

# NATIONAL ASSESSMENT REPORT 2010

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DEPARTMENT OF CLIMATE CHANGE AND ENERGY, MINISTRY OF HOUSING,  
TRANSPORT AND ENVIRONMENT

# National Assessment Report II

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### EXECUTIVE SUMMARY

The UN General Assembly Resolution 63/213 (February 2009) Follow-up to and Implementation of the Mauritius Strategy for Further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States reaffirmed the GA decision 62/191 to “review process made in addressing the vulnerabilities of small island developing States through the implementation of the Mauritius Strategy for Implementation (MSI) at the sixty fifth session of the General Assembly”. Resolution 62/213 stressed that “the review should provide the international community with an opportunity to conduct an assessment of the progress made, lessons learned and constraints encountered in the implementation of the MSI and agree on what needs to be done to further address the vulnerabilities of SIDS”.

The MSI acknowledges that sustainable development is primarily a national responsibility but for SIDS to succeed, given their acknowledged vulnerabilities, the Rio principles, including *inter alia*, the principle of common but differentiated responsibilities as set out in principle 7 of the Rio Declaration on Environment and Development is given specific expression for SIDS. As outlined in paragraph 6 of the MSI, SIDS are committed to promoting sustainable development, eradicating poverty and improving the livelihoods of peoples by the implementation of strategies that build resilience and capacity to address the unique and particular vulnerabilities.

In accordance with the GA resolutions above, the overall objective of the National Assessment Report (NAR) has been to gather national level information, as the basis for a review of progress made in addressing the vulnerabilities of SIDS through the implementation of the MSI, at the five – year mark after its adoption in Mauritius in 2005.

This report highlights the concrete actions taken and specific progress made in implementation; lessons learned and good practices; effectiveness of implementation support and mechanisms, including monitoring systems; special constraints and challenges; and recent trends and emerging issues. The information focuses on actions undertaken to address vulnerabilities of SIDS particularly in relation to the means of implementation outlined in paragraph 85 of the MSI such as financing, trade, access to environmentally sound technologies, education, awareness – raising, capacity building and integration into national sustainable development strategies.

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The National Assessment Report addresses thematic areas including climate change and sea-level rise; natural and environmental disasters; management of wastes; coastal and marine resources; freshwater resources; land resources; energy resources; tourism resources; biodiversity resources; and transportation and communication.

The foremost principle of the environment policy of the Government is to view the natural environment as the key to socio-economic development<sup>1</sup>. Furthermore it is to ensure the provision of the fundamental services provided by the environment; the right to access to safe drinking water, safe disposal of solid waste and access to electricity.

Climate change threatens fundamental human rights, including the right to life. Climate change is also a grave security concern because rising sea levels for instance threaten the very existence of the island nation. The country's vulnerability to climate change and sea level rise is evident. Major vulnerabilities identified include severe beach erosion, damage to human health and infrastructure, loss of biodiversity and impacts on food security and the economy.

The new policy focus is to ensure sustainable adaptation measures and is developed on the view that the ability to adapt to environmental degradation is fundamentally linked to good governance and careful planning<sup>2</sup>.

## **INTRODUCTION**

The Republic of Maldives consists of a chain coral atolls 80-120 km wide and 860 km long, which lie on the Laccadive-Chagos submarine ridge, in the Indian Ocean. There are 26 natural atolls over a total land area of about 300 square kilometers with an exclusive economic zone of approximately 859,000 square kilometers.

The population of the Maldives is approximately 310,000 inhabiting 198 of 1190 islands scattered through the atoll system.

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<sup>1</sup> "Aneh Dhivehi Raajje" – The National Strategic Action Plan 2009 -2013

<sup>2</sup> "Aneh Dhivehi Raajje" – The National Strategic Action Plan 2009-2013

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The atolls vary in shape from oval to pearl shaped and they surround lagoons 40 – 60 metres deep. The islands themselves vary in size, from 0.5 square kilometers to around two square kilometers. Some islands are sand banks with sparse vegetation while others are elongated strips of land. Some islands move as a result of storms and are often formed or destroyed by such storms.

The Maldives faces a variety of economic and developmental problems that are compounded by a restricted natural resource base and rapid population growth. The prospect of sea-level rise and increase storm damage both driven by climate change and climate variability pose major environmental and socio-economic threats. No island of the Maldives stands more than three metres above mean sea level and over 80 percent of the islands are less than one metre high.

There is no doubt that the Maldives has achieved considerable progress over the last two decades, leading to economic and social development. However, the Maldives remains a small island developing state with inherent vulnerabilities and structural constraints, placing major obstacles in its development path. The existing combination of economic and environmental conditions in the Maldives, render the pursuit of sustainable development difficult. There are people living in extreme poverty in certain islands. Climate change is a high danger looming in the horizon. The coral reefs which are the back bone of the islands and the economic are under excessive stress from natural and human interventions. Energy security and food security are key challenges for an import dependent nation. The geographic dispersal of the inhabited islands and tourist resorts makes efficient transport a basic necessity. Changing lifestyles and environmental pressures are adding to the disease burden of the population.

The Government now has a special focus on renewable energy with the announcement in March 2009 by His Excellency President Nasheed, on making the country carbon neutral by 2020. It is hoped that with this vision, the country can now play a leading role in climate change mitigation as well as adaptation. As the country's contribution to global green house gas emissions has been negligible, it does not identify as being part of the climate change problem but is determined to play a role in part of a global solution. Thus, the Maldives has pledged to become a carbon neutral country within a decade, spearheaded by a switch from oil to 100% renewable energy.

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### CLIMATE CHANGE AND SEA-LEVEL RISE

The Maldives being a fragile low lying small island ecosystem, is very vulnerable to climate change and its associated impacts especially the predicted sea level rise. Although the Maldives contributes minimally to the global greenhouse gas emissions: 0.001%, it is among the most susceptible to impacts of the changes in climate.

The Intergovernmental Panel on Climate Change (IPCC) in its Fourth Assessment Report estimates 0.18–0.59 metres by the mid-2090s relative to the average sea level over 1980–1999. This estimate is based on projections from 17 different global climate models, for six different future emission scenarios. With more than 80% of the land area of Maldives less than a meter above mean sea level, the slightest rise in sea level will prove extremely threatening. This is further aggravated by the variation of the tide. Many islands already suffer inundation and shoreline erosion because of their low elevation. The inundation often leads to freshwater shortages and disease outbreaks. The magnitude of rise in sea level projected in the IPCC Fourth Assessment Report threatens the very existence of life and livelihood in the Maldives.

A particular concern of the Maldives is the impact of climate change on the groundwater availability. In the islands rainwater lenses lie atop salt water. As sea level rises, the thickness of the freshwater lenses decrease, and the volume of freshwater decreases. Sea level rise would also increase the likelihood of storm over wash of the islands, causing increased incidence of saltwater contamination of the freshwater lenses.

The existing policies and strategies for adaptation to climate change are provided in the National Adaptation Programme of Action (NAPA), Seventh National Development Plan (NDP7), Third National Environmental Action Plan (NEAP 3), and First National Communication of the Maldives to UNFCCC and the National Strategic Action Plan 2009-2013.

The small size, extremely low elevation and unconsolidated nature of the coral islands place the people, their livelihoods and critical infrastructure at very high risk from sea level rise. Maldives is the sixth smallest sovereign state in terms of land area estimated to be approximately 235km<sup>2</sup>. This land is divided over 1192 coral islands and 96 percent of the islands are less than 1km<sup>2</sup> in area. Only 10 islands are more than 2.5km<sup>2</sup>. Over 80% of the total land area of

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the Maldives is less than 1m above sea level<sup>3</sup>. As future sea level is projected to rise to 88cm between 1990 and 2100 in the worst case scenario, the islands of the Maldives would be submerged.

Given the close proximity of the settlements to the sea and low elevation of the islands, homes of people are at a severe risk of inundation even with lower rises in sea levels. At present 44% of the settlement footprints of all islands are within 100m of coastline. This translates to 42% of the population and 47% of all housing structures being within 100m of coastline<sup>4</sup>.

The small size of the islands and their low elevation also makes human settlements defenseless against severe weather events and storm surges. Over the last 6 years more than 90 inhabited islands have been flooded at least once and 37 islands have been flooded regularly or at least once a year. The beaches that represent 5% of the total area of the Maldives, are of unconsolidated nature and naturally dynamic and unstable. More than 97% of inhabited islands reported beach erosion in 2004, of which 64% reported severe beach erosion. More than 45% of 87 tourist resorts have also reported severe erosion<sup>5</sup>.

The scarcity of land in the Maldives, the smallness of the islands and extreme low elevation makes retreat inland or to higher grounds impossible. Building setback has limited utility and beach replenishment may only be a temporary remedy for beach loss. Unless expensive coastal protection measures are undertaken the human settlements face the threat of inundation.

Significant investments have been made to develop infrastructure in the country.

The location of infrastructure within close proximity to the coastline makes them highly vulnerable to sea level rise and storm conditions. The transport infrastructure includes three major commercial sea ports, more than 128 island harbours, and five airports of which two are international.

About 30% of the infrastructure of Male' international airport lies within this range and land reclamation towards the ocean-ward side has resulted in parts of the airport being within 15m of the wave break zone<sup>6</sup>. Other critical infrastructure includes utilities and environmental services.

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<sup>3</sup> Maldives National Strategy for Sustainable Development 2009

<sup>4</sup> Maldives National Strategy for Sustainable Development 2009

<sup>5</sup> Maldives National Strategy for Sustainable Development 2009

<sup>6</sup> Maldives National Strategy for Sustainable Development 2009

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The average width of inhabited islands is 566, and in both inhabited islands and resorts 80% of the powerhouses are located within 100m of coastline. Also, 90% of the islands have their waste disposal sites within 100m coastline and on the ocean ward side of the island. More than 75% of communications infrastructures are located within 100m from the coastline.

### *Adaptation*

As the Maldives is very vulnerable to the predicted climate change and sea level rise, the Government has given serious attention to adaptation measures. Various programmes have been designed and implemented in areas such as coastal protection, freshwater management and coral reef protection. A breakwater has been constructed around the capital Malé costing around 30 million US Dollars. The government has also taken measures to protect the coral reefs by reducing import duty on construction materials and prohibiting use of coral for government buildings and tourist resorts and by banning coral mining from house reefs.

If appropriate adaptation measures are not taken, frequent inundations could virtually obliterate the critical infrastructure damaging the economy threatening safety and security of the people. The magnitude of damage that may be caused to infrastructure can be deduced from historical records. The flooding event of 1987 caused damages worth US \$4.5 million to the Male' International Airport alone. During the Tsunami of 2004, damage to transport and communications infrastructures were estimated to be US \$20.3 million where a 4,200m length of quay wall and 15,000m of harbor sea/walls and breakwaters were damaged or destroyed.<sup>7</sup>

The objectives of the adaptation to climate change are<sup>8</sup>;

- Make the inhabited islands resilient against the threats posed by global climate change
- Protect critical infrastructure such as international airports from sea induced hazards and predicted climate change impacts
- Provide innovative coastal protection for selected islands and tourist resorts
- Strengthen human, technical, regulatory and institutional capacity for coastal zone management.

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<sup>7</sup> World Bank 2005

<sup>8</sup> Maldives National Strategy for Sustainable Development 2009

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The Maldives has also pledged to be a carbon neutral country within a decade. The objectives of this goal are to make energy supply secure and affordable; reverse the increasing dependency of diesel powered electricity generation in the Maldives and limit climate change; provide for reliable delivery of energy and guard against energy emergencies; invest in advanced energy technologies that will enable carbon neutrality and improve energy efficiency and acquire and demonstrate sound water technologies suitable to small coral island environment.

There are several constraints and emerging issues in this sector of climate change and sea level rise. Firstly a lack of decentralized environmental governance system in the country. There is inefficient utilization of the existing resources and disparities between donor funds and donee's sectoral needs. Poor aid coordination further adds to the problem. There are poor inter/intra sectoral commitments and coordination and poor integration of the existing plans within the sector. Lack of a common platform for data sharing or information dissemination. Poor public awareness on environment friendly practices and finally lack of financial resources for the implementation of the programs and strategies.

### *Coastal Protection*

The islands of Maldives are reef-based and coral reefs serve as natural breakwaters. With damage to the coral reefs comes the bigger danger of losing the natural protection of the islands from the waves and currents. An island with a degraded reef is more open for coastal damages such as beach erosion and more susceptible to inundation by uncontrolled waves reaching the shore. The Maldives faces severe constraints in adapting to increased erosion expected with the rising sea level. A major constraint is the lack of capacity to evaluate the magnitude of erosion and identify quantitatively the major causes of erosion. Without such knowledge, appropriate adaptation strategies cannot be formulated.

Developing resilient communities by addressing impacts of climate change, disaster mitigation and strengthening adaptation and mitigation responses for beach erosion and developing a system to assist communities affected by beach erosion are two major environmental policies of the Government related to coastal protection climate change.

The Government of Maldives proposes the following four activities to implement the policies as identified in the Strategic Action Plan.

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- Construct coastal defences around 4 selected islands facing the most severe erosion and flooding due to storm surge
- Develop a shoreline management plan that would be nationally implemented when undertaking any coastal modification project
- Undertake a soft engineering research project in one selected island to come up with a cost effective method that could be used in other islands
- Establish coastal survey units in 7 provinces and train staff to monitor the shoreline in all inhabited islands to help develop locally appropriate measures to prevent erosion and flooding.

Some islands have gone through severe erosion problems in the past with no sustainable solution, because of which livelihoods have been lost and the families had to be relocated to safer areas. Adverse climatic conditions observed in the south-east and south Asia over the past few years have also contributed to the acceleration of natural erosion whereby making these islands even more vulnerable. Thus the importance of sustainable erosion protection to ensure the safety of these delicate coastlines are realised for the survival and wellbeing of the island communities.

The four islands identified for constructing coastal defences are Gn.Fuamulaku, N.Holhudhoo, Ha.Hoarafushi and GDh.Gadhdhoo. Out of the four islands, in the past few years, the Government of Maldives has already spent up to USD 200,000 on temporary shore protection works at Ha. Hoarafushi. In 2007, the Government carried out a 1.1 million US Dollar beach fill/reclamation project at Ga. Gadhdhoo to prevent the erosion and flooding issue that was facing the island. A shore protection structure is needed to prevent the erosion of this fill or would end up losing the Government's investment.

Due to the relatively small size of the islands that make up the country, no person lives more than a kilometre away from the shoreline. Shorelines constantly change due to waves and tides. This natural process is influenced by the people's action and during recent times due to the effect of climate change.

The Shoreline Management Plan would identify management measures that will provide the best approach to manage erosion and flooding at specific areas. The main objective of a Shoreline Management Plan (SMP) is to assess the risk associated with coastal process and help reduce these risks to the people, infrastructure and the natural environment. The aim is to

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reduce the threat of erosion and flooding and to act as a guideline for development around the shoreline based on a sustainable development policy of the Government.

Soft engineering methods are fast becoming the most preferred option for coastal protection around the world. One of the biggest advantages of soft engineering methods is that it is environmentally friendly and is easy to modify or remove depending on the shoreline's response. While the resort islands in the Maldives have been successfully using soft engineering techniques, it is rarely used in the inhabited islands.

Due to the infrastructure development, the shorelines in most of the inhabited islands are already in state of severe stress. Hence, it might not be possible to adopt the exact model used by the resorts. Therefore, it is important to carry out a research project in one inhabited island to study the feasibility of soft engineering shore protection methods and determine if soft engineering or a combination of soft and hard engineering techniques can be replicated in other inhabited islands.

The Government has carried out a few studies into this subject. Presently, the Environmental Protection Agency is undertaking a USD 50,000 erosion study, which can be used to expand to a full research project into soft engineering.

Coastal processes happen over a timescale of seconds to centuries. To have a good understanding of the process that shape the shoreline, it is important to have long term data. The Government has recently established small survey units in the north of the country and the extreme south. The central surveying division at Ministry of Housing, Transport and Environment has conducted training programs that has trained staff for the north and south surveying units who are currently working as surveyors in these two provinces. By establishing units in all the regions, it would be practical to periodically survey the shorelines of all the inhabited island in that region.

This would help monitor the changes to the shorelines in all the islands and can in turn take appropriate decisions based on accurate data. The result of these surveys can also be used to update the Shoreline Management Plan and possibly come up with Plans specific to each island.

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Spatial configuration of islands varies from atoll to atoll; so are the sizes, population and the distances between the islands; about 99% of the nation constitutes ocean. A population of 320 thousand lives in 196 scattered islands recently re-grouped into 7 administrative provinces by the new government.

### *Integration of Communities*

Male is the capital of the country and has the international airport and seaport. Supplies of goods to people residing in the islands do not have affordable means of transport even to the neighbouring islands and rely on ad-hoc transport organized by traders and fishermen, which are expensive, inconvenient and unorganized. This not only increases the financial costs but also it increases the amount of green house gas pumped into atmosphere. Thus the carbon emissions cause negative impacts of climate change in the Maldives. Several measures are needed to mitigate this climate change issues, ranging from climate friendly transport facilities as well as introducing regular public transport system.

Sea plane services are available in the country but cater to the tourist resort needs mostly. Traffic using current wheel based domestic flights to 4 domestic airports (one of which, S.Gan, was recently upgraded to international category) is relatively low. Even if a regional airport is located in their atoll, passengers may have to spend relatively more between the domestic airports to their islands by sea.

The current government strongly believes that providing a reliable, safe and affordable regular transport system is crucial for the development. This transport network will enable equitable distribution of wealth, encourage economic development, enable social and commercial networking as well as the transportation of goods and services, and provide easy access to essential services closer to home for all citizens. To address this situation a concept plan was produced to establish a nationwide sustainable integrated transport network to be operated by private sector and regulated by the government.

Immediately after assuming the office in November 2008, the government made a public announcement to find interested parties to provide much needed transportation services in the Maldives. Seven private parties have signed 50 year service contract with the government to provide transportation service to 7 provinces. Temporary transport service has already started in three out of seven provinces, and as per the agreements, all the service providers will have to

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start temporary transport service by the end of April 2010 and permanent service within next 2-3 years. To strengthen regulatory framework, new regulations for land based transport as well as ferry has been formed. New regulation for ferry will be in force by end of April 2010

For proper integration of transportation to economic activities as well as to make the transportation sustainable and fitted to the environment it very important to develop a comprehensive Transport Master Plan. Such a plan will address issues of land transport, especially in the congested urbanised capital island, encouraging environmentally friendly modes such as walking and cycling also discouraging excessive reliance on private vehicles. It is the aim of government to understand benefits of public transport system and how such a key system to be integrated in to the national development plan.

To manage the continuously increasing demand for land based transportation is a priority of the sector to make it more environmentally friendly as well as to integrated ferry network. Government aims to limit number of land based vehicles and assign a capacity for each island, introduce green-taxi and pedestrian friendly environment will help to reduce pollution and achieve carbon neutrality. To achieve these objectives, the Government will increase the licensing and parking fees and impose high violation charges.

The Government expects to strengthen regulatory framework, facilitate and provide incentives to encourage private sector investment in the development of airports and regional ports and other transport related infrastructure. It also planning to promote and facilitate the development of transport related infrastructure (such as secure ferries, comfortable ferry terminals, and safe access jetty/harbours) in the outer islands through private sector participation to increase sustainability, improve safety and security.

Required human resource capacity to develop transport sector is weak hence government plan to focus on human resource development in the regulator side as well as facilitate funding to the private sector to increase their capacity of managing and operating transport services.

The Government acknowledges the Maldives as an island nation and aim to retain its island characteristics by facilitating ways of life the residents of any island in their own island or any island of their choice. Transportation system facilitates consolidation of population in more sustainable manner by giving the residents choice; strengthening social fabric of the island communities giving them time to know one another.

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It is vital to note that, resources in any island is limited, focus on a group of connected islands as a community can be more sustainable rather than focusing development on one island. The consequences of such concentration leads to reclamation of the lagoon to make more land, less green area to make way for urban sprawl and more demand for the natural water resources of that particular island. These factors are becoming the norm in some islands and to reduce more islands being succumbed to this and to preserve the environment, it is important to integrate all communities by a regular affordable transport network

### *Fisheries*

Fisheries is also likely to suffer from the impacts of climate change. Tuna fishery is the main fishery and tuna is a migratory species. A possible change in temperatures can drive the tuna stock to more favourable temperatures. This can lead to a decline in the fisheries industry as the fishermen loose their fishing grounds. As the tuna fishery is based on pole and line method using bait-fish; any changes to the availability of bait fish caused by damage to the reefs would also affect the tuna fishing industry.

### *Tourism*

The tourism industry relying heavily on the marine ecosystems is also under threat from the impacts of climate change. An increase in temperature can very easily bring the reef growth and reef ecosystems to an alarmingly poor status. Although almost all the reefs have recovered from the coral bleaching event of 1997 /1998, the impacts of bleaching were felt on around 90% of the reefs of Maldives, bleaching them totally or partially. The corals already growing at highest tolerable temperatures (approximately 30°, Celsius) have a very grim possibility of survival given the predicted rises in temperature of 1.4 to 5.8°C for the period of 1990 to 2100.

The key goals of the environment sector as identified in the National Strategic Action plan are to;

1. Maneuver Maldives as a central player on climate change globally
2. Promote the rights of all citizens from the impacts of climate change
3. Protect and preserve the natural environment to ensure prosperous economic development
4. Reduce Green House Gas emissions and achieve carbon neutrality

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5. Minimise pollution for the development of healthy communities through proper waste management
6. Create public awareness of environmental values to promote environmentally friendly lifestyles.

## NATURAL AND ENVIRONMENTAL DISASTERS

The frequency of occurrence of natural disasters in the Maldives is low. The fact that disaster preparedness became a priority of the Maldivian government only after the tsunami of 2004 was therefore quite normal. The Department of Meteorology, however, suggests that the islands, 199 of which are inhabited, must be prepared for significant disasters. The eastern sector of the Northern and Central islands are highly vulnerable to tsunami while the Northern islands have the greatest exposure to surge hazards and cyclones. Other hazards include earthquakes, thunderstorms, flash floods, and prolonged dry periods.

The Maldives has rarely experienced a big disaster until December 2004 when the Indian Ocean tsunami caused economic losses of \$470 million, which is 62% of the gross domestic product. Even though only less than a hundred deaths were reported, nearly one-third of the population were affected through loss or damage to homes, livelihoods and local infrastructure. Since then, the country's main economic sectors - tourism, fishery and agriculture - have recovered. Nevertheless, the country faces constant threat by its very location and atoll structure. The key geophysical characteristics of the islands influence predispose its propensity natural vulnerability. Its geographic location near the equator in the Indian Ocean exposes Maldives to different natural hazards<sup>1</sup> earthquakes (particularly the South), tropical cyclones, storms, thunderstorms, heavy rainfall, drought, floods induced by heavy rainfall, storm surges, swell waves, usher, tsunami, and climate-related hazards such as accelerated sea-level rise, sea surface temperature rise, and changes in monsoon pattern.

The UN Intergovernmental Panel on Climate Change forecasts that the seas are likely to rise by up to 59 cm by 2100, due to global warming. Most of the Maldives are just 1.5m above water and combined with issues such like beach erosion, water shortages, and limited shore

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defences, the tipping point disaster event for the Maldivians may come even earlier than current projections of 2100.

Health emergencies in the past include epidemics due to vector borne diseases. Dengue epidemics occurred in 1987 and then re-emerged in 1998; dengue fever has been endemic since then. More recently, in 2006 chickengunya was introduced into the country and led to epidemic levels. Other communicable diseases such as scrub typhus and leprospirosis have re-emerged in the country. Increased and variable patterns of rainfall and temperature have led to outbreaks of both dengue and chickengunya.

There is a 10% probability of a storm hitting the northern atolls with wind speeds from 118 to 177 km/h (Scale 1 and 2 on the Tropical Storm Intensity Saffir-Simpson Hurricane Scale) to happen in the next 10 years<sup>9</sup>. However, the vulnerability of the Maldives lies in the low elevation (80% below 1 meter above sea level) and flat topography of the small islands and the wide dispersion of its population in the atolls. The biggest island is only 5 kilometers long while Male,, the capital, is home to a third of the total population. The Maldives is losing land to perennial beach erosion. Salt water has intruded into its ground water resources. Finally, its economy is extremely highly dependent on tourism.

Climate change impacts Climate change is expected to have severe impacts on the small, low-lying coral islands of the Maldives because they “are highly reliant on the biological and geomorphologic functioning of the coral reef environment for their stability. The economic base, tourism and fisheries, and livelihood are directly linked to the coral reefs.”<sup>10</sup>

The maximum sea level rise of 59 cm by 2100 which is predicted by the UN due to global warming is expected to make flooding incidents more frequent and coastal erosion more prevalent. The projected increase in sea surface temperature poses problems as it threatens the survival of the coral reef ecosystem. With the high unit cost for providing social and economic services and infrastructure and the difficulties of access to the islands, these factors “combine to create one of the most vulnerable communities in the world.”<sup>11</sup>

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<sup>9</sup> Strategic National Action Plan for Disaster Risk Reduction and Climate Change Adaptation 2010 -2020

<sup>10</sup> Strategic National Action Plan for Disaster Risk Reduction and Climate Change Adaptation 2010 -2020

<sup>11</sup> Strategic National Action Plan for Disaster Risk Reduction and Climate Change Adaptation 2010 -2020

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### *The Imperative for Disaster Risk Reduction and Climate Change Adaptation*

A review of the occurrence of disasters between 1988 and 2007 conducted by the Centre for Research on the Epidemiology of Disasters and the Catholic University of Louvain concludes that 80% of all disaster events are climate-related and that such hydrological, meteorological and climatological events account for 45% of deaths and 79% of economic losses<sup>12</sup>.

The data for the period from 2000-2007 revealed a strengthening upward trend with an average annual growth rate of 8.4% in reported hydro-meteorological disasters worldwide. Various studies predict that climate change will affect disaster risks through increase in weather and climate hazards and in the vulnerability of communities to natural hazards due to ecosystem degradation, reduction in water and food availability, and changes in livelihood. In the case of the Maldives, the temperature spike during the 1998 El Nino event devastated the coral reefs, and the fishing industry.

The vulnerability of the islands is magnified further by extreme dependence on imported basic commodities like food, clothing, fuel and construction materials, usually from neighboring India, Sri Lanka and other traditional sources which, it is important to note, are likewise facing challenges due to climate change and extreme weather events.

The huge costs of disasters in terms of lost lives, property and productivity are expected to be exacerbated by climate change impacts during the coming decades. There is, therefore, good sense in finding an approach that will address both concerns with simplicity and comprehensiveness, and extra benefits as well. Climate change adaptation and disaster risk reduction (DRR) have similar aims and may utilize the same tools that have proven effective over the years. Disaster risk reduction, or systematic efforts to analyze and manage the causes of disasters for the purpose of reducing the risks and the adverse impacts of natural hazards, promote the avoidance of hazards, reduced social and economic vulnerability to hazards, and improved disaster preparedness.

DRR encompasses a wide range of natural (geological, hydro-meteorological, and biological) and human-induced (environmental degradation and technological) hazards. The Hyogo Framework for Action provides the foundation for the implementation of disaster risk reduction.

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<sup>12</sup> Strategic National Action Plan for Disaster Risk Reduction and Climate Change Adaptation 2010 -2020

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Agreed in January 2005 by 168 Governments, it seeks substantial reduction of losses due to disaster. It specifically identifies the need to promote the integration of risk reduction associated with existing climate variability and future climate change into strategies for reduction of disaster risk and adaptation to climate change. Climate change is addressed in two ways: by mitigation, or reduction of greenhouse gas emissions, and by adaptation, or the management of its impacts. There are technological mitigation solutions for the transport and power sectors in renewable energy and energy efficiency.

A solution that will depend mainly of mitigation will require investments for replacement of fossil fuels and a drastic change to a low-carbon lifestyle. Its effect will be on the global concentration the gases. Adaptation, on the other hand, strengthens ecosystems, protects water resources, improves food production and livelihood, identifies risks, develops early warning systems, enforces safe building standards and provides social safety nets. It empowers the public through knowledge sharing, skills training and access to helping partners and networks, as it ensures sustainability of the local environment.

Whereas DRR deals with the full range of natural and human-induced hazards, climate change adaptation moves outside the realm of most DRR experience, to address longer term impacts, such as loss of biodiversity, changes in ecosystem services and spread of climate-sensitive disease, that the DRR community is not likely to address. It is important for both the climate change and disaster risk management communities to recognise that adaptation and DRR have these more exclusive elements, to avoid perpetuating the erroneous view that all adaptation and DRR is the same. However, recognition of exclusive elements should not hinder the development of a more integrated approach, as the majority of adaptation and DRR measures have mutual benefits that offset both climate and disaster-related risks for a “win-win” solution.

To achieve these mutual advantages, both communities must increase awareness and understanding of adaptation and DRR synergies and differences at all levels and encourage systematic dialogue, information exchange and joint working between climate change and disaster reduction bodies, focal points and experts, in collaboration with development policy makers and practitioners.

The Maldives Strategic National Action Plan for Disaster Risk Reduction and Climate Change Adaptation 2010 -2020 (SNAP) process was initiated with UNISDR assistance as per agreed

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with President Nasheed on July 12, 2009 to undertake the development of the Strategic National Action Plan on Disaster Risk Reduction and Climate Change Adaptation. Designed to promote collaboration among policy makers, experts, and practitioners of disaster risk reduction and climate change adaptation in the country for the development of a comprehensive risk management approach, SNAP will support the new democratic government achieve its vision of good governance and prosperity for the Maldives. SNAP aims to build resilience of the nation and the island communities to disasters by sustaining progress made, by consolidating learned best practices, and by incorporating risk reduction into the strategy for decentralization. Harmonized with the policies, plans, and sustainable development strategy, it will identify a consolidated set of programs/projects that can be undertaken with the Government budget and those that may be considered for donor assistance.

The SNAP Process in the Maldives, the stocktaking and consultation process was guided by the principles and tools of the Hyogo Framework for Action. The review of existing policies, plans and programs related to DRR and CCA was conducted from August to October, 2009. Multi-sectoral consultations consisting of focus group discussion and a consultative leadership workshop of local government officials were held from August 16-20, 2009. Almost 100 representatives attended the forums. The primary purpose of the consultations and interviews was to engage the stakeholders in identifying weaknesses and needs, as well as strengths and actions for adaptation and disaster risk reduction, thereby promoting a higher level of awareness among them.

A qualitative assessment of progress was made along the priorities for action of the HFA, namely governance, risk assessment and early warning, knowledge management, vulnerability reduction, and disaster preparedness. The results of these activities include recommendations for actions that the respective sectors could plan for and eventually implement. More significantly, during the process the major challenges as perceived by the participants, and the gaps in their organizations and agencies, that could prevent success in addressing disaster risk surfaced.

Emerging from the process were four strategic areas of action in which all stakeholders could confront and address the major challenges:

Strategic Area: Enabling Environment/Towards Good Governance

1. Institutional Framework: Strengthen institutional capacity to deal with disasters

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2. Capacity Building for Disaster Preparedness: Enable stakeholders to deal with disasters in an effective, efficient and timely manner Strategic Area: Empowered and Capable Communities
3. End-to-End Early Warning System. Enhance the early warning system.
4. Community-Based Disaster Risk Management. Enable island community to deal with disaster risks. Strategic Area: Resilient Communities with Access to Technology, Knowledge and Other Resources
5. Knowledge Management. Build knowledge management capacity.
6. Awareness-Raising. Enhance public awareness about disaster risks and climate change.
7. Connecting Island Communities to Technology and Resources. Ensure that communities have access to Internet, knowledge and other resources needed for reducing vulnerability. Strategic Area: Risk-Sensitive Regional and Local Development
8. Regional Development Focused on Vulnerable Communities. Create adequate safe spaces for vulnerable communities and generate economic livelihood.
9. Risk-Sensitive Policy and Regulation. Mitigate disaster and environmental risks in infrastructure, buildings and industrial activities.
10. Disaster-Resilient Community Housing and Infrastructure. Promote construction of safe housing and community infrastructure.

The National Plan on Disaster Management and Mitigation has been drawn to respond to any type of emergency situation in the country. Hence plans from the various government and private agencies must fall in line with the overall objectives of this plan, specially focusing on area of responsibility defined by the government. Such plans should be submitted to the National Disaster Management Office and must be coordinated with the official body responsible for the management of state of emergency.

As mentioned in the plan, the agencies will benefit the support of the National Disaster Management Office. In the event of the need for individual activities, the agencies must coordinate with the National Disaster Management Office.

The most important thing is the institutionalization of NDMC: in this regard Disaster Management Bill has been drafted by a team of lawyers. This would provide legitimate power and recognition to implement those action plans.

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There has also been the establishment of DRR Unit: a separate unit has been formed within the centre focused on DRR and is expected to be decentralized down to island level. Currently in this unit, 7 graduates, 1 expert and 1 historian are working for disaster risk reduction. These few recruits have been given a series of training in several relevant areas to cater for DRR in the Maldives.

The DRR has been prioritized in all its functionalities to mitigate the impact on communities and development. In this regard, awareness programs have been conducted to make people aware of the importance of DRR approaches to development. It is commonly understood that good development is the best DRR and CCA approach.

The Strategic National Action Plan for DRR & CCA (SNAP): a well-rounded action plan has been formulated and is submitted for cabinet endorsement. On establishment of the legal framework, NDMC would be geared up to implement the action plan across all sectors in which co-ordination would be one of the key functions of this agency.

Except a few, all natural disasters are unpredictable. It is the responsibility of the National Disaster Management Office to inform the public on an imminent disaster. When the National Emergency Operation Centre is in action, this responsibility must be taken by the Centre. Specific warnings must be announced by the National Meteorological Centre by utilizing the highest government mechanisms.

Any effort made in advance and during a disaster to face the damages will also be accounted here. Disaster management refers to all preparations and practical work involved before, during and after a disaster for ensuring a normal life. This includes seeking solutions to damages and possible damages. The coordination among the various agencies is also part of disaster management. The result of such activities should reflect the use of government mechanisms in paving way for achieving development goals even during such periods.

Due to the seriousness of weather variability and natural hazard risks, it has become necessary for the Maldives to be concerned about climate change adaptation and disaster risk reduction in all aspects of its development. The Maldives has a radical economy-wide carbon neutral plan for the next 10 years (2019), the first and most comprehensive in the world. With its own SNAP, the nation will join the leading countries with a concrete strategy and action plan that links

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disaster risk reduction and climate change adaptation, drawn through broad-based multi-stakeholder consultations. Disaster risk reduction action now can delay this inevitable crisis event by decades. Dealing with climate change and disaster risks decisively is the key to reducing poverty and achieving the Millennium Development Goals. According to the Strategic Results Framework (formerly Global Environmental Fund (GEF) Logical Framework), the goal is “to increase the resilience of the Maldives in the face of climate change and improve country capacity to respond effectively to climate related hazards.”

In line the goals of the new Government towards the attainment of “Aneh Dhivehi Raajje”, or The Other Maldives, The Manifesto Of The Maldivian Democratic Party – Alliance 2008-2013 and guided by the Hyogo Framework for Action and the United Nations Development Assistance Framework (UNDAF), a multi-stakeholder process that will build upon the existing capacities and identify priority concerns and actions of the country was designed. This process leads towards the Strategic National Action Plan for Disaster Risk Reduction and Climate Change Adaptation (SNAP). Every disaster presents financial challenges to an affected nation as well as assistance providers. The SNAP therefore not only manifests political commitment to optimize DRR and CCA countermeasures but also seeks to mainstream these into the budgeting process. SNAP is a road map using a multi-hazard risk management approach which is a potent driver to consolidate given meager means and resources.

The Third National Environmental Action Plan (NEAP) 2009-2013 also identifies natural disaster preparedness and mitigation. Goal 7 of NEAP is identified to ‘make Maldivians safe and secure from natural disasters through information dissemination and, planning and coordination of national response actions.

The targets identified:

- By mid 2010, establish a national early warning system to disseminate warnings of natural disasters
- By 2010, establish website and public information systems including fact sheets and awareness materials, hazards and disasters
- By mid 2010, develop a National Disaster Management and Mitigation Plan
- By 2011, develop a Biological Incident Management Plan
- By mid 2010, develop an Oil and Hazardous Material Incident Management Plan
- By 2011, formulate disaster classification standards and risk assessment protocols

### MANAGEMENT OF WASTES

Solid and hazardous waste management has recently emerged as one of the greatest environmental challenges in the Maldives. The worsening waste management situation is attributed but not necessarily limited to; rapid growth in population which is unevenly distributed within the inhabited islands, changing consumption patterns, limited land area and the wide distribution of the islands within the maritime area on 859,000km<sup>2</sup> of the Maldives.

The worsening situation may cause irreversible damage to the environment through pollution and even now, is a serious threat to public health through the Maldives. This growing problem may ultimately threaten the economic development which is intrinsically linked to the tourist and fishing industries and the overall sustainable development of the country.

The average rate of generation of waste in Male is approximately 2.48kg per capita per day. In the atolls average rate of generation of waste ranges between 0.79kg and 0.70 kg per person per day. In the resorts the average rate of waster generation per guest per day is 7.2kg.<sup>13</sup>

The major source of waste in Male' are domestic waste, commercial waste and construction demolition waster. There are two separate collection yards in Male' with one for construction and demolition and one for domestic and other sources of waste including the commercial sector. Villingili also has a dedicated waste collection yard similar to that in Male'. Despite the considerable volume of construction and demolition waste and the significant problems associated with its transportation and disposal, no fee is levied for this service.

Collection and transfer of waste in Male' is carried out by Male' Municipality and other private parties. However, some households and other sectors do it by themselves. About ten roadside binds used to be in place on the periphery of Male'. However these have been removed due to odour nuisances and anaesthetic sights. These bins are still present in two locations of Male' as an option for householders to deposit their waste. Alternatively householders can deposit their waste directly at the domestic waste collection yard free of charge.

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<sup>13</sup> State of the Environment Maldives 2004

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Waste is segregated to some extent at the collection yards and a small area is dedicated to deposit reusable waste at this site. However, as there is zero segregation at the source, all types of waste are deposited together making sorting at the domestic collection yard a time consuming and difficult task.

The waste is removed from the collection yards and placed on a barge to transfer to the municipal landfill site known as Thilafushi. Municipal waste is transported in large static compactor units while construction and demolition waste is transported by tipper trucks. At Thilafushi waste taken from the collected yards are further segregated as much as possible and stockpiled in open areas. The usual categories of segregation are paper, plastic box, tins, aluminium, electric materials, HDPE plastic, vegetable baskets, wooden box, fibre, used pol, dry batteries, coconut husk, furniture and tiles.

There is very little export of waste that is implemented. Most of the waste is burnt openly and wholesale causing odour and smoke nuisances. In the absence of any composting initiatives, green and organic waste is routinely burnt. Windblown litter, such as plastic bags, packaging and paper, enter the marine environment.

In addition to Male' Thilafushi receives waste from Villingili, the Male' International Airport, Hulhumale, resorts and inhabited and industrial islands. On average 32,307 trucks of waste are received at Thilafushi per year from these different sources.

The major type of solid waste generated in the island varies from that of Male'. In the islands the composition of organic waste which includes kitchen waste and green waste is relatively higher than any other categories of waste. There is little, if any waste segregation practiced at household level. However backyard composting is still a common practice at households. Therefore organic waste is usually separated from any other types of municipal waste.

Generally there is little provision of waste collection services throughout the islands. Consequently, householders are required to carry their waste to disposal sites. Usually the women of the household carry the waste in wheel barrows to the disposal site. In 83.2% of the inhabited islands, collection and transfer of waste is carried out by householders themselves. Approximately 8.4% of inhabited islands have an additional fee system. This maybe private

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parties operating with a single vehicle or individuals carrying waste on a weekly or monthly basis for a fixed fee. Only in 1.97% of the islands an established fee system for collection and transfer from all households<sup>14</sup>.

Public spaces in the islands are cleaned and maintained by the Women's Development Committee but often their task is hindered by lack of resources. For example in some of the islands the women have to use their own funds to pay for the transfer of waste that is accumulated through the cleaning activities to be transported to the designated disposal sites.

In all the inhabited islands designated disposal sites exist. Usually the disposal sites are designated by a government authority such as a relevant ministry or the island or atoll office. Stakeholder consultations representing the different sectors of the community are conducted prior to relevant ministries designating sites. However, due to lack of efficient and affordable collection systems, greater distance between household and disposal sites and low level of awareness random disposal of waste is a common practice.

The standard of disposal sites varies for open areas to waste management centres (WMCs) that are equipped to some extent. In the island of Kulhudhufushi, Haa Dhaalu Atoll and Hithadhoo, Seenu Atoll waste management centres were established under the Regional Development Project Phase I implemented by the Ministry of Planning and National Development. These two centres have been in operation since 2003.

Due to absence of proper collection and disposal facilities segregation of waste is very low. Usually the segregation is limited to combustible and non combustible waste. This is because the common practice to reduce the volume of waste is open burning owing to the lack of other disposal options.

The normal practices of waste disposal in the islands are open burning usually with little segregation, random dumping in the bush, or shoreline or in the sea. In most of the islands the disposal site or sites are located close to the shoreline and usually enclosing an area of the lagoon with the intention of reclaiming land by land filling. As a consequence windblown litter such as plastic bags, packaging and paper frequently enter the marine environment. Further

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<sup>14</sup> Waste Management Survey of Inhabited Islands, MEC 2004

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leakage of waste from such locations has the potential to cause irreversible damage to the marine environment.

The inhabited islands do not have the option of transferring waste to a landfill site such as Thilafushi. For most of the islands the distance is too great and costs too high for the community to undertake transfer of waste to Thilafushi.

The tourism sector has a much higher rate of waste generation in comparison to Male' and inhabited islands. However problems relating to waste management are relatively small due largely to better waste management facilities.

Resort staff regularly collects solid wastefrom the sources of generation such as the guest rooms, restaurants and public areas. Further beaches and open areas are swept on a daily basis to keep them free of litter. Most, if not all resorts have a central waste handling area where the various waste categories are sorted for processing and final disposal.

All resorts are required under their operational licence to have appropriate waste treatment equipments such as bottle crusher, metal compactor and incinerator. Food waste generated within the kitchens, bars and restaurants is routinely disposed of at sea. This practice is usually undertaken at night, to minimize concerns to the tourists and usually some distance from the island.

Other wastes such as packaging, metal containers, and green waste generated from maintaining the grounds, is transported by boat, often on a daily basis to the central disposal site on Thilafushi. A charge is paid at the disposal site which relates to the size of the vessel carrying the waste. The size of the vessel generally ranges from 40-100 feet in length. The average number of entries of waste transfer vessels to Thilafushi from the resorts is approximately 478 per month. Inspections are undertaken by offices of the Ministry of Tourism to ensure that individual resorts comply with licence conditions and specifications. It is reported that each resort is visited on at least an annual basis.

The Ministry of Environment Housing and Transport is mandated to design and formulate a national policy on waste disposal and treatment and implement measures required to carry out such a policy. In addition the Environment section is responsible for waste management in the atolls. Male' Municipality is responsible to providing waste collection services within Male'.

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The National Environment Action Plan II (NEAP) requires for the assessment of solid waste disposal problems in inhabited islands, tourist resorts and industrial islands which is being conducted continuously by the Environment section. Furthermore the Ministry has developed the National Solid Waste Management Policy. Under this policy, development and implementation of appropriate policy and regulatory measures for the reduction of waste, safe and efficient management of solid waste, proper management of disposal sites, import of environment friendly products and better involvement of private sector will be addressed as according to NEAP II. The policy also addresses the country wide public awareness related to waste management.

The Maldives is a party to the Basel Convention on the Trans – boundary Movement of Hazardous Waste and their Disposal. Under the Environment Protection and Preservation Action of Maldives (Law 4/93), disposal of hazardous waste within the territory of Maldives is prohibited. If disposal of such waste within the territory of Maldives is absolutely necessary permission has to be obtained from the Ministry of Housing, Transport and Environment at least three months in advance.

The Ministry of Tourism has formulated and implements laws and regulations specific to disposal of garbage in the tourism sector. Under these laws and regulations tourist resorts are required to dispose waste in a manner that would not cause any damage to the environment.

The primary barriers preventing sustainable improvements in the delivery of waste management in Maldives have been identified through a project titled 'Preparatory Assistance for a Solid Waste Management Project' which was funded by UNDP. These gaps were:

- Within the island and atolls there is insufficient funding of waste management infrastructure equipment and practices. It is noted that this is not the case within Male'
- The lack of investment outside of Male' is exacerbated by, or is possibly a function of, an absence of appropriate cost recovery mechanisms.
- Inadequate institutional capacity within key government agencies, coupled with a lack of clear roles and responsibilities, has resulted in an absence of clear leadership or co-ordination on the subject
- Inadequate level of public education and raising awareness amongst the public resulting in uncertainties regarding available options.

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- Weak legislative and regulatory framework which hinders monitoring and regulatory functions.
- Limited opportunities for the involvement of the private sector in service delivery

Existing barriers preventing the delivery of efficient waste management services were identified, and appropriate interventions were recommended for their removal. Seven islands in four different atolls were visited where site inspections were undertaken in conjunction with stakeholder consultations. In addition, relevant government stakeholders were visited

to assist in the identification of barriers to waste management.

## COASTAL AND MARINE RESOURCES

While reef fishery has recently become popular due to the demand created by the tourism industry, Maldivians have traditionally been engaged in tuna fishery for generations. Today, the key components of the sector are pole and line skipjack fisheries, hand line yellow fin fisheries, and fishing of groupers and other reef fish, sea cucumbers and lobsters.

The sector has accounted for around 4-6 percent of GDP in recent years and contributes to Maldives' earning of foreign exchange on account of the export of fresh, chilled, frozen and canned skipjack and yellow fin tuna. With fishing fleet of about 1,200 vessels, close to 15,000 fishermen and their families depend on fishing. The sector represents about 10-15 percent of the local workforce.

Following the liberalization of the skipjack industry in 2001, there has been large scale investment in infrastructure in the past few years. The disposable tuna catch is purchased by 5 companies that have exclusive rights to buy skipjack tuna under agreements with the government. Meanwhile a fishery for large yellowfin tuna has developed independently in recent years and represents, on average about 14 percent of the total landings over the past five years. However, being a very seasonal industry, there have been fluctuations in landings. This has inevitably resulted in difficulties for the industry at times when planned growth patterns have not materialized. Concurrently as the size of fishing vessels have increased in recent years, they have become less fuel efficient and therefore, fewer trips are made during periods of low-catch of high overheads.

*Goals of the Sector*

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- Ensure the sustainable development of fisheries for economic diversification and growth
- Expand youth participation in the sector
- Promote exports and trade of the fisheries sector
- Enhance infrastructure and financial services to support sector development
- Promote research, training and technical development in the sector.

### Constraints of the Sector

- Heavy investments were made following the high fish landings in 2005 and 2006 when local fishermen and boat owners invested in newer and bigger boats. Falls in catch over the past two years have impacted these new investments heavily with the low fishing period and also coinciding with higher fuel prices, crippling the industry.
- Lack of cooling systems on vessels is a major constraint for catch storage on local fishing vessels until its delivery to land centers. It is now widely accepted that all fishing vessels need to be designed and equipped with cooling systems to enable delivery of higher quality fish for better returns on catch.
- The existing legal framework does not allow effective modern management of the sector.
- A boat building code and associated guidelines are necessary in order to manage the capacity and quality issues as well as the engine sizes of the vessels. An optimum boat and engine size has yet to be identified but it is observed that smaller vessels consistently operate profitably during low fishing seasons.
- No dedicated fisheries ports in the Maldives exist with modern services and facilities such as fuel, ice and water and other amenities.
- No major investments have been made although the Maldives has all the basic characteristics necessary to develop a lucrative aquaculture industry.
- Maldives has not yet become a member of IOTC which is the regional fisheries management body in the Indian ocean, although it is widely accepted that due to their migratory nature tuna stocks can best be managed regionally.
- Nonexistence of a marketing body hinders the opportunity to capture the best market price for pole and line methods of fishing.

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### LAND RESOURCES

Recognising that agriculture is the principal source of livelihood for a significant proportion of the population, the Government is committed to its development by establishing better infrastructure, investment in research and new technologies, establishing sustainable support mechanisms and expanding the reach of local produce within the country. Agriculture is an important supplementary source of food and cash even on islands with a diversified occupational base. Development of the agricultural sector is crucial to address the MDG goal of poverty alleviation and the national problems of high malnutrition and food insecurity.

However, while agricultural output has increased in recent years its contribution to the economy and labour force of the country has remained low.

Due to natural limitations unique to this sector it is able to contribute only 10 percent of the country's food requirements. This has forced the country to be import-dependent for staple food items such as rice, wheat flour, potato, edible oil and sugar. The degree to which Maldives is dependent on food imports makes it vulnerable to external price shocks – a major hurdle to fulfill people's right to food security. However in recent years the local produce of some products have exceeded the import quantity and thus reduced dependency on their import.

Agricultural systems are grouped into three major types of farming; subsistence, semi – subsistence and commercial. The viability of the latter two is dependent on the transport and marketing systems in addition to the research, advancement and technical support provided by the Government. Farmers must be able to reach major markets for agricultural products to sustain their business. While the increase in the number of resorts has created a substantial marketplace for local produce, expensive and unreliable storage and transportation systems causes problems for the assured supply and delivery of fresh, high quality produce demanded by the hotel industry.

All these factors result in the local farmers having to plan transportation, marketing, and selling their produce. As a result most of the produce are usually sold only in Male' and rarely in other islands.

*Goals of the sector*

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- Reduce dependence on imports and improve national food security
- Promote agriculture for economic diversification and poverty reduction
- Improve national food security status by strengthening agriculture sector
- Strengthen value – chain in agriculture
- Ensure equitable access to support in agriculture

### *Constraints in the sector*

- Natural resource limitations due to fragile agro-ecological conditions such as low percentage of arable land, limited good quality soils and groundwater, wide dispersion of communities and production areas.
- Labour shortage in the sector due to the obstacles to the expansion of the sector, lack of incentives for farmers, perception of farming as a low-class occupation and not being sufficiently trained or introduced to the sector at early ages.
- Technology related constraints include weak and non-participatory research systems, under developed extension systems that are unable to respond fully to emerging needs of farmers and entrepreneurs. In addition there is substandard quantity and quality of agricultural inputs, inadequate storage facilities, processing technologies and quarantining to control pests and diseases.
- Infrastructure and marketing constraints include an unreliable transportation network as well as the lack of critical facilities such as harbours and jetties on agriculturally important islands. There is also a lack of wholesale market infrastructure in regions and atolls and an absence of market information system. The industry faces high unit costs due to spatially dispersed (and often unviable) markets and unavailability of capital financing.
- Institutional constraints include the lack of organization capacity, lack of private sector participation, insufficient legal and regulatory provisions which limit the growth of the sector.
- Lack of trained personnel in the sector at all levels.

## ENERGY RESOURCES

The Government recognizes that electricity, fuel and energy security are a human rights and is committed to the provision of these at affordable costs to all Maldivians. As the Maldives has no

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conventional energy resources it is dependent on imported petroleum fuels to meet almost all of its energy needs<sup>15</sup>.

Due to the increased use of electricity and transportation, national energy consumption also increased in Maldives from 223,970 tons of oil equivalent (toe) in 2002 to 348,610 toe in 2008. More than 70% of primary energy demand and a large proportion of power generation and transportation use diesel fuel. Sixty percent of all electricity produced in the country is produced and consumed in the resorts. Until recently, State Electric Company (STELCO) supplied power to 32 main population centers of the Maldives. Power generation for Male' accounts for approximately 72% of all generated power for inhabited islands. Power demand in Male' is expected to grow rapidly at a rate of more than 11% per annum<sup>16</sup>.

To meet the increase in fuel prices and to maintain cost of electricity, the Government has been subsidizing the operational costs of electricity generation in Male' and other inhabited islands.

The dispersed nature of the islands does not allow the installation of a single national grid. Each island is forced to operate and maintain its own powerhouse and power distribution system. The initial investment costs and subsequent running costs of powerhouses on other smaller islands are very high. The current price of electricity ranges from US 0.12 to US 1.16 per unit (kWh). The lower prices are for larger systems operated by STELCO. For smaller systems, like those found on other islands, the prices are high due to small scale and operational inefficiency. Although the country is expected to continue to rely on imported fuels for most of its energy needs, renewable energy resources such as solar power and wind have been identified as potential replacement sources for electricity generation whereas biomass and biogas have been identified as potential energy sources for cooking.

One of the priorities of the Government is for the country to achieve carbon neutrality by 2020. The Government authority primarily responsible for this initiative is the Ministry of Housing, Transport and Environment. The initial process has been to prepare the National Energy Policy Guidelines and an action to implement the strategies.

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<sup>15</sup> Aneh Dhivehi Raajje" – The National Strategic Action Plan 2009-2013

<sup>16</sup> Aneh Dhivehi Raajje" – The National Strategic Action Plan 2009-2013

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Energy efficiency is a central component of the National Energy policy. The policy framework for 2009-2014 is designed to steer the Maldives to a new and sustainable future. Energy efficiency helps the Maldives to reduce greenhouse gas emissions and energy costs. Efficient energy use directly contributes to the security of energy supply, sustainable transport, affordable energy and environmental sustainability. Developing energy efficiency products and services will also support jobs and growths in the energy sector.

The objectives of this sector are to:

- Make energy supply secure and affordable
- Reverse the increasing dependency on diesel powered electricity generation in the Maldives and limit climate change
- Provide for reliable delivery of energy and guard against energy emergencies
- Invest in advanced energy technologies that will enable carbon neutrality and improve energy efficiency.
- Acquire and demonstrate sound water technologies suitable to small coral island environment.

The Maldives has an extreme dependency on imported petroleum based fuels to provide for power generation, transportation, lighting, water production and food preparation. In 2007, the Maldives imported 250,866 MT of diesel, 28,115 MT of petrol, 14,124 MT of aviation gas, and 6,051 MT of LPG. The total CIF value of imported petroleum products stood at Rf 2.6 in 2007<sup>17</sup>.

The electricity generation sector is the largest consumer of fuel and is one of the fastest growing sectors. This trend reflects increased electrification in the islands as well as the growth in tourist resorts. The production of electricity can be classified under four segments for comparative analysis : (1) Stelco operated electricity production in 32 islands including Male', Villingilli, Hulhumale' and S. Gan (2) Inhabited islands covered by community and private operators in the atolls; (3) Private electricity production in 97 tourist resorts ; (4) Electricity production for industrial purposes and industrial islands such as Felivaru, Maandhoo and Kooddoo.

At present, the total fuel consumption per year by STELCO is around 63 million liters. The consumption of diesel for electricity production in the inhabited islands is estimated to be 7.5

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<sup>17</sup> Maldives National Strategy for Sustainable Development 2009

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million liters. Assuming average use of 38,07 liters of diesel per bed and 18,498 beds the diesel consumption of tourist resorts for electricity generation is estimated to be at 70 million liters. From the data available from three fish canning and freezing installations of MIFCO, the estimate of annual diesel consumption for industrial fisheries is 6 million liters. In addition, Male' Water and Sewerage Company (MWSC) provides desalinated water for consumption in Male', Villingili, Hulhumale' and Maafushi. More than 500m<sup>3</sup> of water is produced daily and MWSC used 2,126 tonnes of diesel to produce water in 2004.

The fluctuations in world oil prices make the economy of the Maldives extremely vulnerable. For example in mid 2005 the price of diesel delivered to STELCO operations was around Rf 8.45 per liter. In mid 2008, the retail price per liter of diesel was Rf17.50 and this amounts to a total fuel expense of around Rf 1.1 billion per year for STELCO operations alone.

According to the first greenhouse gas inventory of the Maldives, total greenhouse gases emissions amount to 665,000 tons of carbon dioxide equivalent. Improvements in energy efficiency and the introduction of feasible, alternative sources of energy are therefore high priority needs.

The Science and Technology Master Plan of the Maldives identifies six alternative sources of energy for practical use in the Maldives. They are solar (including thermal as well as photovoltaic); oceanic; biogas; biomass and fuel wood; garbage; and wind. A survey conducted by Ministry of Communications, Science and Technology in 2004 showed that 10-15% of energy requirements (excluding transport) could be met by renewable resources.

The Energy Action plan 2009-2013 has been prepared in support of the energy policies and includes a series of actions, measures, programs and targets to be met over the next five years (to 2013) to achieve greater energy efficiency and conservation awareness, together with reductions in CO<sub>2</sub> emissions to meet Government targets. The Action Plan intends to persuade government, private organizations and individual citizens that energy conservation is the responsibility of all.

Solar energy and wind energy are considered to hold the best short term supplemental opportunities for application in the Maldives. Solar thermal is already widely used in resorts to heat water and lighting and in the islands for communication and navigational lighting. There is

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also good potential for use of solar energy for traffic signals, street lighting and other similar uses. Recently a demonstration solar – diesel hybrid power generation was established in Mandhoo where daytime electricity demand is met by solar.

The targets to advance energy security are:

- Become carbon neutral in the energy sector by 2020
- Ensure 50% of the electricity is from renewable sources by 2015
- Achieve a 50% reduction by 2015 in energy sector greenhouse gas emissions compared to 2000 levels
- Reach a saving of 7.5% of final energy consumption over 10 years until 2020 through efficiency.

*The Goals of the sector are to:*

- Provide reliable, affordable and sustainable energy supply to all citizens as a basic right
- Promote renewable energy technology applications, energy efficiency and energy conservation and increase the energy security of the country.
- Protect the environment and health of the people from the hazardous effects of energy production
- Reduce greenhouse gas emissions.

*The existing policies and strategies are provided in the:*

- National Energy policy
- Seventh National Development Plan (NDP7)
- Science and Technology Master Plan
- Technology Needs Assessment (TNA)

The proposed policies, strategies and tools are:

- Develop policy to harmonize in all the islands of the Maldives electricity tariff with market fuel prices and limit power sector subsidies.
- Introduce market incentives and life line tariffs to ensure affordability of energy supply throughout the country.
- With regard to energy generation, acquire renewable energy, co-generation, demand side management, and improved transmission technologies

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- Promote energy efficiency in electricity production, distribution and storage.
- Produce an analysis of how to achieve the existing targets for renewable and how further to promote renewable energies in a cost-effective manner over the long term.
- Without delay establish the institutional framework to implement clean development mechanism in the Maldives
- Promote demand side management with focus on key energy users such as public buildings
- Establish a regional power grid for Male' urban region and in Addu with submarine cables linking different centres.
- Adopt and implement an ambitious and realistic Action Plan on Energy Efficiency with particular attention to the tourism sector and growing air-conditioning needs in Male'.
- Energy suppliers should enhance the efficiency of power stations in particular by further promoting the use of combined heat and power
- Without further delay invest in regional fuel storage farms in five different locations of the Maldives
- Ensure strategic and emergency fuel reserves are in place in selected supply centres
- Acquire efficient energy use technologies, particularly in the buildings and residential Subsector. The specific technologies are: Efficient building design; energy efficient air conditioning and natural ventilation system; CFLs and solar lights; Solar water heaters/individual heater; Building materials, glass, aluminium and wood.
- Demonstrate infiltration gallery technology in selected islands.
- Undertake an in depth assessment of solar desalination technology and pilot test the technology in a selected location
- Enable household and community level rainwater harvesting through providing rainwater tanks free of charge to needy households and assist in roof retrofitting where necessary to prevent potable water shortages.
- Make it mandatory to harvest rainwater from all public buildings

## TOURISM RESOURCES

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The tourism industry has grown rapidly since 1972 transforming the Maldives into a quintessential island holiday destination with a global reputation winning international acclaim and awards. The growth of the industry has progressed largely on a planned path determined by a series of Tourism Masterplans. Economic growth in the key markets coupled with a collective promotion effort by the Government and the industry have facilitated continued good performance.

As is the case in many island nations, tourism here has become the key platform for national economic development. In 2008 tourism accounted for 27% of GDP and about 29% of Government revenue directly. It also accounts for more than 24,000 jobs<sup>18</sup>.

Sustainable tourism development has been the key to the Maldives as a tourist destination. An established regulatory framework is responsible for overseeing safe and environmentally sound development, construction and operation of resorts.

A total of 96 islands had been developed into tourism resorts by the end of September 2009. An additional 62 resort/hotel development projects representing over 10,000 beds have been allocated and they are in various stages of construction.

In the past resort development was concentrated in the central region of the country within easy reach of the Male' International Airport. However under the new policy, islands for resort/hotel development have been released across the country, along with plots of land for city-style hotel development in inhabited islands. The decision for development of guesthouses in the atolls is expected to bring direct benefits to island communities while reviews of regulations are needed for these emerging markets and products.

The volume of tourist arrivals has risen from 42,000 in 1980 to 683,000 by 2008 producing an annual average growth rate above 12 percent compared with a global average of 5 percent. The supply of tourist accommodation increased from 2,400 beds to about 23,500 over the same period. The initial Third Tourism Master Plan projections forecast that visitor arrivals would reach a million visitors by 2011 with a target of 33,327 beds by the end of the Third Tourism Master Plan period.

However tourist arrivals are susceptible to fluctuations in the global economy. The recent global recession reduced industry growth rate to 1.1% in the last quarter of 2008. Currently, the growth

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<sup>18</sup> Ministry of Tourism, 2006

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rate stands at -8%. It is estimated that average growth will be about -7% by the end of the year. Industry projections estimate that tourist arrival levels reached in 2008 will not be met until 2011.

Maldives Tourism Promotion Board which is the marketing arm of the Ministry of Tourism Arts & Culture, mandated with destination promotion and marketing is considering restructuring the institution to improve marketing activities, financing and management. A study is planned in 2009 with assistance from UNWTO to identify a suitable corporatization model for the Maldives Tourism Promotion Board. A strong marketing strategy and adequate promotional activities are required to support the tourism sector in improving arrivals and meeting with the targeted growth in the short and long-term.

### *Goals of the Sector*

- Promote sustainable investment in the tourism sector and supporting infrastructure
- Improve training and employment opportunities in the sector for Maldivians
- Ensure environmental sustainability of all tourism related ventures.

### Constraints of the Sector

- Raising investment finance remains a major obstacle in meeting development targets in the sector. Investment banks and easy loans for tourism investment projects for locals are needed for the sustainable development of the industry. Since the end of 2008, the global economic recession has significantly affected the planned private sector tourism developments and there has been subsequent loss of government revenue due to resulting delays.
- With over 70 percent of tourists sourced from Europe any impact on European economies or change in market sentiment affects tourism in the Maldives
- The newly enacted Labour law requires supporting tripartite discussion and dispute resolution mechanisms. Consequently tourist safety and security is an emerging issue that is of concern to the industry.
- The Government's commitment to the carbon neutral policy envisages a switch from fossil fuel to renewable energy by 2020 with planned 50% reduction in electricity generation by fuel by 2015. Naturally, the tourism industry which is high in energy dependency will need to have an adaptation strategy formulated urgently with technical

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and financial assistance to revert to alternative sources of energy and to adapt to climate change.

- Since the development of international tourism in the Maldives, there has been a mismatch of trained human resources to the opportunities created in the sector. Although the Faculty of Hospitality and Tourism Studies at the Maldives College of Higher Education conducts some courses, and a few resorts conduct internship programmes, the necessary pool of skilled human resources has not been developed domestically. Furthermore, although it has improved significantly over the years, women have generally not taken to direct employment in resorts and hotels due to the stigmatization of tourism jobs, social values attached to working away from home and due to undesirable working conditions.
- Direct contribution of the tourism industry to general economic development in the Maldives has been limited in part due to the one-island, one-resort concept that has been employed until recently. With a view to meeting sustainable development objectives and maximizing economic benefits to the local communities. The Government has recently proposed PPP models of engaging tourism operators in the nation's infrastructure development through their corporate social responsibility obligations.

## BIODIVERSITY RESOURCES

The greatest diversity of life in the Maldives occurs in the coral reefs of the island nation. The life on the reefs is characterized by high diversity and low abundance.

At least 1090 species of fish and 187 coral species have been recorded from the Maldives. The other groups such as mollusks and crustaceans are poorly studied and only a little over 400 species of mollusks, 350 species of crustaceans have been recorded from these diverse groups.

The islands are typical coral islands with limited life on land. About 583 species of plants have been recorded of which 260 are believed to be native or naturalized and 323 are cultivated plants introduced for agriculture and ornamental purposes. Nearly 170 species of birds have

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been recorded in the Maldives of which few have localised distributions in the Maldives and many are migratory species.

Many islands harbor small wetland areas and sea grass beds. These areas have been poorly studied and the variety of life in these little known. Endemic species are few in the Maldives. One species of fish the blenny (*Ecsenius minutes*) has been recorded only from the Maldives and the anemonefish, (*Amphiprion nigripes*) is recorded from the Laccadives and Sri Lanka apart from the Maldives.

Habitat destruction and over exploitation are major threats to the biological diversity of the Maldives. Coastal development activities like harbor development and land reclamation adversely effect the reefs around such areas. Coral mining for construction of buildings and coastal protection is a major concern. Land clearance for housing threatens the scarce terrestrial biological diversity of many islands, especially the highly populated islands. Over – exploitation of high valued reef resources such as sea cucumber, groups and giant clams have become a major issue in recent years. Timber harvesting threatens the survival of old growth and hardwood trees on uninhabited as well as inhabited islands. In addition, affects of increased sea temperatures, due to global warming on the health of the coral reefs are a major concern.

The major underlying cause for loss of biological diversity in the Maldives is the increased demand on natural resources due to population expansion and rapid economic development. There are only limited natural resources to cater to an increasing population. Paucity of biological resources results in a few resources being intensively utilized by many user groups. Conflicts between user groups for these limited resources are becoming an increasingly important issue. In addition, there are few alternative income earning opportunities to exploit biological resources and marine resources, in particular, especially in the islands other than the capital Male' and tourist resorts.

Maldives has taken some initiatives on biodiversity conservation. Several marine species including napoleon wrasse, dolphins, turtles, whales and black coral have been protected. A total of 23 bird species are protected of which 17 are seabirds. A total of 25 marine sites have been declared as protected and only diving and bait fishing are allowed at these sites. In addition three unique islands are protected.

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Some measures have been taken for sustainable use of the biological resources of the Maldives. Several regulations are in place to control the exploitation of some species. A size limit has been placed on lobster harvests and exploitation of sea cucumber using SCUBA gear is not allowed. The export of a number of marine species is prohibited while quotas are in place for species used in the aquarium trade. Coral mining from certain areas is prohibited.

However much remains to be done for effective biodiversity conservation. Although several regulations are in place for biodiversity conservation and sustainable use the capacity to monitor and enforce these regulations is minimal. In addition many of the regulations are formulated by different sectors such as fisheries and tourism. Therefore, there is little coordination between the various sectors in enforcing and implementing these regulations. Biological diversity is a part of every day living and if conservation is to be effective conservation measures need to be integrated into all relevant areas under a comprehensive plan. Increased co-ordination between the various organizations is required. Strengthening laws and regulations and their enforcement is an immediate requirement. Capacity building to plan and implement biodiversity conservation activities in all areas is a high priority.

To date the Maldives has designated 33 Protected Areas out of which 28 are Marine Protected Areas. The areas are protected by Environment Law 4/93. The areas are protected due to its unique morphological and natural characteristics and presence of mega fauna and flora.

### I. Obtaining a policy buy in:

The Marine Protected Areas are established under the law 4/93 and the extents of public acceptance of such areas have been quite limited due to lack of implementation of the law and awareness. However the perceptions are now changing and communities are now calling for more protected areas

### II. Acquisition of appropriate technologies:

Due to financial and resource constraints, the appropriate technology for such an extensive research is not available

### III. Land Delineation for the MPA

Most of the marine protected areas are represented in one single GPS point and such demarcations and boundaries are in few places which have been protected in recent years. However, work is on going to implement boundaries for existing marine protected areas by the Environmental Protection Agency.

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### IV. Development of Management Plans

The process of development of management plan for the Protected Areas is underway and some will come in action within the span of the year 2010.

### V. Self Sustainability

Specific management plans are prepared for the key areas which explains how the areas will sustainably utilized. Atoll Ecosystem based conservation project (AEC) will prepare two management plans for the Marine Protected Areas and prepare management plans for 5 selected Marine Protected Areas.

Progress has been made in the following:

- I. Integration of biodiversity protection into national sustainable development strategies – Atoll Eco Based Conservation Project (AEC) has already developed this strategy
- II. Building partnership with stakeholders for conservation and sustainable use of biodiversity resources: the approach for conservation and sustainable use of resources is holistic and it builds partnership between the key stakeholders in benefit sharing and management of the protected area. These works are done in the preliminary phase as well as the implementing and monitoring stage. Hence the work is focused greatly on stakeholder involvement
- III. Addressing island biodiversity within the context of climate change and land degradation: Due to a lack of capacity, expertise and finance, the above mentioned area has not yet been addressed.
- IV. Implementing guidelines on the Convention on Biological Diversity and Tourism Development: these guidelines have been developed as well as implemented.
- V. Establishment of protected areas consistent with international law and based on scientific information: The protected area or the proposed protected areas is selected based on various factors;
  - a. Environmentally sensitive areas
  - b. Historically important areas
  - c. Areas consisting special morphological features
  - d. Area enriched with mega flora and fauna and habitats with unique features
  - e. Economically viable areasThese areas are categorized according to international criteria such as IUCN and various international specified laws and regulations
- VI. Controlling the spread of alien and invasive species : this is an ongoing process

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- VII. Develop local capacity for protecting and developing traditional knowledge of indigenous groups taking into account the Convention on Biological Diversity and the Bonn guidelines: Capacity of the locals are developed for protecting and developing traditional knowledge with respect to the beliefs, values and practices of the indigenous groups. The guidelines as well as the management plans are site specific and produced upon various consultation processes in which greater part constitutes of the long standing traditions and practices of the specific region, indigenous, or local communities.
- VIII. Participation to address intellectual property rights: This is an ongoing process
- IX. Developing human and institutional capacity for research on biodiversity especially taxonomy: Presently there is no supporting system for the development and implementation of national bio-safety.
- X. Supporting the development and the implementation of National bio-safety especially taxonomy: Presently there is no supporting system for the development and implementation of national bio-safety.
- XI. Building community capacity to conserve important species, sites and habitats: The work is underway for the capacity building for the communities in the subject of conservation of important species, sites and habitats. The management plan constitutes of the role and responsibilities of the communities, hence strengthening the capacity of the community. Decentralised management of Protected Areas are now considered in the approach to Protected Area management.
- XII. Development of economic incentives for the application of clean technologies: These activities are included in the draft of the Environment Act as well as the EIA regulations
- XIII. Improve the living standards of coastal communities: this work is implemented as part of Mangroves for the Future (MFF) project which looks at improving the living standards of coastal communities. A National Strategy and Action plan has been developed.

### TRANSPORTATION AND COMMUNICATION

One of the five main pledges of the Government is to create a nationwide transport system<sup>19</sup>. An integrated transport network is a top priority of the Government in order to foster regional development. The Government recognizes transport and connectivity as pivotal in fostering economic growth and social cohesion.

Ninety – nine percent of the Maldives constitutes ocean; but to date there is no sea-based integrated public transport network between the islands. People residing in the islands do not have affordable means of transport even to the neighbouring islands. Chartering a boat to travel to a nearby island becomes unreasonably expensive for the general public.

Due to the limited inter-island transportation facilities, development has been concentrated solely on the capital Male', leading to congestions and resultant socio – economic problems. Island residents find it easier to travel long distances to Male' for basic services than to neighbouring islands. The lack of a proper transportation system between islands and atolls has hindered and constrained involvement of island residents in contributing to national development and development of their islands.

To address this situation a concept plan for a nationwide sustainable integrate transport network has been developed. This transport network will enable equitable distribution of wealth, encourage economic development, enable social and commercial networking as well as the transportation of goods and services, and provide easy access to essential services closer to home for all citizens.

Land based public transportation is also a priority of the sector to assist the integrated ferry network which in turn reduces the number of vehicles used within the islands. The Government's vision to minimize private vehicles, introduce green – taxi and pedestrian friendly environment will help to reduce pollution and achieve carbon neutrality. To achieve these

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<sup>19</sup> "Aneh Dhivehi Raajje" – The National Strategic Action Plan 2009 -2013

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objectives, the Government will increase the licensing and parking fees and impose high violation charges.

The Government has also recognized civil aviation as important to the development of the country and intends to provide aviation in a safe and economic manner. The aviation policy of the Maldives is based on the Convention on International Civil Aviation (the Chicago Convention). The Civil Aviation Act (02/2001) stipulates that all relevant rules and regulations have to be at or above the promulgated in the Annexes to the Chicago Convention Standards and Recommended Practices (SARPs). Each contracting state is audited to ascertain the level of compliance with ICAO Annexes under the Universal Safety Oversight Programme (USOAP).

Local regulations will also have to reflect the aviation security conventions (Tokyo, Hague amendments) that may be issued to Annex 17 (Security) to the Chicago Convention. The ICAO Universal Audit Programmed (USAP) is an initiative to establish a global aviation security system and provides for the conduct of universal, mandatory and regular audits of the aviation security systems in all ICAO member States. The Maldives was audited under this program in 2006 and the follow – up was done in 2008.

### *Objectives of the Sector*

- Ensure that transport systems meeting society's economic, social and environmental needs whilst minimizing their undesirable impacts on the economy, society and the environment
- Reduce demand for transport to Male' from different islands
- Reduce significantly transport sector greenhouse gas emissions
- Reduce pollutant emissions from transport to levels that minimize effects on human health/and or the environment
- Achieve a balanced shift towards environment friendly transport modes to bring about a sustainable transport and mobility system.

### *Goals of the Sector*

- Connect services, markets, people and harbours through and integrated transport system which will ensure equal access to affordable transportation for all citizens.
- Make airports and regional ports more sustainable by seeking public private partnerships in the development and operation

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- Ensure the safety and security of the transport sector
- Promote and encourage the orderly and economic development of the transport sector
- Develop human resources, financing and strengthen the legal framework of this sector

### *Constraints and Emerging Issues of the Sector*

There are several key constraints and emerging issues in the transport sector;

- While a majority of the country's population are forced to travel to Male' for basic needs there is no public terminal and citizens face great difficulties in boarding, loading and offloading goods at the Male' harbor.
- Even though various service centres have been established at regional level, an affordable transport system to access these services is lacking
- Harbours have been established on several islands at huge financial cost even though these facilities cannot be utilized due to the lack of any inter island transportation.
- Populations of the nation are scattered into small island with limited people. Hence traffic alone on any route may not be initially sufficient to make the whole transportation network feasible unless the transportation service providers have been given opportunities to operate ferry terminals and generate revenues. However, a major constraint the development of the sector is the dearth of investment capital. It is very important to source finance to the interested private sector party for the development of the terminals and capital investment of boats to enhance the development.
- Private investors are reluctant to invest in inter-island transport due to the lack of a transparent legal framework for the sector.
- Air transport activities within the country are expected to grow with the introduction of medical evacuation services, helicopter operation and large jet aircraft. At present 44 aircrafts are on the Maldivian Register utilized among 3 aircraft operators. There are 15 Approved Maintenance Organisations (AMOs). There are 2 international and 3 domestic airports and 56 floating platforms in operation and a further twelve sites are identified for airport development.
- Inadequate capacity of qualified and competent technical staff in the Civil Aviation Department (CAD) is a serious constraint for an effective oversight organization. It is imperative that appropriately trained and experience personnel are available and retained.

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With increasing globalization, international connectivity is critical for sustaining economic growth. Male' International Airport and Hulhule with a runway of 3200m by 45 m is the main gateway to the Maldives. In 2006 more than 35 airline companies operated 10,470 international flights. The total number of international arrivals reached 734,733 while there were 113,854 transit passengers. Cargo freight that came into the Maldives was 20,350,648 kg while 15,118,680 kg of cargo was exported. In order to upgrade facilities and relieve congestion a new development phase is underway at the Male' International Airport. The regional airport in Gan in the south was upgraded recently to international standard and direct international flights began operation in 2008.

Male' Commercial Harbour (MCH) has been the only international sea port until December 2005 when two regional sea ports in Khulhuduffushi in the North and Hithadhoo in the South, were commissioned and opened for international service. The Male' Commercial Harbour can accommodate vessels up to 15,000GT and has 1.7 ha of open storage and 0.3 ha of closed storage area. The annual cargo throughput reached 1,234,700 freight tones in 2004.

Due to the geography of the country, air transportation is crucial for the development of the country. In addition to the two international airports; Male' and Gan, there are three regional airports ; Hanimaadhoo, Kaddhoo and Kaadedhdhoo. Island Aviation Services, an 100 percent state owned company offers daily scheduled services to the four regional airports and transported approximately 110,000 passengers in 2005. Two private companies, Maldivian Air Taxi (MAT) and Trans Maldivian Airways (TMA) provide sea plane operations for transfer of tourists from Male' International Airport to tourist resort islands. They operate more than 40,000 flights a year and transported approximately 400,000 passengers in 2005.

An efficient maritime domestic transport network is critical for the holistic development of the nation. From 1005 to 2005, harbor construction projects in 74 islands, channel deepening projects on 14 islands and 08 land reclamation projects were completed. Of the 198 inhabited islands in the Maldives 105 have proper harbours and access facilities.

Cargo-come-passenger vessels carry most of the inter-island cargo and passenger traffic. Cargo vessels usually berth at the North Harbour in Male'. The average time at port is 7 days for "front loading" cargo vessels while it is 17 days for "side loading vessels".

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Although a number of ferries are operated by island communities, private parties or the Maldives Transport and Contracting companies, the scheduled ferry services network in the Maldives is still very limited.

Recently, land transport has become an issue of major concern, especially in the capital Male'/ The increase in the number of passenger vehicles, especially motor cycles and cars, is threatening the safety on roads and the quality of the environment. Concerns have also been raised about the type and extent of fuel used for land transport. Throughout the inhabited islands a complex network of roads is found and is built generally with coral sand. The two most significant inter-island roads are found in Addu Atoll and Laamu Atoll, both approximately 14km in length. Proper traffic engineering designs, construction of safe roads and establishing road safety measures is a priority.

The targets are to:

- Establish an integrated public passenger transport service by 2010
- Halve road transport deaths by 2015 compared to 2005
- Reduce CO2 emissions from light vehicles – the average car fleet should achieve CO2 emissions of 140g/km by 2015
- By 2015 not less than 10% of transport fuel should consist of biofuels, as an indicative target, considering raising their proportion to 20% by 2020.

The existing policies and strategies are given in:

- The Transport Master plan
- Male' International Airport Master Plan
- National Strategic Action Plan
- Technology needs assessment

The proposed policies, strategies and tools are:

- Take measures to improve the economic and environmental performance of all modes of transport and, where appropriate measures to effect a shift towards lower transport intensity through production and logistic process reengineering and behavioural change combined with a better connection of the different transport modes.

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- Improve energy efficiency in the transport sector by making use of cost effective instruments.
- Focus on possible alternatives to transport to Male' for freight and passengers including the appropriate development of the regional airports as hubs.
- Network and establish links for freight logistics, for tourist resorts
- Establish effective solutions for the reduction of harmful impacts of maritime travel such as waste and oil disposal.
- With a view to halving road transport deaths as well as reducing the number of injured in road traffic, increasing road safety by improving road infrastructure, by making vehicles safer, by promoting awareness campaigns with a view to change road user behavior and effective driving lessons and testing.
- In urban centres, councils should develop and implement urban transport plans and road side tree planting to make roads pleasant for pedestrians.
- Develop a long term and coherent fuel strategy for transport needs across the Maldives
- The following technologies are needed for the management and policy improvement of land transportation system, public transport systems, cleaner efficient fuel vehicles, using natural gas or LPG, hybrid vehicles, urban traffic planning and landscaping, air quality emissions testing vehicle inspection and monitoring equipment, traffic control systems.
- Technologies needed for the marine transport sector are: scheduled ferry system, regional ports and hubs (integrated tourism and fisheries service centres); organized cargo delivery; hybrid vessels.

### *Communication*

The Maldives is currently seeking ways to take advantage of science and technology to promote economic development. Better quality education, training and research and development are viewed as pre requisites to the advancement of human resources necessary to utilize new technologies. Information and Communication Technology (ICT) plays a vital role in linking our dispersed communities and reduce the impact of the geographical isolation that exists between island communities of Maldives. ICT will also play a major role in achieving the economic and social goals of good governance, and human rights developmental objectives envisaged in the Manifesto of the current Government.

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Telecommunications services, especially the cellular mobile services have expanded to cover nearly the entire country. Two independent network infrastructures established throughout the length of the country have created better availability and accessibility to telecommunications services and created new opportunities to provide higher capacity and access to a wider population. It has allowed the introduction of new services at cheaper prices, especially on the mobile network, although tariffs for land-line and international services have also reduced. While internet access is available across the nation, broadband services are only available to key population centers.

A more comprehensive regulatory framework was established that provided sufficient powers and transparency to the Regulator, resulting in foreign as well as local investments in the sector.

Maldives is in a better position in terms of telecommunications development compared to most countries in the South Asia region, as over 100 percent penetration in teledensity has been achieved. Nevertheless much work remains to be done to further improve the national telecommunication scenario and to keep abreast of the developments in regional and global telecommunications markets.

A Government computer network is currently being used and e-government is being implemented under the ongoing Information Technology Development Project (ITDP). An integrated Public Accounting System to enable better accountability is also in the process of being implemented. At the same time the Government seeks to follow – up on strengthening science and technology education, promoting the effective use of instructional technology at all levels of the education system, and modernizing the health information system and to deliver public services electronically.

### *Goals of the Sector*

- Drive Maldives towards the use and development of telecommunication and ICT technologies to enable citizens to fully embrace its benefits and achieve the right to information
- Provide affordable telecommunication and ICT services
- Provide government services in a transparent democratic and equitable manner
- Enhance the role of science and technology in the attainment of governance, human rights, economic and social development and to support economic diversification.

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### *Constraints in sector*

- While there are improvements on availability of bandwidth within the country it does not provide sufficient capacity for availing broadband connectivity on a wider scale to improve internet and other ICT applications. The success of broadband ICT will depend heavily on the available national broadband capacity and affordable services across the nation. The requirement is further enhanced with the recently introduced submarine optical fiber cables that connect Maldives to the outside world.
- Effective use of ICT and e-government requires comprehensive capacity building and resources in order to develop e-services and to make infrastructure and services sustainable.
- Scientific advances and worldwide trends indicate that Maldives should urgently seek to expand and deepen activities in science and technology particularly in areas which appear likely in the short and medium term to make contributions towards research and development and innovations to improve the economy and standards of living of its people.

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### KEY DOCUMENTS

- “Aneh Dhivehi Raaje” – *National Strategic Action Plan 2010- 2013*
- First National Communication of the Republic of Maldives to the United Nations Framework Convention on Climate Change, *Ministry of Home Affairs, Housing and Environment 2001*
- Maldives Post Tsunami Environmental Assessment, *United Nations Environment Programme 2005*
- Maldives National Strategy for Sustainable Development, *Ministry of Housing, Transport and Environment 2009*
- Maldives Strategic National Action Plan for Disaster Reduction and Climate Change 2010 - 2020, *National Disaster Management Centre 2010*
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- National Plan on Disaster Management, *National Disaster Management Centre 2010*
- Second National Environment Action Plan, NEAP II, *Ministry of Home Affairs, Housing and Environment, 1999*
- State of the Environment, Maldives, *Ministry of Environment And Construction, 2004*
- Third National Environment Action Plan, *Ministry of Housing, Transport and Environment 2009*

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### **KEY STAKEHOLDER CONSULTATIONS**

- Department of National Planning, Ministry of Finance
- Environmental Protection Agency
- Maldives Water and Sanitation Authority
- Ministry of Fisheries and Agriculture
- Ministry of Housing, Transport and Environment
- Ministry of Tourism, Arts and Culture
- National Disaster Management Centre