. Waste management regulation implemented.	Area of reef reclaimed. Area under vegetation cover. Number of unused islands.	4/10
Target 6 – all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing isavoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	Pole and line fishery practiced in Maldives. Bait fisheries Management Plan implemented. Marine Stewardship Council Certification achieved. Fishing licenses introduced. Logbook data collection implemented. Vessel monitoring undertaken. Grouper Management Plan implemented. Shark Conservation Plan implemented. Long line fishing introduced. Mariculture introduced.	Number of fisheries certified as sustainable.	8/10
Target 7 – areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	Research on aquaculture undertaken. Guidelines for aquaculture developed.	Quantity of fertilizers imported. Quantity of pesticides and insecticides imported. Number of licenses for aquaculture issued.	2/10
Target 8 – pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	Waste regulation introduced. Regional waste management facility developed. Through lessons from Ukulhas, composting introduced. Water and sewerage standards developed. Government investment in sewerage for different islands. Water bill drafted.	Number of islands with sewerage systems. Number of islands with waste management plans. Number of islands with waste management infrastructure.	4/10
Target 9 – invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	Regulation on alien species drafted. Alien species free island project initiated.	Quantity of trees and plants imported.	2/10

Target 10 – the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.		Number of reef reclamation projects and area reclaimed.	1/10
Target 11 – 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the widerlandscapes and seascapes.	42 protected areas designated. Hanifaru Management Plan implemented. Wetland Management Plan implemented.	Percentage of protected areas by ecosystem. Number of management plans. Number of rangers employed.	1/10
Target 12 – the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	83 species declared protected. Convention on International Trade of Endangered Species (CITES) ratified.	Number of species protected. Number of threatened species on International Union for Conservation of Nature Red List. Import data of CITES appendix 1 species.	7/10
Target 13 – the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.			0/10
Target 14 – ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.	Mangrove restoration projects under Global Environment Facility (GEF) small grant and Mangroves For the Future small grant implemented.	Water quality. Health of coral reefs.	2/10
Target 15 – ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	Coral propagation projects in resorts implemented. Tree planting programs undertaken. Mangrove restoration projects implemented.	Number of coral reef restoration projects. Number of trees planted.	2/10
Target 16 - the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation	Maldives is yet to ratify the Nagoya Protocol.		0/10
Target 17 - each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.		Percentage of activities in National Biodiversity Strategy and Action Plan implemented.	5/10
Target 18 - the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effectiveparticipation of indigenous and local communities, at all relevant levels.	Under GEF Small Grants Programme, projects focusing on conservation of traditional knowledge implemented. Inventory of medicinal plants published.	Number of registered traditional medicine practitioners. Number of available traditional medicine in the market.	1/10
Target 19 - knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.	Geographic Information System introduced. Social media used. National Coral Reef Monitoring Framework introduced.	Number of research papers and articles on biodiversity published. Number of staff employed in the biodiversity sector (including Environmental Protection Agency, Marine Research Centre, Ministry of Fisheries and Agriculture). Number of mechanisms in place for sharing information and knowledge (e.g. Clearing House Mechanism).	2/10
Target 20 - the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.	Geographic Information System introduced. Social media used. National Coral Reef Monitoring Framework introduced.	Number of financial instruments established (e.g.: conservation fund, Maldives Green Fund). Budgetary allocation for biodiversity (Government of Maldives, Small Grants Facility, grants and loans).	3/10

11. CONTRIBUTION TOWARDS MDG GOALS

Maldives is committed to the MDGs set in 2000 to reduce global poverty. The Maldives has produced three reports to assess the progress of the country towards MDGs, the first in 2005, the second in 2007, and the third in 2010. The third report showed that the Maldives made significant progress towards the goals and had achieved five out of the eight MDGs ahead of the 2015 deadline. The report also recognised that the Maldives is South Asia's only 'MDG+' country. However, the report also noted that progress has been relatively slower towards achieving gender equality and women's empowerment (MDG 3), ensuring environmental sustainability (MDG 7) and developing a global partnership for development (MDG 8).

The Maldives has contributed to MDG 7: Ensure Environmental Sustainability in a number of ways and this report looks at targets 7A and 7B under MDG 7:

> **Target 7A:** Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources.
>
> **Target 7B:** Reduce biodiversity loss, achieving by 2010, a significant reduction in the rate of loss.

The Government of the Maldives has ensured that national policies and programmes follow principles of sustainable development. The national development plans, sector master plans, atoll development plans, and island development plans follow the principles of sustainable development. Environmental sustainability is a key theme in these plans and policies.

The environmental impact of all development activities is considered through the EIA process under Article 5 of the EPPA 4/93. All development activities are screened or assessed to ensure that they do not cause or are not likely to cause a significant impact on the environment. In the EIA studies, special emphasis is given to ensure there are no significant negative impacts on the habitats and species that are critical or important to the resilience and richness of ecosystems in the Maldives.

The Government of Maldives has embarked on a programme to make the Maldives a low emission country and is executing integrated energy programmes under a new energy policy.

12.LESSONS FROM IMPLEMENTATION OF THE CONVENTION

The following are the key lessons learned from the Atoll Ecosystem Conservation approach to biodiversity conservation in the Maldives:

- The 'atoll-level' provides a practical, ecosystem-based level at which to manage the environment and implement sustainable development in the Maldives.

- A clear and aspirational vision can bring diverse stakeholders together to work for a common objective. Achieving UNESCO accreditation has brought pride, international recognition and new opportunities to Baa Atoll. Having the support of the community in advance was crucial.

- Conservation and sustainable development happens on the ground and in the waters; the AEC project demonstrated that decentralized environmental management could reduce user conflicts and bring benefits to atoll stakeholders.

- Building capacity for decentralized environmental management is the highest priority, since this is a new experience for Maldives, and few people have the required qualifications or experience.

- Effective governance and institutional arrangements is needed both at local (implementing) and national (enabling) levels.

- An effective funding mechanism is crucial; local tourism businesses are willing to invest in environmental management to resolve environmental conflicts and support community development.

- Good communications and cooperation between key stakeholders such as the atoll council, the EPA and the resorts is essential. Individual 'champions' play a vital role in motivating and leading such cooperation.

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Appendix I

Information concerning the reporting Party and preparation of the fifth national report

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Date of submission	

Appendix 2
Further Sources of Information

Names and Organizations contributed during 5th National Report Stakeholder Consultation

NO	NAME	ORGANIZATION
1	Adnan Yusuf	Alternative Medicine Committee
2	Mohamed Shumais	Live & Learn Organization
3	Fathimath Shadhiya	Maldives National University
4	Aminath Shazly	Maldives National University/ Faculty of Education
5	Zeeniya Rasheed	Department of National Planning
6	Mariyam Fariha	Department of National Planning
7	Dr. Patrik Svensson	IUCN
8	Dr. Ameer Abdulla	IUCN
9	Rifaaee Rasheed	IUCN
10	Mohamed Ibrahim	Maldives National Defence Force
11	Uza Faena Fayyaaz	Attorney Generals Office
12	Hussain Sinan	Ministry of Fisheries & Agriculture
13	Adam Ziyad	Ministry of Fisheries & Agriculture
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15	Muruthala Moosa	Ministry of Foreign Affairs
16	Mariyam Abdul Rahman	Ministry of Human Resources, Youth & Sports
17	Mohamed Nahid	Ministry of Tourism
18	Aminath Abdul Raheem	Ministry of Environment and Energy/ ClimateChange
19	Imad Mohamed	Local Government Authority
20	Aishath Farhath Ali	Environmental Protection Agency
21	Ibrahim Haleem	Presidents Office
22	Ali Shareef	Ministry of Environment and Energy/ ClimateChange
23	Mohamed Asif	Ministry of Environment and Energy/ ClimateChange
24	Abdulla Shibau	Ministry of Environment and Energy/ MEMP
25	Dr. Hussein Zahir	Ministry of Environment and Energy/ MEMP
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30	Zammath Khaleel	Ministry of Environment and Energy
31	Fathimath Shafeega	Department of National Planning
32	Aminath Ismail	Ministry of Fisheries and Agriculture
33	Aishath Siyana	Environmental Protection Agency
34	Ahmed Zakariyya	Ministry of Gender, Family & Humanrights
35	Mohamed Mauroof	NGO Federation
36	Ashiya	
37	Samiya Mohamed	Mulak Atoll Council

38	Abdullah Jameel	Mulak Ekuveri Zuvaanunge Jamiyya
39	Jameela Ahmed	Veyvah Women Development Committee
40	Aishath Reema	Dhiggaru Women Development Committee
41	Aishath Nazly	Dhiggaru Council
42	Hassan Abdul Rahman	Naalaafushi Council
43	Ibrahim Muaz	Naalaafushi Zuvaanunge Jamiyya
44	Nishaana	Kolhufushi Women Development Committee
45	Zeeniya Saud	Kolhufushi Zuvaanunge Jamiyya
46	Mohamed Fuad	Meemu Atoll Council
47	Hussain Hameed	Dhaalu Atoll Council
48	Mohamed Savaad Jaufar	Kudahuvadhoo Council
49	Haathim Ibrahim	Rinbidhoo Council
50	Nadhiya Abdul Rahman	Hulhudeli Women Development Committee
51	Aishath Waheedha	Maaemboodhoo Women Development Committee
52	Fathimath Zaahira	Meedhoo Women Development Committee
53	Naasira Ali	Kinbidhoo Women Development Committee
54	Mohamed Nizam	Thaa Atoll Council
55	Ahmed Faheem	Guraidoo Madharusa
56	Ibrahim Anees	Laamu Atoll Council
57	Abdul Hannaan	Gan Council
58	Hussain Nizaam	Maavashu Council
59	Hussain Habeeb	Fonadhoo Zuvaanunge Gulhun
60	Ahmed Naseer	Haa Alifu Atoll Council
61	Ahmed Nooree	Hoarafushi Council
62	Mohamed Hameed	Maarandhoo Council
63	Ahmed Yoosuf	Baarah Council
64	Ibrahim Rasheed	Dhidhoo Ekuveringe Gulhun
65	Mohamed Waheed	Kelaa Youth Forum
66	Aminath Vishaama	Utheemu Women Development Committee
67	Aminath Nahla	Dhidhoo Women Development Committee
68	Shaahnaaz Moosa	Hoarafushi Women Development Committee
69	Ali Aboobakuru	Haa Dhaalu Atoll Council
70	Ali Shareef Adam	Kulhudhuffushi Council
71	Ali Abdul Waahid	Kumundhoo Council
72	Abdul Hameed Hussain	Nellaidhoo Ekuveringe Gulhun
73	Ummukulsoom Ibrahim	Kulhudhuffushi Women Development Committee
74	Suvaidha Adam	Makunudhoo Women Development Committee
75	Raziyya Ibrahim	Vaikaradhoo Women Development Committee
76	Mohamed Zahir	Maroshi Council
77	Ali Nizaar	Foakaidhoo Council
78	Ali Arif	Noomaraa Council
79	Hussain Hameed	Goidhoo Council
80	Aminath Shifza	Landhoo Women Development Committee
81	Aishath Nizma	Kendikulhudhoo Magistrate Court
82	Mohamed Irfan	Lolhi Zuvaanunge Club
83	Ahmed Hamdhaan Nasir	Holhudhoo Council
84	Ibrahim Zaki	Velidhoo Council
85	Ibrahim Naseer	Manadhoo Council
86	Saeed Ibrahim	Noonu Atoll Council

87	Zaheen Abdulla	Maafaru S.M.D
88	Maryam Hussain	Maalhendhoo Women Development Committee
89	Ali Waheed Ahmed	Gaafu Dhaal Atoll Council
90	Mohamed Rizan	Gaafu Dhaal Atoll Council
91	Mohamed Sujau	Gahdhoo Council
92	Hassan Mohamed	Madaveli Council
93	Faisal Najeeb	Nadella Council
94	Hussain Qasim	Madaveli Council
95	Hussain Rasheed	Fares Association of Reborn Society
96	Ishag Rasheed	Gahdhoo Youth Society
97	Asiyath Najeeba	Madaveli Women Development Committee
98	Yumna Ahmed	Gahdhoo Women Development Committee
99	Zuha Mohamed	Nadella Island Development Society
100	Niloofa Ali	Maamendhoo Council
101	Mohamed Sharam	Maamendhoo Council
102	Ahmed Izzath Abdulla	Kolamaafushi Council
103	Azwan Moosa	Dhaandhoo Council
104	Ahmed Hassan Didi	Gaafu Alifu Atoll Council
105	Azeema Hassan	Villingili Council
106	Niyaz Nizar	CapitalCity/Villingili
107	Ahmed Hilmy	Villingili Council
108	Aminath Aroosha	Ministry of Fisheries & Agriculture
109	Fahmeeda Islam	Ministry of Fisheries & Agriculture
110	Mohamed Nahid	Ministry of Tourism
111	Fathimath Shahudha	National Social Protection Agency
112	Aminath Mohamed	Alternative Medicine Committee
113	Aminath Shahula	Ministry of Foreign Affairs
114	Mohamed Imad	Department of National Planning
115	Aishath Saadh	Department of National Planning
116	Faena Fayyaaz	Attorney Generals Office
117	Ahmed Faheem	Maldives Customs Service
118	Adnan Mohamed	Ministry of Defence and National Security
119	Hussain Riffath	Ministry of Defence and National Security
120	Ismail Nazim	Maldives Police Service
121	Mohamed Rassam	Ministry of Economic Development
122	Ibrahim Hameed	Ministry of Home Affairs
123	Mariyam Umana	Live & Learn Organization
124	Ibrahim Munaz	MATATO
125	Hussain Iyad	Maldives Broadcasting Cooperation
126	Mohamed Visham	Haa Alifu Atoll Council
127	Mohamed Ali	Noonu Atoll Council
128	Mabrook Naseer	Baa Atoll Council
129	Abdulla Humaidh Abdul Razzaag	Lhaviyani Atoll Council
130	Ibrahim Shareef	Male' Atoll Council
131	Moosa Naeem	Alifu Alifu Atoll Council
132	Ahmed Riza	Alifu Dhaalu Atoll Council
133	Abdulla Umar	Faafu Atoll Council
134	Mohamed Haleem	AdduCity Council
135	Aminath Shazly	Maldives National University

136	Maeed Mohamed Zahir	Ecocare Maldives
137	Mohamed Affaan	Ecocare Maldives
138	Gabriel Grimsditch	IUCN
139	Hudha Ahmed	Renewable Energy Maldives
140	Moosa Zameer Hassan	Ministry of Tourism
141	Riffath Naeem	Environmental Protection Agency
142	Mariyam Rifga	Environmental Protection Agency

Appendix 3
List of goals, objectives and targets for biodiversity conservation in NEAP III

GOALS	OBJECTIVES	TARGETS
Goal 8: Improve scientific knowledge and access to information for biodiversity conservation.	Objective 8.1: Improve the knowledge base for biodiversity conservation by identifying and monitoring status of biodiversity; identifying the economic value of biodiversity; understanding threats to biodiversity; and monitoring effectiveness of management.	By 2010, identify priorities for biodiversity research. By mid 2010, identify and map at province/atoll level the important populations of flora and fauna, significant sites for migratory species, critical habitats for threatened species, ecological communities and centres of endemism. By mid 2010, generate a policy research paper on economic value of biodiversity conservation.
	Objective 8.2: Verify, and make accessible existing knowledge and information on biodiversity.	By mid 2010, make accessible to community, students, teachers, scientists, planners and decision-makers a networked and distributed system of databases containing information about the important components of biodiversity. By 2011, make universally accessible, an Internet based, integrated Maldivian biodiversity information system.
	Objective 8 .3: Increase the public awareness and understanding of the concept of biodiversity and the actions that can be taken to conserve species, ecological communities and ecosystems.	By 2013, increase by 100 percent the awareness and understanding of the significance of biodiversity conservation and actions that can be taken to conserve species and threatened ecosystems. By 2011, produce multi-media awareness and education material on species conservation, protected areas, and the economic value of biodiversity.

GOALS	OBJECTIVES	TARGETS
Goal 9: Bring institutional and legislative reforms to enable biodiversity conservation.	Objective 9.1: Recognize biodiversity conservation as a core business of island and atoll offices.	By 2010, identify National Government, Province/ Atoll Office, Island Office and Community responsibilities for biodiversity conservation. By 2012, integrate biodiversity conservation as a core component in all provincial development strategies, atoll development plans and island land use plans.
	Objective 9.2: Remove legal impediments to biodiversity conservation.	By 2010, all Ministries review the legislative and regulatory frameworks under their jurisdiction to identify impediments to biodiversity conservation and incentives that encourage biodiversity loss. By 2012, Ministries remove the legislative and regulatory impediments to biodiversity conservation, including incentives that encourage biodiversity loss.
	Objective 9.3: Introduce formal agreements and market based instruments for biodiversity conservation.	By 2010, review legislative and regulatory frameworks to identify impediments to the introduction of formal agreements for biodiversity conservation. By 2011, concerned Ministries review their legislative and regulatory frameworks to identify the effectiveness of economic instruments and incentive based policies such as tradeable permit schemes, taxes, charges and subsidies that promote biodiversity conservation.
	Objective 9.4: Achieve substantial progress in the implementation of the international commitments of the Maldives to conserve globally significant biodiversity.	By 2010, mobilize finance for projects under the Bio-safety framework. By end of 2009, accede to RAMSAR convention on wetlands. By 2011, accede to Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). By 2011, accede to Convention on Migratory Species.

GOALS	OBJECTIVES	TARGETS
Goal 10: Protect and restore coral reefs.	Objective 10.1: Establish and manage MPAs.	By 2011 establish a fully functional Marine Protected Areas System in the Maldives. By 2011 ensure that 05 percent of the coral reefs of the Maldives are given protected status. By mid 2010 introduce a national comprehensive system for the prevention and management of introduced marine pests. By 2011, prepare recovery plans for all marine listed threatened species.
	Objective 10.2: Develop policy and legal framework to protect and manage coral reefs.	By 2010 complete a review of the existing institutional framework to identify gaps and barriers in coral reef management and recommend roles and responsibilities for custodians, users and managers. By mid 2010 develop the coral reef regulatory framework that enables the relevant institutions to designate zones, uses and marine protected areas systems. By mid 2010, develop regulations and conflict resolution mechanisms for resource use among competing industries such as fishing and tourism to ensure balance between resource protection and resource usage. By 2010 develop standards and guidelines for high impact coastal development activities, especially land reclamation and island access infrastructure development.
	Objective 10.3: Enable the enforcement of existing coral reef management regulations.	By mid 2010, inform and educate public infrastructure contracting agencies and contractors on coral reef protection regulations relating to design and construction of coastal developments. By 2010, launch the mechanisms for public consultation and inquiry in the EIA process. By mid 2010, conduct capacity building programme covering all island and atoll offices to enforce regulations including training on coral reef management and designation of staff responsible for enforcement and monitoring.

		By mid 2010, conduct an information dissemination campaign to inform public on all regulations related to coral reef management.
	Objective 10.4: Reduce human induced and natural stress on reef environment.	By 2010, commence environmental impact assessment for all licensed export of reef fisheries. By mid 2010, publicize an ecological performance assessment of all export reef fisheries. By mid 2010, develop guidelines on different reef resource uses. By mid 2010, develop monitoring plans for reef fishery stock. By 2011, develop and establish best practice guidelines on snorkeling, diving and water sports activities.
	Objective 10.5: Develop the capacity of national organizations and communities to manage coral reef environment.	By 2010, develop the terms of reference, organisational structure and staffing needs for a National Coral Reef Management Authority (NCRMA) with nodal agencies in the atolls. By 2010, complete a training needs assessment to determine the training requirements for the NCRMA and nodal agencies and a strategy for human resource development. By mid 2010, develop a comprehensive training package on coral reef science and management to be integrated into the existing Coastal Zone Management Training Course.

GOALS	OBJECTIVES	TARGETS
Goal 11: Protect and restore vegetation, terrestrial ecosystems and islands.	Objective 11.1: Reverse the decline in natural vegetation, ecological communities and the ecosystem services they provide.	By 2010, mechanisms are put in place, including land use planning regulations that prevent decline in the natural vegetation and communities as a result of land clearance. By mid 2010, all islands have programs in place to protect the areas of high quality natural vegetation in their island. By 2010, regulations are in place that control the clearing and removal of mature trees. By 2011, all atolls have in place vegetation restoration programmes for ecological communities and trees that are nationally listed as critically endangered. By 2010, all atolls have in place continuing tree planting campaigns.
	Objective 11. 2: Protect a representative sample of the islands of the Maldives and their terrestrial ecosystems.	By mid 2010, all atolls identify islands and terrestrial ecosystems within their jurisdiction that would be protected as atoll reserves. By 2011, 20 representative islands will be designated under Article 4 of the National Environment Protection and Preservation Act as protected areas. By 2011, management plans are developed and implemented for: national protected areas, atoll protected areas and private land covered by formal conservation agreements.
	Objective 11.3: Protect threatened species and ecological communities.	By mid 2010, all atolls have identified threatened species and ecological communities. By 2011, recovery plans are in place for all nationally listed critically endangered species and ecological communities. By mid 2010, all atolls have incorporated the recovery of threatened species and ecological communities into their atoll development plans and land-use plans.

GOALS	OBJECTIVES	TARGETS
Goal 12: Protect and restore wetlands and mangrove ecosystems	Objective 12.1: Manage threats, prevent degradation and maintain the ecological character of the nationally significant wetland dependent, water dependent and mangrove ecosystems.	By mid 2010, identify wetlands of atoll significance in all the atolls and determine wetlands of national significance. By 2011, prepare management plans for 75 percent of nationally significant wetlands. By mid 2011, introduce effective regulations and land use planning guidelines to protect wetlands of national significance.
	Objective 12.2: Protect significant habitats for migratory water-birds.	By 2011, identify important areas of habitat for migratory waterbirds in all province/atolls. By 2013, have programs in place to protect nationally significant habitats for migratory waterbirds.
Goal 13: Control invasive species..	Objective 13.1: Prevent or control the introduction and spread of invasive species.	By mid 2010, develop a risk assessment process for the import of all new live organisms that identifies the conditions necessary to minimize threats to the environment. By 2010, ensure no new non-native terrestrial species are deliberately introduced into Maldives unless assessed as being of low risk to the environment. By 2011, put in place programs to manage invasive species that are major threats to biological diversity. By mid 2010, approve and publicize quarantine laws and guidelines on import control of alien species, pests and diseases.

Appendix IV

List of islands with wetlands and area of wetland

No.	Island	Atoll	Size (ha)
1	Uligamu	Haa Alifu	0.5
2	Gaamathikulhudhoo	Haa Alifu	0.8
3	Medhafushi	Haa Alifu	1.4
4	Molhadhoo	Haa Alifu	0.7
5	Filladhoo	Haa Alifu	7.2
6	Thakandhoo	Haa Alifu	2.4
7	Baarah	Haa Alifu	37.2
8	Mulidhoo	Haa Alifu	6.4
9	Maafahi	Haa Alifu	1.3
10	Finey	Haa Dhaalu	0.5
11	Nolhivaramu	Haa Dhaalu	5.2
12	Kulhudhuffushi	Haa Dhaalu	35.8
13	Keylakunu	Haa Dhaalu	0.8
14	Kumundhoo	Haa Dhaalu	15.2
15	Neykurendhoo	Haa Dhaalu	2.7
16	Goidhoo	Shaviyani	7.7
17	Nalandhoo	Shaviyani	42.1
18	Madidhoo	Shaviyani	0.5
19	Madikurendhoo	Shaviyani	1.0
20	Milandhoo	Shaviyani	5.9
21	Maakandoodhoo	Shaviyani	28.7
22	Naainfaru	Shaviyani	0.1
23	Medhukuburudhoo	Shaviyani	1.6
24	Farukolhu	Shaviyani	7.1
25	Funadhoo	Shaviyani	1.2
26	Eriadhoo	Shaviyani	1.8
27	Eskasdhoo	Shaviyani	35.8
28	Mathikomandoo	Shaviyani	0.7
29	Kudalhaimendhoo	Shaviyani	0.3
30	Bodulhaimendhoo	Noonu	23.8
31	Burehifasdhoo	Noonu	5.8
32	Kendhikulhudhoo	Noonu	53.2
33	Maalhendhoo	Noonu	10.2
34	Landhoo	Noonu	10.2
35	Maafaru	Noonu	3.8
36	Kudafushi	Noonu	3.6
37	Karinmavattaru	Noonu	0.8
38	Madhirivaadhoo	Baa	1.3
39	Goidhoo	Baa	7.4
40	Faadhoo	Lhaviyani	1.3
41	Maidhoo	Lhaviyani	0.2

No.	Island	Atoll	Size (ha)
42	Kanifushi	Lhaviyani	0.4
43	Maakoa	Lhaviyani	5.4
44	Hudhufushi	Lhaviyani	1,5
45	Huraa	Kaafu	4.0
46	Gaakurali	Meemu	0.1
47	Kolhufushi	Meemu	5.9
48	Kadinma	Dhaalu	1.2
49	Maaen'boodhoo	Laamu	8.1
50	Gan	Laamu	27.7
51	Hithadhoo	Laamu	13.5
52	Mendhoo	Laamu	6.7
53	Kunahandhoo	Laamu	1.6
54	Mudhimaahuttaa	Gaafu Alifu	0.4
55	Villigili	Gaafu Alifu	3.1
56	Kon'dey	Gaafu Alifu	1.2
57	Maafehelaa	Gaafu Atoll	0.1
58	Kanduhulhudhoo	Gaafu Alifu	0.5
59	Kafenaa	Gaafu Dhaalu	3.7
60	Kaadedhdhoo	Gaafu Dhaalu	0.1
61	Madaveli	Gaafu Dhaalu	4.8
62	Hoadehdhoo	Gaafu Dhaalu	5.3
63	Nadella	Gaafu Dhaalu	0.1
64	Mudhimaahuttaa	Gaafu Dhaalu	0.2
65	Kalherehaa	Gaafu Dhaalu	6.3
66	Viligillaa	Gaafu Dhaalu	0.1
67	Fiyoaree	Gaafu Dhaalu	3.3
68	Dhigelaabadhuvaa	Gaafu Dhaalu	0.5
69	Fuvahmulah	Gnaviyani	141.4
70	Ismehela hera	Seenu	0.5
71	Herethere	Seenu	14.9
72	Hithadhoo	Seenu	61.4
73	Villingili	Seenu	4.9
74	Meedhoo	Seenu	1.4
75	Hulhudhoo	Seenu	23.5

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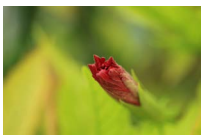


Mariyam Shidha Afzal

Ali Shimah

Mariyam Shidha Afzal

Mohamed Azmeel

Mohamed Ahusan

Mohamed Hashmath

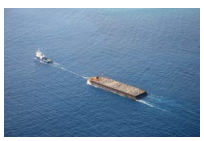
Thilafushi Corporation

Samaah Ibrahim

Mohamed Mihaaz

Samaah Ibrahim

Aminath Afiya



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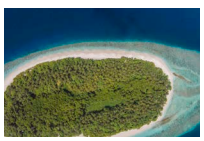

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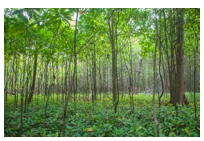

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