



**Ministry of Environment and Energy**

Republic of Maldives

**Climate Change Trust Fund**

## **Environment & Social Assessment & Management Framework**

### **Climate Change Adaptation Project**

November 2014

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## ACRONYMS & ABBREVIATIONS

AASWM	Ari Atoll Solid Waste Management	IPM	Integrated Pest Management
ADB	Asian Development Bank	ITCZ	Inter Tropical Convergence Zone
BATNEEC	Best Available Technology not Entailing Excessive Costs	IUCN	International Union for Conservation of Nature
BCD	Buoyancy Compensation Device	IWMC	Island Waste Management Center
BOD	Biochemical Oxygen Demand	LGA	Local Government Authority
BP	Bank Policy	MEE	Ministry of Environment and Energy
BPEO	Best Practicable Environment Option	MEMP	Maldives Environment Management Project
CBWMP	Community Based Wetland Management Plan	ML	Million Litres
CCA	Climate Change Adaptation	MoFA	Ministry of Fisheries and Agriculture
CCTF	Climate Change Trust Fund	MoGF	Ministry of Gender and Family
CECM	Clean Energy for Climate Mitigation	MoHF	Ministry of Health and Family
CEDAW	Convention on Elimination of All Forms of Discrimination	MRC	Marine Research Center
COD	Chemical Oxygen Demand	MVR	Maldivian Rufiya
		NAPA	National Adaptation Programme of Action
DEM	Digital Elevation Model	NBSAP	National Biodiversity Strategy and Action Plan
E&S	Environment and Social		
EA	Environment Assessment	NEAP	National Environment Action Plan
EEZ	Exclusive Economic Zone	NGO	Non-Governmental Organization
EIA	Environment Impact Assessment	OP	Operational Policy
EPA	Environment Protection Agency	PAP	Project Affected Person
EPPA	Environment Protection and Preservation Act	PDO	Project Development Objective
ESAMF	Environmental and Social Assessment and Management Framework	PMP	Probable Maximum Precipitation
		PMU	Project Management Unit
ESDD	Environment and Social Due Diligence	PSP	Private Sector Participation
		RAP	Resettlement Action Plan
ESIA	Environment and Social Impact Assessment	RPF	Resettlement Policy Framework
		RWMF	Regional Waste Management Facility
ESMF	Environmental and Social Management Framework	SAP	Strategic Action Plan
		SEA	Strategic Environment Assessment
ESMP	Environment and Social Management Plan	SIA	Social Impact Assessment
		SNAP	Strategic national Action Plan
EU	European Union	SW	South West
EVD	Extreme Value Distribution	SWM	Solid Waste Management
FAO	Food and Agriculture Organization	UNCBD	United Nations Convention on Biodiversity
GCE	General Certificate of Education		
GDP	Gross Domestic Product	UNDP	United Nations Development Programme
GHG	Greenhouse Gas	UNFCCC	United Nations Framework Convention on Climate Change
GoM	Government of Maldives		
GPS	Geographical Positioning System	WCCM	Wetland Conservation and Coral Reef Monitoring
IDA	International Development Association		
IEE	Initial Environment Evaluation		
IFRC	International Federation of Red Cross and Red Crescent		
IPCC	Intergovernmental Panel on Climate Change		

## EXECUTIVE SUMMARY

**Background:** The Government of Maldives (GoM) received support from the World Bank-managed Climate Change Trust Fund (CCTF) to deal with adaptation and mitigation of climate change. A multi-donor Maldives CCTF was established in December 2009 with the aim to build a climate resilient economy and society in Maldives through adaptation to climate change as well as mitigation for a low carbon development path. The total resources pledged by the European Union and the Government of Australia were US\$10.3 million. Three projects that have been implemented under the CCTF so far include: (i) Wetlands Conservation and Coral Reef Monitoring for Adaptation to Climate Change project (WCCM) (P128278); (ii) Clean Energy for Climate Mitigation project (CECM) (P128268); and (iii) AASWM pilot project (P130163). All the three projects are planned to end on November 30, 2014. The EU expressed its intention to support the second phase with a supplemental contribution of EUR 3.85 million. With support from CCTF second phase (CCTF-II), GoM proposes a project named Climate Change Adaptation (CCA) Project in the southernmost atolls (Addu/Seenu and Gnaiviyani) to undertake an integrate approach to respond to climate risks while ensuring environmental sustainability in a select geographical area. It is envisaged that this comprehensive approach of combining natural resources management and SWM may create synergy and establish a self-sustained system. The CCA Project supports initiatives to strengthen knowledge and leadership in the government, build adaptive capacity through pilot programmes, develop low-carbon options and improve policy and institutional capacities in both public and private sectors related to climate change adaptation and mitigation with a focus on flood management, wetland management, biodiversity conservation and integrated solid waste management.

**Purpose of the Environmental and Social Assessment and Management Framework: Projects and Programs** financed through World Bank need to comply with World Bank Operational Policies. Therefore, components eligible for funding under this project will be required to satisfy the World Bank's safeguard policies, in addition to conformity with environmental and social legislation and policies of the GoM. The overall negative environmental and social impacts of the project is minimal, as the project is focused on ensuring climate resilience and environmental management of wetland and coral reefs ecosystems, as well as setting up integrated solid waste management system in selected sites in Maldives. The objectives of the framework are to:

- Ensure that components comply with the relevant environmental and social safeguard requirements of the GoM and the World Bank.
- Provide a filter for investments, for ensuring that the selected investments are well-prepared and amongst the most effective in minimizing risks and enhancing positive impacts/benefits
- Avoid delays and extra costs which may subsequently arise due to unanticipated environmental problems;
- Make transparent the decision-making process in design and implementation of components
- Ensure that the investments are implemented in a sustainable manner by maximizing environmental resources management and socio-economic benefits to local communities within the scope of the project.

**Project Objective and Brief Description:** The project development objective of the CCA project is to demonstrate integrated multi-sectoral approaches to climate adaptive planning and management in Addu and Gnaviyani Atolls.

The CCA Project components with intermediate outcomes have the common theme of intent to contribute to delivering climate resilient island development. All components build on activities initiated in CCTF and use the lessons learned from CCTF-I. All are interdependent and all also require evidence-based and target-driven planning processes to deliver enhanced resilience to climate change.

The CCA project will have five components:

**Component 1: Wetlands conservation:** The purpose of this component is to establish a Protected Wetland Management system based on the implementation of the Community Based Wetland Management Plans (CBWMPs) for Hithadhoo and Fuvahmulah so as to provide ecosystem-linked benefits to the community.

**Component 2: Coral reef monitoring:** The purpose of this component is to develop a stronger evidence base on the status of coral reefs so as to support improved decision making and management of the coral reefs and related ecosystems by involving private sector stakeholders (such as Tourist Resorts, Dive Centres, etc., as well as the planned Protected Area Management Unit in Hithadhoo) in coral reef monitoring.

**Component 3: Development of an island level integrated SWM system:** The purpose of this component is to build the institutional capacity of Addu City and Gnaviyani/Fuvahmulah atolls and island councils to plan an atoll/island level integrated solid waste management (SWM) program to minimize the environmental risks to the country's marine and terrestrial assets while reducing GHG emissions.

**Component 4: Mainstreaming climate change into island development planning:** The purpose of this component is the mainstreaming of climate change into an island development-planning through training of council staff and elected members in partnership with the Local Government Authority (LGA).

**Component 5: Project Management:** The MEE has the overall responsibility for project implementation and for ensuring that the project objective is met. It will execute the project through the EPA, the MRC of MoFA, and the LGA in close coordination with the atoll/island councils. The CCA project will support the MEE in project management through this component.

**Project Location:** The project activities will be primarily carried out in Fuvahmulah, Hithadhoo and few selected sites in Addu City. Gn. Fuvahmulah (73°24'30"E and 0°16'45"S) and S. Hithadhoo (73°05'37"E and 0°37'06"S) are large islands with significant human populations, wetland area, rampant problem of flooding, and where wetlands play an important role in natural drainage and freshwater security. Hithadhoo and Fuvahmulah with a population of 14,323 and 11,073 (in 2009) are next only to Male. Both the islands have a richer diversity of plants compared to the northern islands. Hithadhoo's Eidhigali Kilhi, which is part of Addu City has the largest diversity of migratory species of birds in the Maldives. Although these islands are considered large by Maldivian standards (Fuvahmulah with 424 hectares and Hithadhoo with 525 hectares), the land available for infrastructure and developmental activities is limited – and consequently, there is a constant pressure for land expansion. Both islands face frequent rainfall-induced flooding attributed to both drainage patterns and to human activities (reclamation of wetlands, agriculture practices, and poor consideration for drainage in infrastructure planning). The wetlands in Hithadhoo and Fuvahmulah are among the largest in the country and are significant for biodiversity conservation, freshwater security and flood control.

Unlike other atolls of Maldives, Addu city possesses a natural anchorage within the city basin, as the atoll is land-locked with large islands surrounding the atoll. With a registered population of more than 31,000 it is one of the only two atolls of the Maldives belonging to the southern hemisphere and has a land area of 15,000 hectares. The coastal marine ecosystems of the atoll include reef systems, in the north and south of the atoll, as well as in the periphery of the intra atoll basin. In addition strands of mangroves are found around brackish water systems. Also swampy areas inland, with freshwater is common in the atoll. There are seven coral reefs in the Atoll with an area of 72 square kilometers. The atoll consists of coral islands with coralline soil on top of a thin lens of fresh water. The islands in the Atoll are large in comparison to other atolls, but are fewer in number. Most of the Islands have an average of 1-2 meters above mean sea level. The Atoll has the largest brackish fresh water pond in the Maldives and is a mangrove area of high significance, located in the northern tip of the island of Hithadhoo (*Eidhigali Kilhi*). The area supports resident and migratory bird populations and plant species of national significance. The sustainable human occupation of the islands can be attributed to these important coastal marine ecosystems and their high biodiversity value.

**Environmental issues and impacts:** The overall negative environmental impacts of the project is minimal, as the project is focused on ensuring environmental management of wetland and coral reefs ecosystems in selected sites in Maldives.

Activities under the component 1 - wetland protection and conservation such as zoning, fencing, improvements in waste management, and management of access and use of the wetlands will result in reduced environmental degradation. However, it is possible that due to activities under this component, negative impacts such as temporary disturbance to water bird breeding sites and issues related to shifting of solid waste to another location could also take place. In addition alternative livelihoods support provided under this Component could have negative environmental impacts if not adequately screened and implemented. Ecotourism development may also impact the environment due to increased visitation which will give rise to issues such as increase in waste generation, disturbance to fauna and flora, etc.

Activities under coral reef monitoring (component 2) are not expected to lead to significant negative environmental impacts. The monitoring process that will be put in place will help in ensuring the wellbeing of the coral reefs through identifying degradation of coral reefs both due to anthropogenic such as breaking of corals, removal of organisms, waste accumulation, etc. and natural causes such as climate variability and take necessary actions in time. Potential issues that may require due diligence include possible damage to corals, their habitat and to the associated organisms from activities/events related to field monitoring such as boat anchoring, oil leakages from boats, transect marking and physical monitoring. Safety issues may stem from malfunctioning of equipment, inadequate equipment, diving related accidents, etc.

The component 3 – which will include a strategic options study on integrated solid waste management that will assist Island Councils and communities of Fuvahmulah and Addu islands to identify the scope of the current issues related to managing solid waste and identify potential options of addressing the issues which will be environmentally beneficial in the future by minimizing the environmental risks to the marine and terrestrial assets while reducing GHG emissions. Support to the physical and operational improvement to existing island waste management centers will ensure the establishment of practices such as waste segregation, recycling and composting that will reduce the amount and types of waste to be disposed. While physical improvement expected which will likely to be only setting up of compost pads will not have significant environmental impacts. However, improper handling of waste during operations may lead to health and environmental hazards.

Components 4 and 5 will not have any negative environmental impacts since they are administrative and/or involve training and capacity building.

This project is a second phase of the Climate Change Trust Fund (CCTF) for Maldives. The project is classified under Safeguards Category "B" primarily to reflect the risks involved in physical activities under the first 3 components. There is an existing Environment and Social Due Diligence (ESDD) report prepared for the Wetland Conservation and Coral Reef Monitoring (WCCM) of CCTF phase 1 and Environment and Social Impact Assessments (ESIAs) for ecotourism activities of Hithadhoo and drainage management activities of Fuvamulah. In addition, an ESDD has been prepared for the Ari Atoll Solid Waste Management (AASWM) project also under the CCTF phase I. Based on the findings of the above reports, the project triggers OP 4.01 – Environmental Assessment to ensure any environmental impact associated with project activities are identified in time and mitigated, OP 4.04 – Natural Habitats as project area consists of protected areas and environmentally sensitive areas and OP 4.11 as undocumented and researched ruins of cultural and historical significance could be found in some of these sites.

***Social issues and impacts:*** The assessments carried out during CCTF phase I and recent reviews for the ESAMF prepared by the project shows that the social safeguard issues are not significant. Nonetheless, OP 4.12 has been triggered as there could be future chance find of involuntary land taking in the wetland conservation subproject component 1 impacting community adversely as a small percentage of community relies on the wetlands for agriculture and livelihood. A Resettlement Policy Framework has been prepared as part of ESAMF in line with the Bank's OP 4.12. However, there could be other social issues such as conflict during beneficiary selection for livelihood options; or in finalization of livelihood options; gender representation in community-led management body; etc.

Activities under coral reef monitoring (component 2) are not expected to lead to any negative social impacts.

The component 3 – which will include a strategic options study on integrated solid waste management that will assist Island Councils and communities of Fuvahmulah and Addu islands to identify the scope of the current issues related to managing solid waste and identify potential options of addressing the issues which will be environmentally beneficial to the community. However, improper handling of waste during operations may lead to health hazards for the community.

The ESDDs andESIAs carried out by the client during phase I shows that the social safeguard issues are not-significant. Nonetheless, OP 4.12 has been triggered for a “chance find” as there could be future chance find of involuntary land taking in the wetland conservation component impacting community adversely as a small percentage of community relies on the wetlands for agriculture and livelihood. There could be other social issues such as conflict during beneficiary selection for livelihood options; or in finalization of livelihood options; gender representation in community-led management body; etc. No social safeguards issue is anticipated in coral reef monitoring subproject. Since there is no indigenous community in Maldives, the OP 4.10 has not been triggered.

***Environmental and Social Management Framework:*** The framework part of this report consolidates the previous versions of ESDDs and information generated through ESIAs and includes protocols for screening project activities, guidelines for mitigation of environmental and social risks, and guidance on development of Environmental and Social Management Plans (ESMPs) and Resettlement Action Plans (RAPs) based on the phase I experience, as well as to reflect the new areas of interventions on SWM. It includes guidelines based on the existing international best practices for environmental sports diving prevalent in Maldives, including health and safety. It also provides specific technical guidance based on the conceptual designs of the components, grievance redress mechanism, as well as an entitlement framework. It also has a framework section on managing gender and development within the project.

***Institutional arrangements:*** The Project Management Unit (PMU) in the Ministry of Environment and Energy will have an Environment and Social (E&S) Coordinator who will report to the Project Manager and will work closely with the wetlands technical coordinator; solid waste management coordinator, the coral reef monitoring coordinator and the Communications Officer. The E&S Coordinator will be responsible for overall implementation of ESAMF and also liaison with other agencies at the island level to implement safeguards mitigation measures, monitoring and evaluation of implementation and report on compliance and status of performance indicators. In addition, project level coordinators will be appointed in the project islands. The E&S coordinator will orient the island level coordinators in environmental and social issues with assistance from the Communications Officer. The coordinators at island level will also be first level of contact for any grievance / feedback for the community.

In addition to the MEE, there are several ministries, departments and agencies that will be involved in the implementation of the CCTF-II project. These include the Environment Protection Agency (EPA), Ministry of Fisheries and Agriculture, Marine Research Center (MRC), Ministry of Tourism, Arts and Culture (MOTAC), tourist resorts and the Fuvahmulah Atoll Council, Hithadhoo Island Council. And Addu City Council Communities, Protected Area Community Advisory Boards in Addu and Fuvahmulah and communities. Communities and NGOs are still not well organized on the islands but have shown considerable interest to participate in the project.

***Consultation and Disclosure:*** Public consultations on the project (including environmental and social impacts) were held with affected stakeholders at local and national levels during the preparation of ESAMF. All safeguards related documents have been disclosed on September 11, 2014 in-country athrough print media and other means and will be disclosed in World Bank’s InfoShop. The client has published the ESAMF in the website requesting public comments. Once the project commences implementation, the project team is expected to have regular consultations with local stakeholders on issues related to environmental and social issues.

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# 1 INTRODUCTION

## 1.1 Background

The Government of Maldives (GoM) received support from the World Bank-managed Climate Change Trust Fund (CCTF) to deal with adaptation and mitigation of climate change. A multi-donor Maldives CCTF was established in December 2009 with the aim to build a climate resilient economy and society in Maldives through adaptation to climate change as well as mitigation for a low carbon development path. The total resources pledged by the European Union and the Government of Australia were US\$10.3 million. Three projects that have been implemented under the CCTF so far include: (i) Wetlands Conservation and Coral Reef Monitoring for Adaptation to Climate Change project (WCCM) (P128278); (ii) Clean Energy for Climate Mitigation project (CECM) (P128268); and (iii) AASWM pilot project (P130163). All the three projects are planned to end on November 30, 2014. The EU expressed its intention to support the second phase with a supplemental contribution of EUR 3.85 million. With support from CCTF second phase (CCTF-II), GoM proposes a project named Climate Change Adaptation (CCA) Project in the southernmost atolls (Addu/Seenu and Gnaiviyani) to undertake an integrate approach to respond to climate risks while ensuring environmental sustainability in a select geographical area. It is envisaged that this comprehensive approach of combining natural resources management and SWM may create synergy and establish a self-sustained system. The mid-term evaluation of the CCTF-I projects undertaken by the EU in February 2014 also recommended that a CCTF expansion should be built on lessons learnt from the pilot activities to improve approaches and implementation practices according to the realities on the ground. Hence the CCTF II bases its design on the lessons learnt from phase I. The CCA supports initiatives to strengthen knowledge and leadership in the government, build adaptive capacity through pilot programmes, develop low-carbon options and improve policy and institutional capacities in both public and private sectors related to climate change adaptation and mitigation with a focus on flood management, wetland management, biodiversity conservation and integrated solid waste management.

The PDO of the CCA project is to demonstrate integrated multi-sectoral approaches to climate adaptive planning and management in Addu and Gnaviyani Atolls. The project implementation period is three years (January 2015 to December 2017). Due to the project's short duration, the indicators will capture intermediate outcomes.

The key intermediate outcome indicators for the project will be:

- Establishment of a Protected Area management system for Hithadhoo and Fuvahmulah that provides ecosystem-linked benefits to the community.
- Strengthened evidence base on coral reef status for improved management and decision making.
- Improved capacity of GoM and Atoll/Island Councils of Hithadhoo and Fuvahmulah on island level SWM.
- Increased awareness on mainstreaming climate change adaptation in island development planning in Atoll/Island Councils.

The project has been designed in consultation with GOM, civil society and other stakeholders, as well as technical assessments undertaken and lessons learnt from the first phase of the CCTF projects as well as the IDA-funded Maldives Environment Management Project (MEMP).

The proposed CCA project has been designed based on consultations held with GoM, Atoll and Island Councils, other international development agencies operating in the Maldives, the private sector, the CCTF beneficiary communities and the civil society. Based on the established consensus, a tripartite discussion was held in Male' on August 5, 2013 between the Ministry of Environment and Energy, the European Union and the World Bank. The discussion was recorded in a document titled *Revised Results for CCTF II Funding*, which constitutes the core element of the 'Description of the Programme', and subsequently turned into a European Commission Decision adopted on December 3, 2013, allocating an amount of EUR 3.85 million.

There are five main components in the CCA Project that together contribute to delivering climate resilient island development. All the components build on activities initiated and lessons learned from the CCTF-I

interventions and are also complementary to each other. The wetlands conservation component builds on the community based planning achieved in CCTF-I and focuses on protected area management. The SWM component contributes directly to reducing the problems of waste dumping in wetlands and spillage into marine areas. The coral reef monitoring component focuses on strengthening a monitoring system to support evidence-based management. The mainstreaming component focuses on building capacity of Atoll/Island Councils in climate resilient planning drawing upon lessons from the other 3 components as well as from other projects in the Maldives. The fifth component is on project management.

The five components are described in the next chapter. All components will deliver climate resilience and adaptation in respect of development and the livelihoods that depend on this resilient and adaptive development.

## **1.2 Purpose of the Environmental and Social Assessment and Management Framework**

Projects and Programs financed through World Bank need to comply with World Bank Operational Policies. Therefore, components eligible for funding under this project will be required to satisfy the World Bank's safeguard policies, in addition to conformity with environmental and social legislation and policies of the GoM. The overall negative environmental and social impacts of the project is minimal, as the project is focused on ensuring climate resilience and environmental management of wetland and coral reefs ecosystems, as well as setting up integrated solid waste management system in selected sites in Maldives.

The objectives of the framework are to:

- Ensure that components comply with the relevant environmental and social safeguard requirements of the GoM and the World Bank.
- Provide a filter for investments, for ensuring that the selected investments are well-prepared and amongst the most effective in minimizing risks and enhancing positive impacts/benefits
- Avoid delays and extra costs which may subsequently arise due to unanticipated environmental problems;
- Make transparent the decision-making process in design and implementation of components
- Ensure that the investments are implemented in a sustainable manner by maximizing environmental resources management and socio-economic benefits to local communities within the scope of the project.

## **1.3 Approach to ESAMF**

The Environment and Social Assessment and Management Framework (ESAMF) study has been designed primarily to ensure that the two subject components will comply with the relevant environmental and social safeguard requirements of the Government of Maldives (GoM) and the World Bank.

The ESAMF for CCA project was developed based on the Environmental and Social Due Diligence (ESDD) reports prepared for the CCTF I projects – WCCM and AASWM. In addition, site-specific Environmental and Social Impact Assessments (ESIAs) were undertaken in Hithadhoo and Fuvahmulah that provide the baseline condition of the some of the sites selected for the proposed project. These latter studies provide initial guidance to the project team in terms of hydrological interactions, constraints and opportunities on the islands of Fuvahmulah and Hithadhoo. Whilst the ESAMF studies were wide-ranging, the time allowed for further studies and reporting was tightly constrained. In particular, it should be recognised that this ESAMF will provide the overall framework for the project. Based on the World Bank and GoM policy/legislative requirements further details assessments in the forms of ESIAs, environmental and social management plans (ESMPs), etc. will be undertaken during the project implementation period.

Building further on the consultations that were undertaken during the preparation of ESIAs and developing mechanism for coral reef monitoring during CCTF I, the MEE will carry out consultations of this ESAMF. The continuous consultations carried out during workshops and training events with atoll and island councils and community specifically for WCCM and AASWM projects under CCTF 1 have already contributed to the overall design of the project.

## **2 BRIEF DESCRIPTION OF THE COMPONENTS**

### **2.1 Introduction**

Maldivian economy depends largely on natural resources. A study conducted in 2009 indicated that 71 percent of national employment (78,500 jobs), 49 percent of public revenue (Maldivian rufia (MVR) 2.5 billion), 62 percent of foreign exchange (US\$435 million), 98 percent of exports (MVR 1.7 billion) and 89 percent of gross domestic product (GDP; MVR 135 billion) in the Maldives are dependent on its biodiversity. Maldives is largely a service-oriented economy, with nature-based tourism serving as the engine for economic growth, directly contributing 28 percent to GDP, and indirectly driving other sectors such as communication and construction. About 800,000 tourists – more than twice the country's population – visit the country annually (2008–2012). Snorkeling and diving are the most popular tourist activities (with 59 percent and 53 percent of tourists rating their experience as excellent), both relying on an un-spoilt marine environment. Fisheries and agriculture, both natural resource dependent sectors, contribute about 4 percent to the GDP, and are critical in terms of their contribution to household livelihood security. Rich natural resources are undoubtedly the most important national asset supporting all these three sectors.

The Fifth Assessment Report by Intergovernmental Panel on Climate Change (IPCC) describes a wide range of current and future climate-related drivers of risk for small islands during the 21st century, which include sea-level rise, tropical and extra-tropical cyclones, increasing air and sea surface temperatures, and changing rainfall patterns. The report acknowledges sea-level rise as one of the most widely recognized climate change threats to small islands where the majority of human communities and infrastructure is located in coastal zones with limited on-island relocation opportunities especially on atolls. It is obvious that the projected sea level increase of 0.35–0.7 meters by the year 2100 will threaten the existence of the Maldives. Downscaled global climate change scenarios for the Maldives estimate that there will be an increase in temperature and rainfall over the entire country by 2100. Extreme events of rainfall are expected to increase over the entire country, which could lead to high levels of flooding. This will in turn affect farming, infrastructure and could lead to disease outbreaks. Similar to the increase in air temperature, an increase in the sea surface temperature is predicted that could have an enormous impact on the marine environment.

**Coral Reefs – Climate Change Impacts and Contribution to Adaptation:** The Fifth Assessment Report of the IPCC describes coral reefs as an important resource in small tropical islands, and acknowledges that the well-being of many island communities is linked to their ongoing function and productivity. It emphasizes that the incidence and implications of temperature-related coral bleaching in small islands is well documented, and combined with the effects of increasing ocean acidification, these stressors could threaten the function and persistence of island coral reef ecosystems. It is known that the costs of protection-works to combat sea-level rise would be disproportionately high in relation to GDP for small-island nations, and the Maldives is ranked among the ten nations with the highest protection costs in relation to GDP. In addition to such costs for adaptation, considering the dependence of the Maldives economy on tourism, the potential impact of coral bleaching cannot be underestimated.

**Wetlands – Climate Change Impacts and Contribution to Adaptation:** Rainfall-induced flooding is perceived by island communities as the most devastating impact of climate change. It is a major hazard especially in the southern atolls where rainfall is comparatively higher and these larger islands contain extensive wetland or low-lying areas. Expansion of settlements into the low-lying areas has meant an increase in the impact of occasional severe flooding in these islands. Of the 1,190 Maldivian islands only 41 islands have wetlands. These in-land ecosystems help in climate change adaptation through their role in flood and soil erosion control, groundwater recharge, freshwater storage and livelihood support. They lessen the effect of flooding during high rainfall events and storm surges and also provide water security during low rainfall periods. The common method for flood mitigation is to construct floodways or channels to the sea. Climate change induced rainwater flooding will require additional flood mitigation capacity. However, maintenance of flood mitigation measures has been a challenge as the floodways can regularly accumulate debris including sand, rubble and domestic waste (for example, dumping of waste into the floodways has also been identified as a challenge in Hithadhoo and Fuvahmulah). Clean-up has been generally restricted due to lack of municipal cleaning services and this has resulted in blockage of the channels and flooding on the island. In addition,

climate change induced sea-level rise will reduce opportunities for drainage and increase inundation, and also seriously compromise freshwater wetland viability. It is likely that some freshwater wetlands will only be sustained using tidal barrages and gates.

**Solid Waste – Implications for Climate Change Mitigation and Adaptation:** Poor solid waste management (SWM) in Maldives is a major problem threatening coral reefs and wetlands and consequently the important tourism and fisheries sectors. There is no municipal collection system for household waste in many islands. Waste is usually burned in open fires or shipped to the primary landfill/incineration island, Thilafushi, but too often ends up in the sea. An estimated 312,075 metric tons (mt) per year of solid waste is discarded in the Maldives. About 51 percent of this is from urban areas, 28 percent from island communities and 21 percent from tourism. Island community solid waste has a high organic fraction (70 percent) with recyclables accounting for only 3 percent of the discards and the balance classified as residuals. Waste disposal practices vary among islands depending on access to disposal facilities, local custom and government/council intervention. Waste may be dumped within the island (31 percent of islands), burnt (28 percent), disposed at the beach or sea (13 percent), buried (8 percent), and sent to Thilafushi or other islands (4 percent). Ninety percent of the islands have their waste disposal sites within 100 meters of the coastline and on the ocean-ward side of the island.

A total of 134 Island Waste Management Centers (IWMCs) have been constructed, covering about 66 percent of islands and a few more are under development (for example, SWM systems in Ari Atoll under the CCTF-I Ari Atoll Solid Waste Management (AASWM) Project). Unfortunately a program for gathering waste from the centers for shipment to a suitable location in the Maldives does not fully exist yet (the IWMCs under the AASWM are associated with the sanitary landfill and a waste-to-energy facility in Raa Atoll Vandoo). As these centers have reached their capacity due to the lack of an organized program for management of waste at the IWMCs and waste transfer from the IWMCs, island residents have stopped delivery of waste to these centers. Instead, waste is left on the beach or discarded in low-lying areas, such as the wetlands. The waste on the beach is visually unsightly both for island residents and people on other nearby islands especially tourist resorts. Aside from the aesthetics on the island where the waste is generated, waste thrown on beaches below the high tide line can float into the sea where it may sink or get onto reefs or wash ashore on tourist resort beaches.

Solid waste disposal has implications for both climate change mitigation and adaptation. Waste disposal, including open burning of wastes, accounts for 15 percent of the greenhouse gas (GHG) emissions in the country and improvement of SWM is essential to achieve the country's target of achieving carbon neutrality by 2020. Inadequate disposal affects the health of the vulnerable reefs, which otherwise function as coastal defense systems in the warmer climate. Solid waste disposal into the coastal vegetation is a major contributor to the degradation of the vegetation belt in some islands – Dh. Kudahuvadhoo, Ga. Kolamaafushi, Sh. Funadhoo and N. Velidhoo. Poor solid waste disposal also increases the risk of vector-borne diseases, by creating vector-breeding sites.

The management of solid waste is especially challenging in the Maldives, even more so than other small island states due to the small island sizes, small population on these islands and visible lack of economic activities that make any investment in waste management challenging. With a population spread across numerous islands there is little scope for harnessing economies of scale due to large costs of transportation and low volumes, making the costs of service delivery high. This poses a substantial and visible risk to the country's reputation as an unspoiled tropical "paradise". The scarce surface area of any island in the archipelago puts a premium on the value of land and limits on the landfill method traditionally used in many parts of the world. The amount of waste generated far exceeds the capacity of available landfills which are basically uncontained open dumps. Current arrangements for solid waste management on most inhabited islands are inadequate.

**Policy Framework:** The policy context in the Maldives is very supportive of wetlands conservation, coral reefs protection and SWM from the standpoint of biodiversity conservation, climate change adaptation and mitigation and environmental sustainability. The GoM is a signatory to the United Nations Framework Convention for Climate Change (UNFCCC) and United Nations Convention on Biological Diversity

(UNCBD). Work is underway for Maldives to become a signatory to the Convention on wetlands (Ramsar Convention). The National Biodiversity Strategy and Action Plan (NBSAP) and the Third National Environmental Action Plan (NEAP) stress the importance of protecting and restoring coral, wetland and mangrove ecosystems and management of solid waste. The Strategic Action Plan (SAP; also called National Framework for Development 2009–2013) stresses conserving and sustainably utilizing biological diversity to ensure maximum ecosystem benefits. The National Adaptation Programme of Action 2006 (NAPA) emphasizes wetland conservation through priority actions such as flood control, recognizes the importance of coral, and also includes enhancing capacity for SWM as a priority action to prevent pollution of the marine environment. The Strategic National Action Plan for Disaster Risk Reduction and Climate Change Adaptation (SNAP) (2010–2020) includes a wide range of activities such as early warning systems, knowledge management database, improved land planning, training on coral reef growing, and community based Disaster Reduction Management (DRM). The National SWM Policy 2008 and SWM Regulation 2010 both set the policy framework for SWM including details of the functions of IWMCs. The Fourth Tourism Master Plan (2013–2017) clearly acknowledges and plans to address the vulnerability of the country against the potential impacts of climate change. Overall, national policies (NBSAP, NAPA, NEAP, National SWM Policy and SAP) that provide the basis for climate change adaptation in the country are comprehensive and favorable to wetland and coral reef conservation as well as management of solid waste; however, the implementation of adaptation measures remains a key concern.

Engagement by the World Bank in Reef Monitoring and Wetlands Management: The Wetland Conservation and Coral reef Monitoring (WCCM), administered by the Bank, supports both wetland conservation and coral reef monitoring under funding from CCTF. The Bank's Maldives Environment Management Project (MEMP) has built the capacity for coral reef conservation and also assisted coral health monitoring by having professional scientists engaged in technical assistance. The WCCM project supported the development of Community-Based Wetland Management Plans (CBWMPs) and demonstrative implementation of drainage management and rainwater harvesting systems to reduce flood incidence and enhance freshwater security. The project also piloted capacity building in tourist resorts for coral reef monitoring and provided technical support through professional scientists to develop coral reef conservation protocols and a technology platform (referred to as 'the Coral Reef Monitoring Framework') that will enable easy access to data and decision support tools.

Engagement by the World Bank in SWM: The Bank's MEMP has a component which aims to establish a regional SWM program in the North Province. Due to land scarcity in the country, the process of site selection was slow and difficult, and the project closing date was recently extended by one year to June 30, 2015. MEMP is providing island waste management centers, transshipment services, a sanitary landfill and a waste-to-energy facility in Raa Vandhoo. The AASWM Project (P130163), which is administered by the Bank under funds from CCTF, is establishing an island level integrated SWM system in five pilot islands in Ari Atoll (Dhangethi, Dhigurah, Fenfushi, Thoddoo and Ukulhas). The International Finance Corporation (IFC) supported the SWM of the capital area through a public-private partnership, which invited private participation in the management of Thilafushi Island; a landfill island located around 7 km to the west of Male'.

## 2.2 Project Components

The CCA Project components with intermediate outcomes have the common theme of intent to contribute to delivering climate resilient island development. All components build on activities initiated in CCTF and use the lessons learned from CCTF-I. All are interdependent and all also require evidence-based and target-driven planning processes to deliver enhanced resilience to climate change.

The CCA project will have five components:

**Component 1: Wetlands conservation:** The purpose of this component is to establish a Protected Area management system based on the implementation of the Community Based Wetland Management Plans (CBWMPs) for Hithadhoo and Fuvahmulah so as to provide ecosystem-linked benefits to the community. The CBWMPs developed with support from the WCCM project under the CCTF-I were:

- The CBWMP for Hithadhoo including an ecotourism package was approved by the Addu City Council and by the general public (18 September 2013). The CBWMP has a five year timeframe, of which the initial implementation was carried out under the CCTF-I.
- The CBWMP of Fuvahmulah including ecotourism design concepts and drainage design concepts and plans were approved by the general public (4 November 2013), Community Advisory Board (5 November 2013) and the Fuvahmulah Atoll Council (6 November 2013). The CBWMP has a five year timeframe, of which the initial implementation was carried out under the CCTF-I<sup>1</sup>.

The CCA project will focus on the next three years of the CBWMP implementation period.

Objective: The main objectives of this component are:

- the protection of the wetlands and biodiversity in the Protected Areas of Eydhigali Kilhi and Koatthey (declared in December 2004) of Hithadhoo, and, Bandaara Kilhi and Dhandimagu Kilhi in Fuvahmulah (declared in June 2012);
- the development of ecotourism and other sustainable activities that can contribute to the socio-economic development of the local community; and,
- establishing a model for management of the Protected Area and allied activities.

Activities: The key activities as identified in the CBWMPs include:

- Implementation of the new zonation system and protection regime in Hithadhoo and Fuvahmulah including core areas, conservation areas, buffer zones and eco-friendly agricultural zones. This activity involves implementing a system for regulating access to and patrolling the protected area (entrance fees, permissions for tourism operators, etc.); prevent dumping of waste; prevent extraction of sand, gravel and pebbles; control use of pesticides in farmlands; regulation of fishing; etc.
- Establish the management structure of the protected areas in Hithadhoo and Fuvahmulah including:
  - Recruitment of staff for the Protected Areas on each island including a Protected Area Manager, a Protected Area Conservation Officer and 3 Rangers.
  - Training of Protected Area staff in Protected Area Management focusing on wetland conservation and eco-tourism.
  - Formal constitution and support to functioning of a Community Advisory Board.
  - Provision of office facilities, vehicles and field equipment.
- Implementation of an environmental education and communication program for schools and the general public.
- Implementation of an eco-tourism programme including creation of eco-friendly visitor facilities:
  - Development and implementation of a code of conduct for ecotourists.
  - Training and certification of eco-tourism guides.
  - Visitor centre in Hithadhoo; boardwalk, bird observatory, interpretive signage, tourist information centre, etc. in Fuvahmulah.
- Establishment of a Protected Area Fund: This includes:
  - Establishment of the Protected Area Fund with matching grants from the GoM and the CCTF-II.
  - Establishment of a Protected Area Fund Board to administer the Fund to meet the O&M costs and to support Livelihoods Grants beyond the project period.
- Support to local eco-friendly livelihood activities: This includes:
  - Training programs on eco-friendly livelihoods for community members including youth, women, farmers, etc. Examples include eco-friendly artisanal crafts, organic farming, guiding, etc.

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<sup>1</sup> The activities initiated in CCTF-I in Fuvahmulah were: development of an ecotourism concept, establishment of an informal Community Advisory Board, design of environmental education and communication campaign, design of training on ecotourism, training of wetland volunteers, design of code of best practices for tourism, bird and vegetation inventories and training in composting.

- Supporting eco-friendly livelihood enhancement activities through Livelihoods Grants from the Protected Area Fund.
- Development of a project exit strategy and future sustainability options for the Protected Areas to be presented to the Climate Change Advisory Council.
- Support for a feasibility study and facilitation for designating Addu and Fuvahmulah as biosphere reserves.

Outputs: The key outputs are:

- Management structure created for the protected area including full staff capacity and Community Advisory Board supported with office and field facilities/equipment.
- Environmental education programs for schools and general public implemented.
- Visitor facilities including boardwalk, bird observatory, interpretive signage, nature trails, tourist information centre, etc., created.
- Trained and certified eco-tourism guides.
- Training programs on eco-friendly livelihoods for community members organized.
- Livelihood enhancement activities supported through a Livelihoods Grant.
- Protected Area Fund and Protected Area Fund Board established and operational.
- Project exit strategy and future sustainability options for the Protected Areas presented to the Climate Change Advisory Council.
- Feasibility study report on designating Addu and Fuvahmulah as ‘biosphere reserves’.

Outcomes: The key outcomes are:

- Strengthened capacity of Atoll Councils, the Community Advisory Boards and the planned Protected Area Management for managing the protected areas.
- Enhanced environmental awareness among the general public and tourists.
- Increase in tourist satisfaction with the eco-tourism product as well as enhanced livelihood benefits to the local community from farming, artisanal crafts, etc.
- Clear way forward on future sustainability of the Protected Areas in Hithadhoo and Fuvahmulah.
- Recommendations on designating Addu and Fuvahmulah as ‘biosphere reserves’.

**Component 2: Coral reef monitoring:** The purpose of this component is to provide a stronger evidence base on the status of coral reefs so as to deliver improved management and decision making by supporting the involvement of Tourist Resorts, Dive Centres and the planned Protected Area Management in coral reef monitoring and management. Under the WCCM project of CCTF-I, a set of standardized monitoring protocols and a web enabled database platform (‘CoralDatabase’) were developed, the staff of 5 Tourist Resorts were trained in using the protocols and the database, and one baseline dataset on coral reef monitoring by these resorts could be achieved. The CCA project will focus on strengthening and scaling up the coral reef monitoring programme initiated during CCTF-I.

Objectives: The main objectives of this component are:

- Capacity building of 10 Tourist Resorts and Dive Centres by providing the tools and training to monitor the condition of the coral reefs and the goods and services that they receive from the coral reefs.
- Scale-up the use of the ‘Coral Reef Monitoring Framework’ including the ‘CoralDatabase’ to 10 Tourist Resorts and Dive Centres.
- Pilot the use of the ‘Coral Reef Monitoring Framework’ including the ‘CoralDatabase’ by the planned Protected Area Management in Hithadhoo.

Activities: The key activities to be financed under this component are:

- On-going support for newly inducted and existing tourist resorts, dive centres and the planned Protected Area Management on field data collection and use of the ‘CoralDatabase’. This includes the following:

- Training workshops for newly inducted tourist resorts, dive centres and selected community institutions/groups, as well as refresher training workshops for the 5 existing tourist resort partners on field data collection and use of the 'CoralDatabase'.
- Training videos on use of the protocols in the 'Coral Reef Monitoring Framework' including the 'CoralDatabase' that will be available on-line and can be accessed from the CoralDatabase website.
- On-site bi-monthly facilitation visits by consultants to provide support to resorts for initiating and sustaining the use of the 'Coral Reef Monitoring Framework' including the 'CoralDatabase'.
- Continued support to the 'CoralDatabase' platform developed under CCTF-I to enhance its functionality and user-friendliness for data entry & storage, analysis & decision-making. The enhancements include:
  - Data Entry & Storage: Enhancing compilation speed; facility for producing customized variants of the monitoring protocols; tips, field labels, keyword descriptions and look-up lists for markers indexed to monitoring sites; system for sharing common site/marker IDs between users, providing sub-folders for organisation/infrastructure, etc.
  - Data Analysis & Decision-making: Enhanced search facility (based on time, location, protocol, keyword and/or values); pre-set data searches and presentation for key data (e.g. current bleaching).
  - Transfer to national server: In order to increase administrative efficiency and reduce the cost burden of hosting the 'CoralDatabase' platform, it will be transferred to a national server of the GoM located in the Maldives by the end of the CCA project period.
- Support for strategic mainstreaming of the use of the National Coral Reef Monitoring Programme: (a) into the EIA regulation by making the use of selected protocols (water quality, substrate cover, fish abundance etc.) a requirement to be met by project proponents as part of the EIA; (b) into resort lease conditions; (c) other relevant opportunities.

Outputs: The key outputs are:

- A minimum of one dataset from each of at least 10 participating Tourist Resorts and Dive Centres. regular and periodic field data collection by tourist resorts, dive centres and the planned Protected Area Management covering the at least 4 mutually identified protocols from the following: water quality, catch and effort, ecosystem assets, impact and management, life forms (bottom transect, extended swim, marine turtle), island profile, coral settlement, reasons for visiting, resort diet, wildlife on land, etc.;
- Policy notes and workshops involving key Government ministries and institutions, private resorts, atoll and island councils.
- Strategy for sustaining and scaling-up partnership-based coral reef monitoring.

Outcomes: The key outcomes are:

- Strengthened capacity of tourist resorts, dive centres and the planned Protected Area Management Unit for coral reef monitoring.
- Greater awareness in tourist resorts, dive centres and Protected Area Management Unit on the goods and services they receive from the coral reefs.
- Improved information and knowledge base on status of coral reefs in the Maldives.
- Clear roadmap of the Government of Maldives for sustaining and scaling-up partnership-based coral reef monitoring.

**Component 3: Development of an island level integrated SWM system:** The purpose of this component is to build the institutional capacity of Addu City and Gnaviyani/Fuvahmulah atolls and island councils to plan an island level integrated solid waste management (SWM) program to minimize the environmental risks to the country's marine and terrestrial assets while reducing GHG emissions. Under the Ari Atoll Solid Waste Management Pilot Project of CCTF-I, capacity building on SWM was undertaken in 5 islands of the Ari Atoll and a model for island based integrated SWM could be established on the Ukulhas island. The CCA project

will draw upon the experience of CCTF-I and focus on strengthening the SWM capacity in Addu City and Gnaviyani/Fuvahmulah.

Objectives: The main objectives of this component are:

- To support a Strategic Options Study that will contribute to the development of an integrated island(s) SWM system.
- To demonstrate a system for collection, segregation and composting as part of developing an integrated island(s) SWM system.

Activities: The key activities to be financed under this component are:

- Strategic Options Study on SWM: This includes:
  - Best Practicable Environment Option (BPEO): The BPEO is the primary component of the study. It will identify potentially suitable waste management options for Addu City and Ganviyani/Fuvahmulah through BPEO assessment. It will also identify potentially suitable site for location of the Regional Waste Management Facility (RWMF). Under the BPEO process, a preferred waste management system option will be selected against multi-dimensional criteria ranked by stakeholders. The objective of the investigation is to identify significant environmental, logistical, social, technical and physical aspects of the short listed sites and assess its potential for selection as RWMF. The study will provide process details on the identification and evaluation of options and site and their synthesis into the preferred system configuration. It will also undertake a detailed scoping investigation of shortlisted sites with land use compatible for siting a RWMF and recommend where the proposed RWMF may be located. The study will finally produce potentially suitable integrated waste management system options and financial estimations (including sensitivity analysis) to inform the preferred BPEO selection and best value processes.
  - Assessment of Collection and Transportation Systems: This component will include an assessment of current collection and transportation system and based on the shortlisted integrated waste management system options, propose a collection and transportation system with preliminary financial estimations.
  - User Pays Framework: This framework is for island/atoll waste management that allows for maximum cost recovery while taking into account affordability and ensuring the desired level of services, based on a policy that everything that can be managed on the islands should be managed on the islands. The User Pays Framework Model consists of the final report, a set of economic models for fee setting and a guideline for using the models.
  - Institutional arrangement to operationalize the integrated solid waste management system: This component of the study will assess the existing and proposed institutional arrangements for example in MEMP and ASWMP, as well as existing institutional arrangements in Addu City and Ganviyani/Fuvahmulah to manage solid waste and recommend a cost effective and practical arrangement to operationalize the proposed integrated solid waste management system.
  - Proposal for the next phase activities including technical and financial feasibility study for the preferred regional waste management system option at the final selected site location; environmental and social impact assessment for the preferred regional waste management system option at the final selected site location; development of detailed engineering designs; rehabilitation plan for existing disposal site at Addu City.
- Implementation of an island level recycling and composting program at the Island Waste Management Centres (IWMCs): This includes:
  - Community awareness program on SWM: This activity will create community awareness on the public health and environment implications of poor SWM in the islands and solicit community participation for source segregation of household level solid waste. To ensure a simple segregation process at the household level, the waste will be separated into 3 categories: (i) organic or degradable waste (ii) recyclable waste or waste material that has a resale market (iii) residual waste.
  - Effective system of waste collection and transport to the IWMCs.

- Composting program: Island community solid waste has a high organic fraction (70%) with recyclables accounting for only 3% of the discards and the balance classified as residuals<sup>1</sup>. The biodegradable organic matter can be managed through low cost, low technology composting in the existing IWMCs. The IWMCs (Hulhumeedhoo in Addu City, Hithadhoo in Addu City, and Fuvahmulah) currently do not have provision for composting. A concrete pad for simple windrow composting will be constructed in each of these 3 IWMCs. There will be no leachate treatment facility at the IWMCs. All leachate will be collected and re-circulated into the compost piles as moisture. The compost generated will be utilized in the eco-friendly organic farms and resorts in the islands.
- Recycling and Residual Storage: About 20% of the solid waste generated in the islands is recyclable. The recyclables having a market for resale will be segregated and sold. The residual, relatively inert, waste of about 10% will be baled and stored in the IWMC in a safe and environmentally responsible manner until it is transferred for off-island disposal.
- Capacity building of Island Councils and Utility Company: This includes:
  - Training of Island Council representatives and Utility Company staff on SWM including waste collection, segregation, user fee management, composting, recycling, residual waste storage, etc.
  - Exposure visits of Island Council representatives, Utility Company staff and selected community representatives to the SWM system in Ukulhas Island in Ari Atoll of the Maldives and to the Weligama Urban Council Compost Plant in Sri Lanka.
  - Recruitment of one SWM Associate each for Addu Atoll and Gnaviyani Atoll.
- Communication campaign: This includes a campaign to raise community awareness in order to encourage community participation in island SWM. The components of the campaign will include IEC materials, school education programmes, recognition awards, etc.

Outputs: The key outputs are:

- Report of Strategic Options Study on SWM in Addu City and Ganviyani/Fuvahmulah including Best Practicable Environment Option, Assessment of Collection and Transportation Systems, User Pays Framework, Institutional Arrangements, and, Proposal for next phase activities.
- Infrastructure for windrow composting in 3 IWMCs of Addu City and Ganviyani/Fuvahmulah.
- Collection, segregation and composting of solid waste at the 3 IWMCs of Addu City and Ganviyani/Fuvahmulah.
- Training program and exposure visit for Island Council representatives, Utility Company staff and selected community representatives on SWM.
- Communication campaign on SWM.

Outcomes: The key outcomes are:

- Strengthened capacity of Island Councils, Utility Company and communities for implementing integrated island solid waste management system.
- Composting of organic solid waste generated in Addu City and Ganviyani/Fuvahmulah.

***Component 4: Mainstreaming climate change into island development planning:*** In the context of the Decentralization Act of 2010, the WCCM project in CCTF-I has supported the mainstreaming of climate change into an island development-planning module through a partnership with the Local Government Authority (LGA). This has included the development of curricula and the delivery of cascade-mode training to council staff through LGA master trainers. The CCA project aims to scale up this effort across 50% of the Atoll and Island Councils in the Maldives.

Objectives: The main objectives of this component are:

- To build awareness and strengthen local government capacity to address climate change adaptation issues relevant to island development.

- To support tertiary level education in environmental management including climate change adaptation and mitigation.

Activities: The key activities to be financed under this component are:

- Scaling up of the of the training on climate change to Atoll and Island Council staff and elected representatives through the LGA: This includes:
  - Orientation course on climate change: The 4 hour module on climate change will be rolled out to cover at least 50% of the Atoll and Island Council staff and elected representatives through partnership with the LGA. The training will be provided through a cascade approach through trained master trainers and trainers.
  - Certificate Course on Climate Change: The 100 hour module on climate change will be rolled out as a Certificate Course for Atoll and Island Council staff and elected representatives. It will be offered through the LGA in partnership with the Maldivian National University (?). The training will be provided through trainers from the LGA and the Maldivian National University.
- Support to an ongoing Bachelor in Environment Management program run by the Maldivian National University: This includes:
  - Developing course materials on Climate Change: The 100 hour module on climate change will be adapted for use in the Bachelor in Environment Management program of the Maldivian National University. It will be offered through the Maldivian National University as an elective as part of the Bachelor in Environment Management program. The course will be delivered through trainers from the LGA and the Maldivian National University.
  - Sponsorships of students: 5 students will be supported through scholarships and living allowance to pursue the Bachelor in Environment Management program in the Maldivian National University.

Outputs: The key outputs are:

- At least 50% of the Atoll and Island Council representatives trained on mainstreaming climate change into island development planning through the LGA.
- Course materials developed for integration of climate change adaptation and mitigation into the ongoing Bachelor in Environment Management program in the Maldivian National University.
- At least 5 students are supported to pursue the Bachelor in Environment Management program in the Maldivian National University.

Outcomes: The key outcomes are:

- Strengthened capacity of local government representatives to plan and implement climate resilient island development plans.
- Graduates in the area of environmental management and climate change developed through the Maldivian National University.

**Component 5: Project Management:** The MEE has the overall responsibility for project implementation and for ensuring that the project objective is met. It will execute the project through the EPA, the MRC of MoFA, and the LGA in close coordination with the atoll/island councils. The CCA project will support the MEE in project management through this component.

Objective: The objective of this component is to support the various management functions for implementing the project including human resources, monitoring, equipment, operating costs, etc. This component will finance incremental costs to the existing Project Management Unit (PMU) established for MEMP and CCTF-I.

Activities: The key activities to be financed under this component include:

- Support for PMU staff: PMU staff in the MEE that serviced the first phase of CCTF will continue to undertake day-to-day management. This includes a Project Manager, a Wetlands Coordinator, Solid Waste Management Coordinator, Coral Reef Monitoring Coordinator, Safeguards Coordinator,

Finance Officer and a Procurement Officer. The project will also support a part-time Resort Liaison Officer at MoFA. In addition, a Works Engineer will be provided by the GoM for the project.

- Support for island level staff: In order to decentralize project management, project staff will be posted at Hithadhoo and Fuvahmulah for guiding and overseeing the implementation of project activities. The island level staff at each island will include a Protected Area Manager, a Protected Area Associate, three Protected Area Rangers, a Solid Waste Management Associate and an E&S Officer.
- Support for consultants to oversee the project implementation at the island level and to provide strategic and technical advisory support: The project will support an international implementation support consultant to oversee the project implementation at the island level, and, an international technical advisor to provide strategic and technical support the PMU.

Outputs: The key outputs of this component are:

- Fully staffed PMU in MEE and Resort Liaison Officer at MoFA.
- Decentralized project management structure with island level staff for Protected Area Management and SWM.
- Six-monthly reports on project progress with action plan.

Outcome: The key outcome of this component is efficient and effective management of CCA project components.

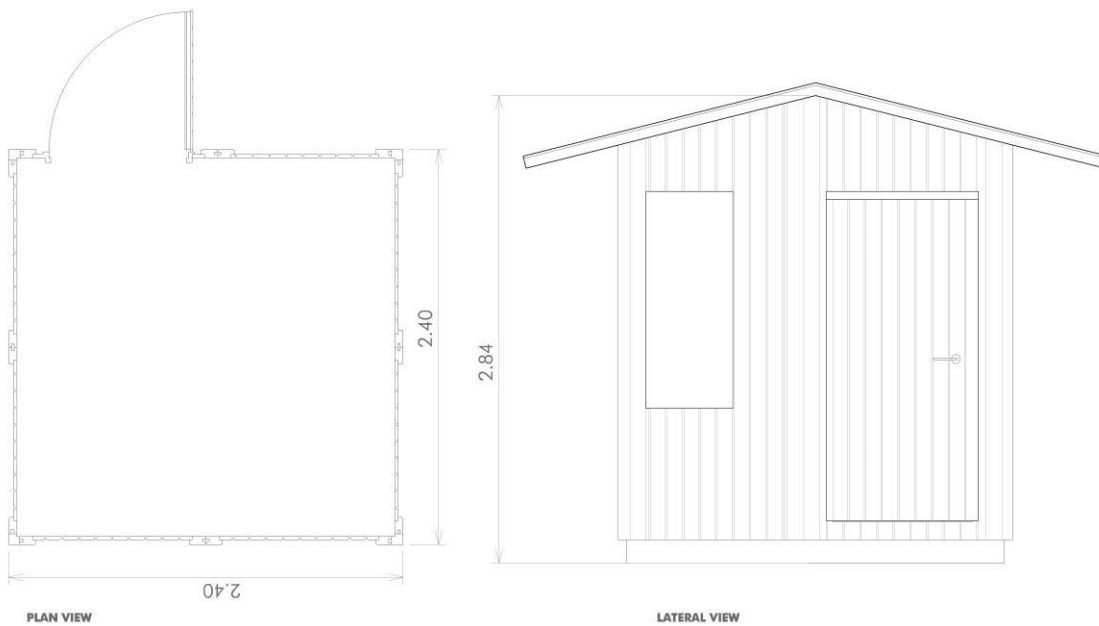
## **2.3 Conceptual details of some of proposed physical activities**

### ***2.3.1 Conceptual Designs of Improvement of Ecotourism Facilities***

#### ***2.3.1.1 Construction of Huts for the rangers***

It is proposed, if not completed under CCTFI, to construct two wooden huts to facilitate the control duties of the rangers, provide them a sheltered place to stay and space to store equipment. The hut in Koathey tip will serve to control recreational activities there and will have an extension for keeping the belongings of tourists while swimming or snorkelling.

The structure foot print is approximately 2.4 m x 2.4 m (See figure 2.4) and will not require removal of vegetation. No special equipment is required for construction.

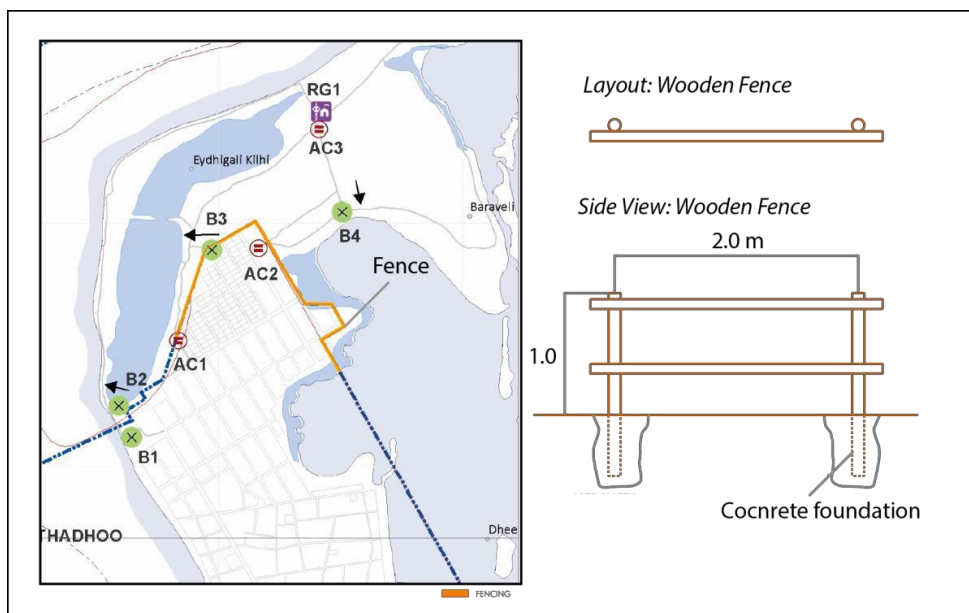


**Figure 2.4: Proposed design for ranger hut (Source IDRIA/AQUATICA, 2013)**

### 2.3.1.2 Control and regulation of access

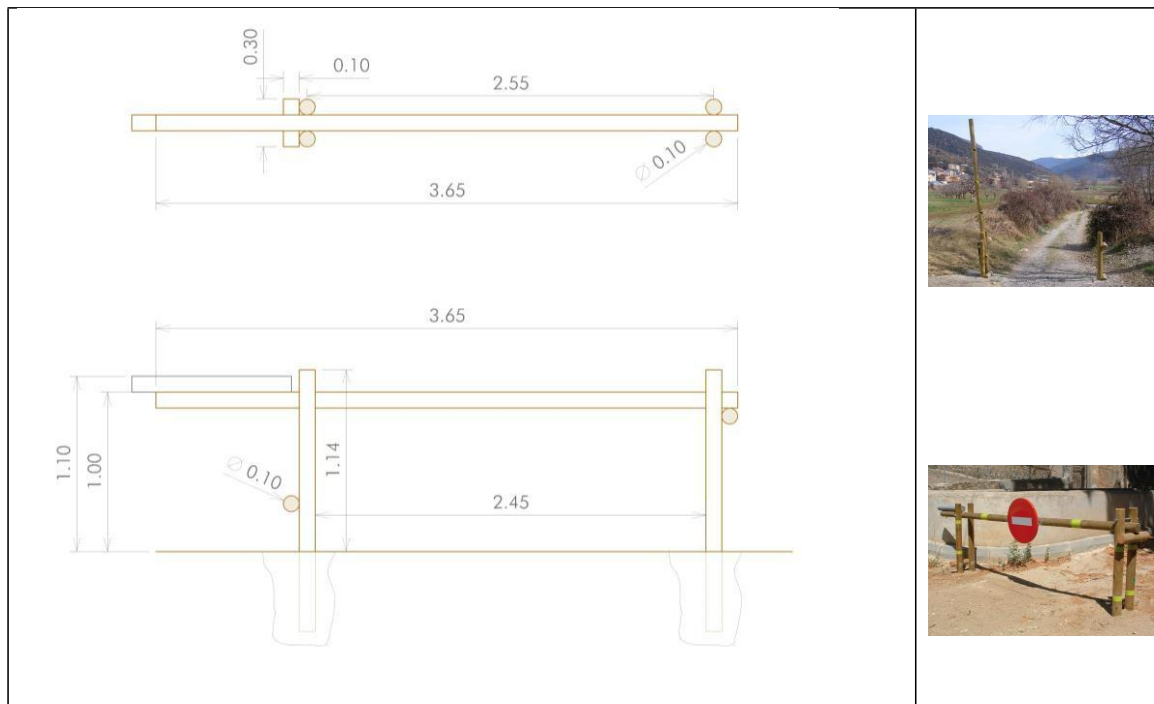
It is proposed, if not completed under CCTFI, to install a closely spaced wooden fence along the extent of the terrestrial boundary with the settlement. An additional 1.5 m or wider footpath is to be created adjacent to the fence on the settlement side and a green fence is to be grown on the protected area side. The total length of the fence is about 1100 m. The design of the wooden fence is presented in Figure 2.5.

Motorized access will not be allowed inside the protected area, except for the management staff, and in special cases for security and emergency services, or holders of a special permit (contractors, researchers, etc.).

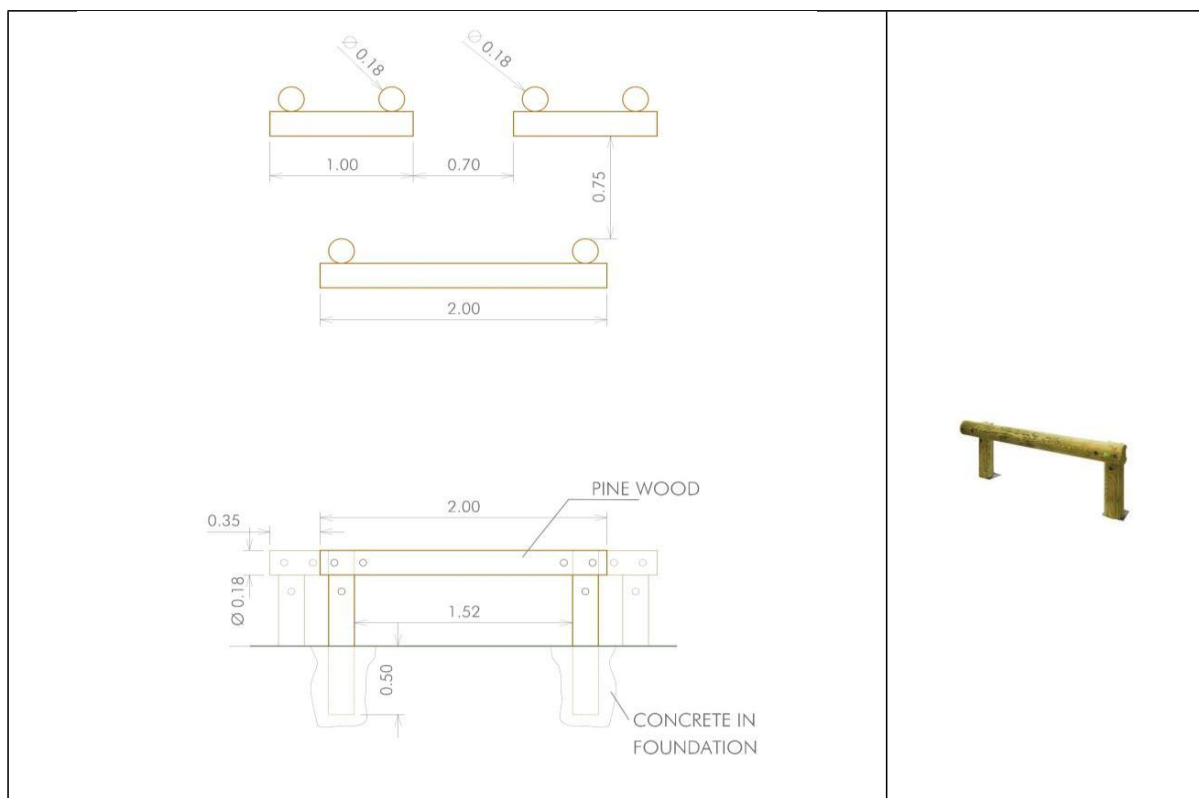


**Figure 2.5: Proposed design for the wooden fence.**

Mobile and fixed access barriers will also be constructed along selected points. Mobile barriers will be located at three locations and fixed barriers (bollards) will be located at four locations. The design for the mobile barriers is presented in Figure 2.6 and that of fixed barriers is presented in Figure 2.7.



*Figure 2.6: Proposed design for the mobile access barriers.*



**Figure 2.7: Proposed design for the wooden fixed barriers**

This activity requires adjusting the fence according to the presence of vegetation and if unavoidable to relocate trees to create the footpaths. Any removed plants can be replanted on the other side to create the green fence. Usually, the fence should avoid trees where possible.

The fence foundation will be installed by excavating a 0.3 m diameter hole up to a depth of 0.5 m and pouring concrete into it. All installations will be undertaken manually.

### **2.3.1.3 Clearing an area along the dyke**

An area along the manmade dyke separating the two sections of the wetland (See Figure 2.8) is proposed to be cleared to facilitate water flow between the two sections. This activity will be undertaken manually. The removed material will be placed alongside the dyke. Occasionally, these areas are cleared by the locals to improve the flow. This activity is expected to be a minor activity with minimal impacts on water quality and vegetation.



**Figure 2.7: Proposed area for clearing the dyke**

#### 2.3.1.4 Restoring native fish population of the Kilhi

In order to restore the native fish population in the Kilhi, a programme for eradicating the exotic and invasive *tilapia* (*Footu mas*) population from the Kilhi and for the reintroduction of native fish (Milkfish, Beyngu, etc.) is planned to be developed and implemented. This activity is planned for the next three to five years and a detailed plan or methodology has been defined.

#### 2.3.1.5 Removing and disposing all existing waste

This activity, if not completed under CCTFI, may require additional one-off removal of all existing waste from within the boundary of the protected area and its buffer zone, and disposing the waste as specified by the Waste Regulations and Addu City Council. Waste is distributed at a number of points and varying volumes across the protected area. Distributions of the major waste piles are shown in Figure 2.8.



**Figure 2.8: Distribution of waste dump sites.**

Given the variations in the density of waste piles, two methods have been proposed for its removal. Firstly, all smaller waste piles and those located on the fringes of the kilhi, mangrove area east of the kilhi, on or near the beach and the track leading Koatney areas shall be cleared manually. Transportation can be undertaken using pick-up trucks.

Secondly, all large waste piles which cannot be removed manually may be removed using a small backhoe/excavator. Excavator use shall not cut down any trees. The composition of waste ranges from general domestic waste, construction waste, electronic waste and green waste. It was difficult to estimate the actual volume of the waste due to poor accessibility. A crude estimate based on the area is between 600 to 1,000 cbm.

All the waste removed from this site will be transferred to the Addu City Waste Management Centre, as agreed with the City Council and as per the new Waste Regulation, 2013. Waste will be sorted on site. Waste transport is the responsibility of the project and disposing the waste is the responsibility of the Waste Management Centre.

#### ***2.3.1.6 Establishment of a waste treatment centre near Eidhigali Kilhi***

In order to minimise future dumping of waste in the protected area a number of awareness activities and sign posts will be utilised over the course of the project lifetime. In addition, there is consideration to develop a waste treatment centre near Eidhigali Kilhi, which will be a waste reception and treatment centre of the households within the vicinity of the protected area. The centre is expected to be working closely with Addu City Waste Management Centre or perhaps even be operated by them.

The details of the centre have not been worked out at the time of this report and are planned for the latter half of the project. No land has been allocated yet. The new centre shall conform to the new Waste Regulations and must be registered with EPA.

#### ***2.3.1.7 Restoration of degraded areas***

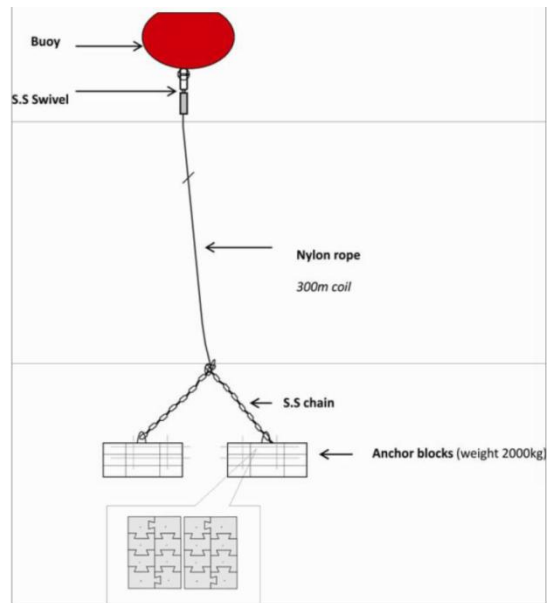
The lack of maintenance and supervision in the protected area has degraded some areas, particularly due to waste dumping and sand mining. These areas need to be rejuvenated through a specific plan. Tree plantation will take place after the removal of the existing waste and the prevention of sand mining. Reforestation will be done using native trees, mangrove and shrub species, which will be selected according to the vegetation found in each specific area. A plant nursery associated to the visitor centre could provide seedlings for the plantations. Bush trees that may be required to remove during construction could also be transplanted in these locations. This action should be carried out with the strong involvement of local community groups (volunteers, environmental clubs, women groups, NGOs, etc.) and always under the supervision and with facilitation from the management staff.

#### ***2.3.1.8 Installation of buoys***

Anchorage in reef areas during traditional bait fishing is a threat to the health of the coral reef. It is proposed to install buoys in the area to assist traditional bait fishing vessels to moor without the use of steel anchors. It is estimated that there will be three such markers installed.

Identification of the marine protected area boundary has also proved difficult in the past for fisherman. A series of marine markers similar to the buoys are planned for the project. It is estimated that there will be five such markers installed.

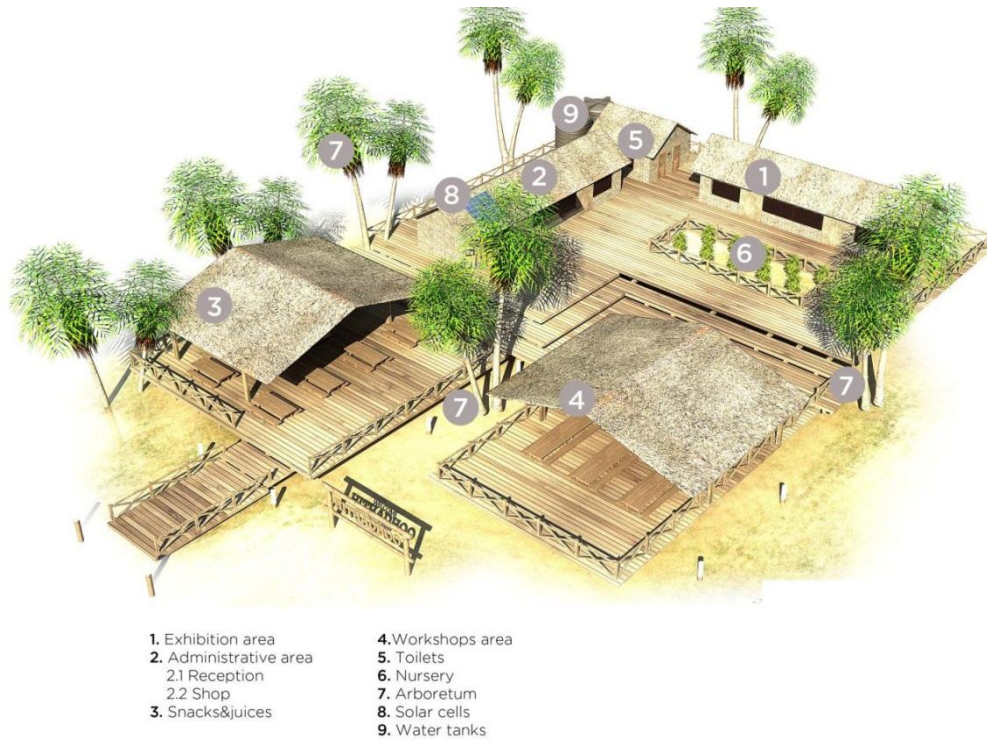
The design for the buoys is presented in Figure 2.9. They are designed to allow two boats to moor concurrently. The anchor blocks are designed as interlocking units for safe and easy installation.



**Figure 2.9: Proposed mooring buoy**

### 2.3.1.9 Construction of the Visitor Centre

One of the main physical constructions from the project is the construction of a visitor centre at the main entrance to the protected area. Figure 2.10 provides an illustration of the proposed site plan.



**Figure 2.10: Artists' representation of the proposed visitor centre layout**

The proposed visitor centre contains the following facilities:

1) Exhibition area: The exhibition area is designed as an educational facility for visitors which displays information about the protected area



*Figure 2.11: Artists' representation of the proposed exhibition area*

2) Administrative area: The administrative area will house the necessary office space required for the management aspects such as record keeping, planning, daily meetings, issue and managing entry fees and as stations for the rangers and office personnel. The area will also host the reception, shop and storage facilities for handicraft, tourist toilets and other rental facilities for tourists.



*Figure 2.12: Artists' representation of the administration building*

3) Cafeteria and rest area: The rest area contains facilities for resting and picnicking, including benches and a small café' for dispensing food and drinks. This area is to be specifically used by visitors to the protected area.



*Figure 2.13: Artists' representation of the rest area*

- 4) Workshops area: This is an area designed specifically to conduct outdoor training and workshop activities related to the protected area. Schools and tour guides can use the area for training and information briefing.
- 5) Toilets: Toilets will be established for visitors which will be maintained by the Protected Area administration.
- 6) Nursery / Arboretum: A nursery with a greenhouse will be established at the visitor centre. Its purpose is to serve as a nursery for trees required to rejuvenate the protected area and as a display of plants in the protected area for visitors. A museum-like setup of the landscape will also be created to display the plants and trees in the area.

#### **2.3.1.10 Site clearance**

Quantity of vegetation to be removed: The approximate quantity of vegetation within the proposed footprint of the visitor centre site are summarised in Section 4.2. The site is dominated by coconut palms and low bush vegetation, mainly Magoo. There are also some medium sized Dhigga and Midhili trees. Among these, most of the coconut palms that fall into the site will have to be relocated elsewhere. Some palms can be retained if they do not fall into the building footprint. An estimate of the number of trees that may have to be moved is provided below. It has to be noted the exact number trees will only be known when the site is set-out.

No. of trees	Detail
15-20	Medium Coconut Palms
10-15	Young coconut palms
3	Dhigga
3	Midhili
Numberous	Magoo

Among these, at least 50-60% may have to be removed.

Method employed to remove trees: Coconut palms and other trees with deep root systems will be sawed around at the base so that soil removal is minimal while some amount of soil is withheld with the root system. The tree will be lifted with the help of an excavator and a purpose built belt, and gently laid on to the truck. If required, the top canopy of the coconut palms will be pruned except for the crown and approximately 1/3 of the fronds will be removed.

Backfilling holes: The trenches and holes dug out to uproot the coconut palms will be levelled using sand available on the site. Additional sand may be bought from local sand suppliers to improve the aesthetics. Given the small number of palms, and their medium sizes, the amount of sand required is expected to be very minimal.

#### **2.3.1.11 Replanting**

Sites for replanting will be identified by the Addu City Council. The planting holes will be watered prior to re-plantation. The palms will be placed exactly at the original height to prevent trunk rot. Initially the trees will be supported by 3 timber stakes tied around it, where necessary, until the roots of the palms take hold. Regular watering will be required to at least 2-3 months, if relocated during the dry season, to assist tree growth until root re-establishment.

#### **2.3.1.12 Construction method**

The proposed site contains vegetation cover, mainly of the bush varieties. They will need to be cleared and disposed. The footprint of the visitor centre area is 2000 m<sup>2</sup>.

All structures are designed with wood to blend it to the surroundings. The structure will be built using prefabricated units made of tropical timber, based on the following construction elements:

- Tropical sawn timber foundation (*cherry, teak, iroko or other similar timber*)
- Sawn tropical timber beams (*cherry, teak, iroko or other similar timber*)
- Large scantling sawn tropical timber trusses (*cherry, teak, iroko or other similar timber*)
- Wooden pergola overlay
- Coconut palm thatch
- Exposed decking made of tropical timber planks (*cherry, teak, iroko or other similar timber*)
- Exterior carpentry using iroko timber, to be varnished

All buildings will be raised from the ground level by about 0.2 m. A timber decking will be constructed for all walkways except for the central courtyard. This area will be covered using coral sand.

Machinery required for construction is a mini excavator and a concrete mixer.

Excavation is required to install the footings. All footing will have a concrete structure embedded into the soil. Dewatering is not expected to be required unless work is undertaken during the peak rainy season. If dewatering is required, the extracted water will be allowed to sink back to the ground water lens and dewatering permit will have to be acquired from EPA.

#### **2.3.1.13 Electricity and Water**

Electricity will be sourced from STELCO on a commercial basis. In addition, solar panels will be installed on the visitor centre roof to reduce the use fossil fuel based power and to reduce electricity costs.

Water for general use will be collected from rainwater and stored in overhead tanks placed above the building. Drinking water will be provided based on bottled mineral water. General use will comprise of cleaning and toilet. In situations where there is rainwater shortage, ground water will be used.

Flushing will use ground water. Given the estimated low usage of toilets, the amount of groundwater extracted is expected to be well below recharge rates of the area.

#### ***2.3.1.14 Sewerage***

The Government plans to install an island wide sewerage system on Hithadhoo Island within the next few years. Once installed, the visitor centre will use the island wide system.

At present there is no sewerage system on the island and most households use individual septic tanks to manage sewage. This project proposes to install a temporary septic tank system for its operations until the main sewer network is installed. The proposed septic tank system is an 1800 gal (6813 litre) system, which is adequate for the estimated visitor numbers for the next 5 years.

The system will be maintained by the staff of the protected area management office. The sludge will be taken out periodically and transported to the waste management centre. It has been planned to dry the sludge in the waste management centre and either burn or use them as fertilizer.

#### ***2.3.1.15 Waste management***

Waste generated during construction will be disposed at the Hithadhoo Waste Management Centre before contractor demobilization. Waste during operation will be collected at the visitor centre, sorted and transported to the Waste Management Centre through the central collection system operated by the City Council. Waste collection within the Protected Area will be undertaken by the Protected Area staff.

#### ***2.3.1.16 Construction of visitor facilities***

The following visitor facilities are planned to be constructed to facilitate the enjoyment of the protected area and to manage the visitor activities.

1) Bird Observatories: Given that one of the main attractions of Eidhigali Kilhi is its bird life, particularly during the NE monsoon, two types of bird observatories are proposed. Type I observatories are a simple wooden structure consisting of a wall with holes at different heights (See Figure 2.14). The wall is a hide-out that enables visitors to watch the birds without disturbing them. It is planned as a non-invasive structure that will take advantage of the surrounding vegetation to provide need for shade. Type II observatories are located at the dyke. The observatory is designed as a small tower with about 0.42 m high to offer better vision of both sides of Kilhi (See Figure 2.15)



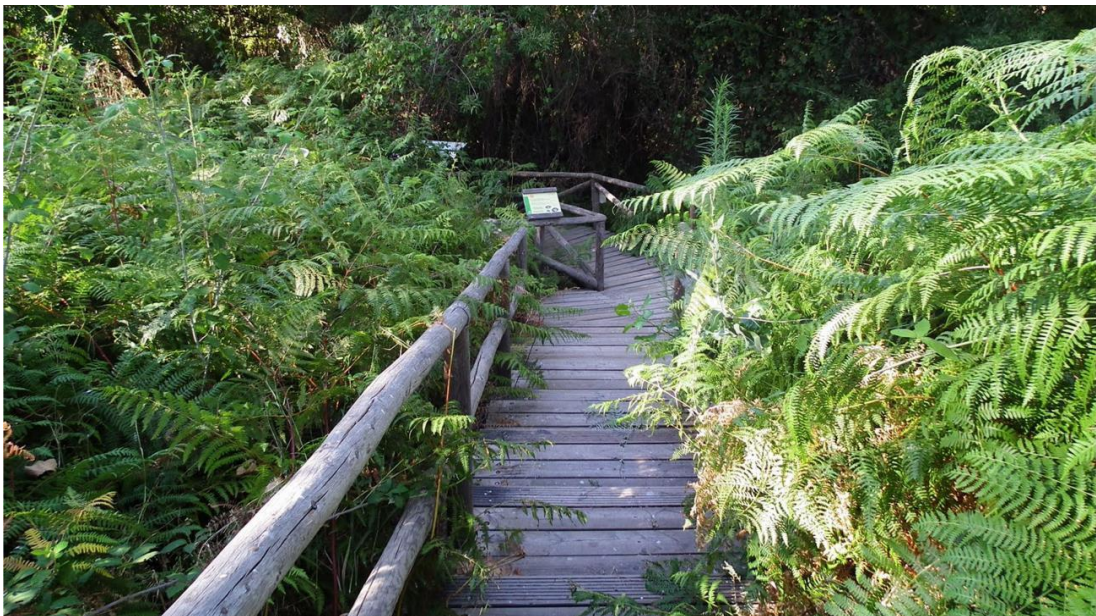
***Figure 2.14: Artists' representation of the Type I bird observatory***



*Figure 2.15: Artists' representation of the Type II bird observatory*

The two types are constructed from treated wood. The wooden piles are driven to the ground using a hammer and the decking will be constructed on them.

2) Boardwalk: To minimise the impacts of walking through the mangrove and to improve the visitor experience a boardwalk is planned to be constructed in the mangrove area. The structure will be approximately 100 m long and 2.4 m wide. The foundation will be cast in concrete and will require excavation. The structure is raised at least 0.5 m from ground level. This activity will require relocating some bush vegetation within the footprint of the boardwalk. No mangrove vegetation will be removed and construction is mainly to taken place in a vegetation free space between the mangrove strands and wetland edge. It will also require manual excavation and concreting within the wetland area (but not areas with surface water).



*Figure 2.16: An example of a boardwalk*

3) View point: Viewpoints are to be constructed at selected points to enhance the visitor experience and to minimize the impact footprint of visitor activities. All structures are made from timber and raised slightly above the ground. Construction is similar to the bird observatories.



***Figure 2.17: Artists' representation of the proposed viewpoint***

- 4) Picnic Area: A picnic area will be created on the Koaatney area but no major structure will be developed. Sitting areas will be created using wooden benches. Picnic area will be clearly marked.
- 5) Sign posts: A number of signposts are planned to be installed around the protected area as guides, notices and awareness information. All signs will be constructed from wood.

#### ***2.3.1.17 Establishment of a green fencing surrounding the farmland***

A green fence, constructed as a layer of dense vegetation, will be developed around the farm land area. This is to reduce the visual impacts for visitors. The trees will be sought from the nursery.

#### ***2.3.1.18 Project Schedule and Life Span***

The proposed works are expected to be completed within 8 months. The tentative work plan for the project is presented in Appendix F. The actual work plan depends on the final contractor.

#### ***2.3.1.19 Labour Requirements and Services***

##### ***2.3.1.19.1 Workforce***

It is projected that the total number of employees during the construction stage will be around 30-40. The origins of workers depend on the final contractor. If a local contractor is involved, all accommodation will be existing facilities on the island. If a foreign contractor is involved, workers will be accommodated on rented houses. The small workforce required for the project is unlikely to have any significant effect on the demand for services and resources.

##### ***2.3.1.19.2 Services***

The Contractor is expected to provide workers with meals and appropriate entertainment facilities. The Proponent would not be responsible for any of the services to be provided to the Contractor's staff or workers.

### ***2.3.1.20 Waste Management, Logistics and Safety Measures during construction***

#### ***2.3.1.20.1 Site Office and Accommodation***

As noted above, it is anticipated that the workforce will be using rented houses or their own residences. The site office for a contractor from outside the island will utilise a rented facility. No additional construction will be required.

#### ***2.3.1.20.2 Utilities***

Electricity for the project must be sourced using a portable generator, unless they can come to a separate agreement with the utility service provider to source electricity from them. In the absence of a desalination plant on the island, water for concreting activities will be sourced from groundwater.

#### ***2.3.1.20.3 Construction Waste Management and Disposal***

The construction waste arising from this project are mainly green waste, general packaging waste (mainly cement and aggregate bags), general municipal waste from workforce and excavated earth. Municipal, packaging and green waste will be disposed to the waste Addu City Waste Management Centre located at Hithadhoo Island, as per the new national Waste Regulation 2013. Excavated earth, if any available, will be reused for making foot paths.

#### ***2.3.1.20.4 Pollution Control Measures***

The following measures will be taken to ensure minimal pollution during construction stage.

- Machinery will be properly tuned and maintained to reduce emissions and minimize risk of spills/leaks.
- Any fuel storage must be bunded.
- No fuel should be stored or handled within the protected area boundary.
- All water pumped out during dewatering must be pumped back into the wetland.
- Before doing so, the pumping area must be bunded using screen small enough contain fine sediments or the outfall of the pipe should be enclosed in a strong bag with a fine mesh.
- Any paints, lubricants, and other chemicals used on site will be stored in secure and bunded location to minimize risk of spill.

#### ***2.3.1.21 Summary of Project Inputs and Outputs***

The types of materials that will go into the development and from where and how this will be obtained are given in Table 2.3 and the type of outputs (products and waste streams) and what is expected to happen to the outputs are given in Table 2.4.

***Table 2.3: Major Project Inputs***

<b>Input resource(s)</b>	<b>Source/Type</b>	<b>How to obtain resources</b>
<b>Construction workers</b>	Local and foreign	Contractors responsibility

<b>Construction material</b>	Reinforcement steel bars, sand, cement, aggregates, treated wood, plywood, and thatch leaves	Import and purchase where locally available at competitive prices – Main Contractor's responsibility.
<b>Water supply (during construction)</b>	Ground Water	Wells
<b>Electricity/Energy (during construction)</b>	Utility service provider	Utility service provider
<b>Electricity/Energy</b>	Utility service provider / solar PV	Utility service

<b>Input resource(s)</b>	<b>Source/Type</b>	<b>How to obtain resources</b>
<b>(during operation)</b>		provider / installed solar PV units
<b>Machinery</b>	Excavators, dump trucks, concrete mixers etc..	Local suppliers
<b>Transport (air and sea)</b>	Domestic air and sea transport	
<b>Food and Beverage</b>	Local cafés and restaurants	
<b>Firefighting equipment</b>	Carbon Dioxide and Foam Fire Extinguishers, etc.	Local suppliers
<b>Fuel</b>	Diesel	Local suppliers

**Table 2.4: Major Project Outputs**

<b>Output Source/Type</b>	<b>Quantity</b>	<b>How it will be dealt with</b>
<b>Outputs during construction stage</b>		
<b>Green waste from site clearance</b>	small quantity	Burnt or mulched at the Addu City Waste Centre.
<b>Construction waste (general)</b>	Small quantities	Combustibles: Sent to Addu City Waste Centre.
<b>Excavated Earth</b>	small quantity	Reused for creating footpaths
<b>Waste from protected area cleaning</b>	Large quantity	Sent to Addu City Waste Centre
<b>Operations stage waste</b>	Small quantities	Sent to Addu City Waste Centre
<b>Hazardous waste (construction stage)</b>	Small quantities	Sent to Thilafushi

## **2.3.2 Conceptual plan for Island Waste Mangement Centers**

### **2.3.2.1 Waste Generation in Addu City and Fuvahmulah**

Waste generation has been forecasted based on studies undertaken by the Ministry of Environment and Energy in designing the waste management systems for Male' and the North Region (Noonu, Raa, Baa and Lhaviyani Atoll). However, household waste generation has been tested in Addu city and placed against the data from the North Region, as part of a recent waste management planning process in the city.

Average waste generation from households is calculated based on the population at 800g (0.8kg) per person per day. Previous studies also indicate that the average waste generation from commercial institutes is 0.65kg per employee per day. Accordingly, average waste generation for resorts and tourist facilities are calculated at 3.5kg per bed night in addition to the 650g per employee.

	Total Waste Generation, Daily (TPD)	Total Waste Generation, Annual (TPY)
Addu City	34	12,410
Fuvahmulah	9.6	3,504

Waste audit carried out in Addu city (September 2013) revealed that about 72% of the waste generated comprises of organic waste including kitchen and garden waste. This is almost the same for all islands in the region.

Plastics and diapers take up the second largest quantity by weight. Diapers are particularly problematic in that they are infectious and do not decompose or combust easily. About a 40% of the plastics hold potential for recycling through accumulation of a marketable quantity in a clean storage. Rest of the plastics is equally distributed into used plastic bags / wrappers and high density plastics. These can largely be reduced through promotion of alternative biodegradable packaging and consumer awareness.

Cardboards and drink containers comprise of around 3% of the total waste generated. There is an existing market for re-export of metals as described in the Waste NL (2009) study undertaken in conjunction with EPA. Price of metal ranges between 50 Laari per kg and MVR 1.50 depending on the level of segregation and compaction of the metals. Glass/ceramic which also takes up around 3% of the waste composition can easily be converted for building or decorative use by crushing.

Although a re-use/ scavenger market exists for fabrics and polyfoams, awareness campaigns can mobilize healthier markets for the fabrics and polyfoams toward minimizing the quantities that enter the waste stream. Construction and Demolition waste is being re-used for the new developments.

#### **2.3.2.2 IWM Targets**

- Ensure that target island has resolved its waste management issues.
- Establish rules and regulations for waste management.
- Reduce the waste produced and to use reusable materials.
- Aggregate all waste that is produced and dispose of it properly.
- Raise awareness of the community regarding the economic benefits of keeping the island clean.
- Establish a mechanism to ensure that waste is managed appropriately through fee collection to meet part of the costs of waste management.
- Establish an appropriate system of using suitable equipment at the waste management centre.
- Strengthen the waste collection system.

It is proposed that household waste will be segregated into two categories; e.g. organic and non-organic wastes. The Community is to decide on household waste collection arrangements. It is proposed that in addition

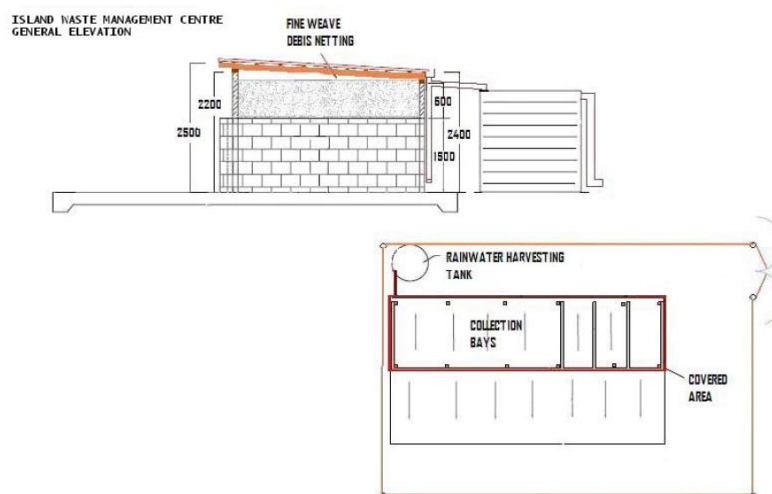
to composting recyclable bottles and other such items would be separated at the island waste management centers (IWMC).

### 2.3.2.3 Framework of interventions

Target	Current status	Activities
Reduce the quantity of waste generated.	Not much awareness activities. Increase in waste generated day by day. Littering on roads and public places.	Undertake awareness activities Promote bulk purchasing
Increase Reuse and Recycling.	Schools have carried out reuse activities to some extent but can be expanded further.	Establish contacts with Aluminum and Can exporters Waste segregation
Generate Revenue from Waste.	Waste is disposed through open burning or dumping.	Composting Waste segregation
Awareness on economic benefits of keeping island clean.		Raising awareness and placing dustbins in public areas
Establish User Fees for sustainable waste management.	Currently Households spend for waste management services.	Establish user fees for waste collection.
Improve the site and waste management centres.	The management of the IWMCs is poor	Construct composting pad Improve the overall storage of segregated waste
Use Waste Management Equipment.	Basic equipment are available	Purchase and use of equipment necessary for segregation, recycling and composting
Establish Waste Collection Service from households	Ad hoc	Acquire bins to keep waste sorted at household level, and to sort waste at the IWMC

### 2.3.2.4 Conceptual Designs of IWMCs

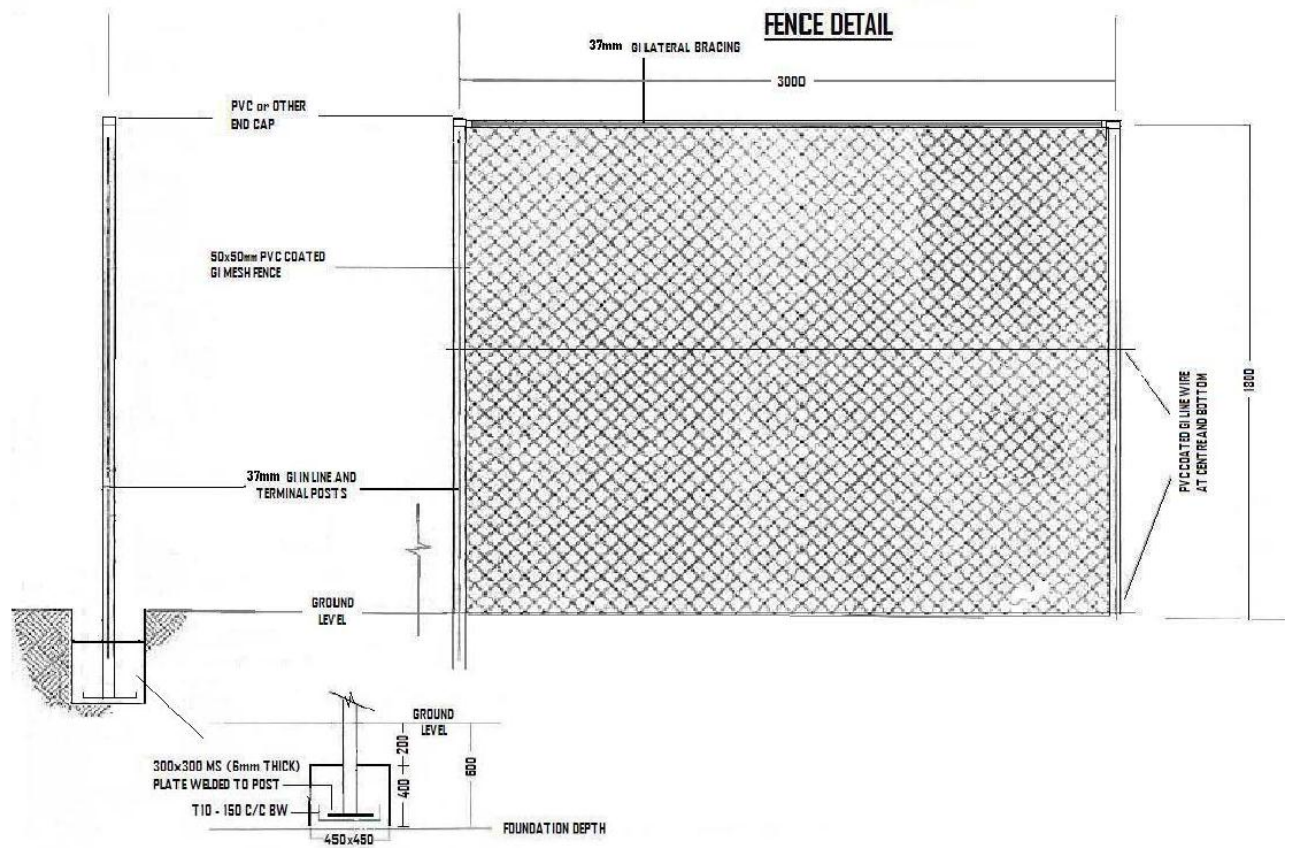
While the project will not construct new IWMCs, the following Figures from 2.18 – 2.26 are provided to give an understanding of the standards to be maintained during the improvement work of existing IWMCs. The details of specifications are provided in Appendix I.



*Figure 2.18: General elevation to be maintained*

COLUMN BASE





*Figure 2.20: Fence design*

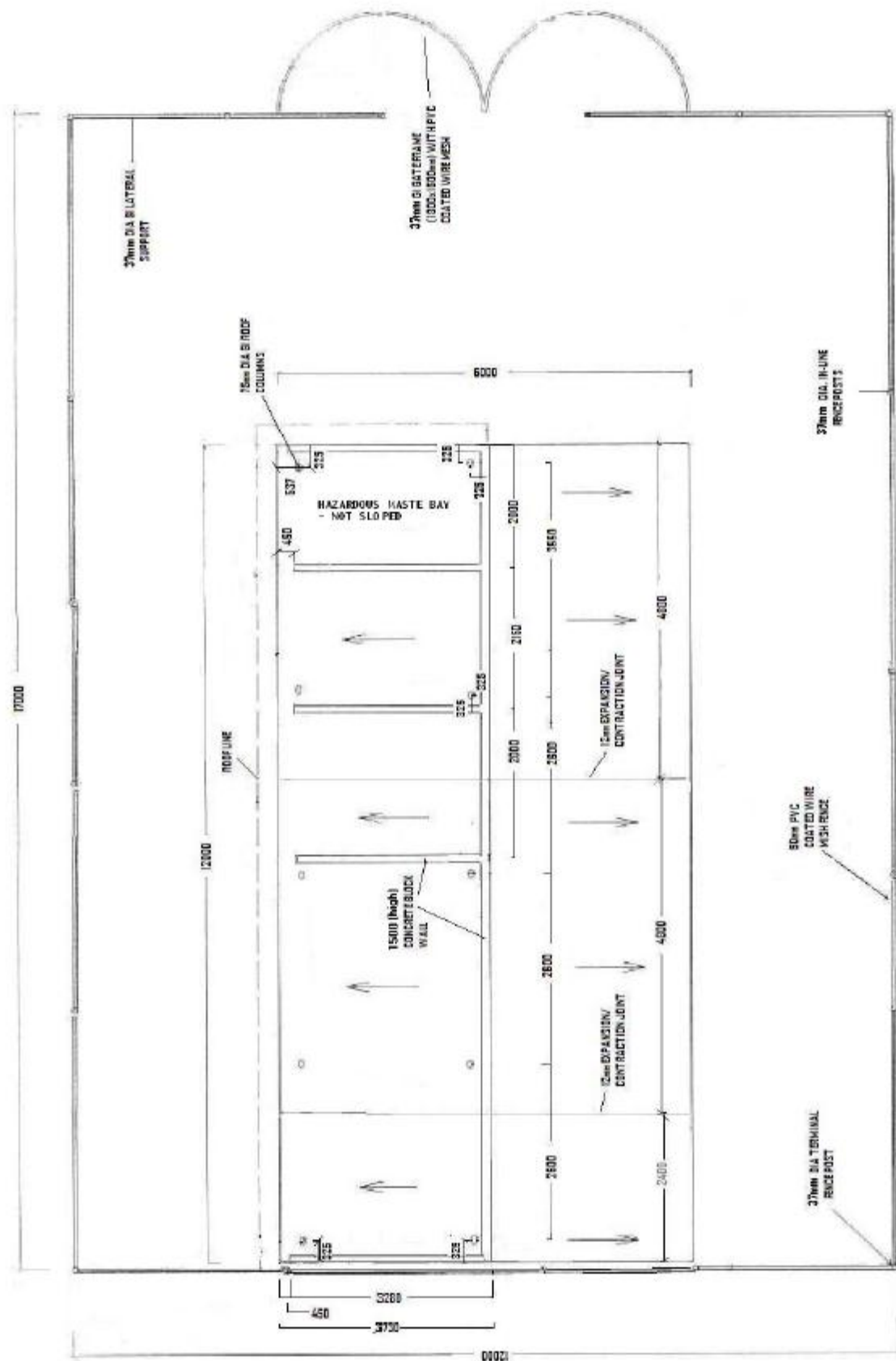


Figure 2.21: 500 person IWMC layout

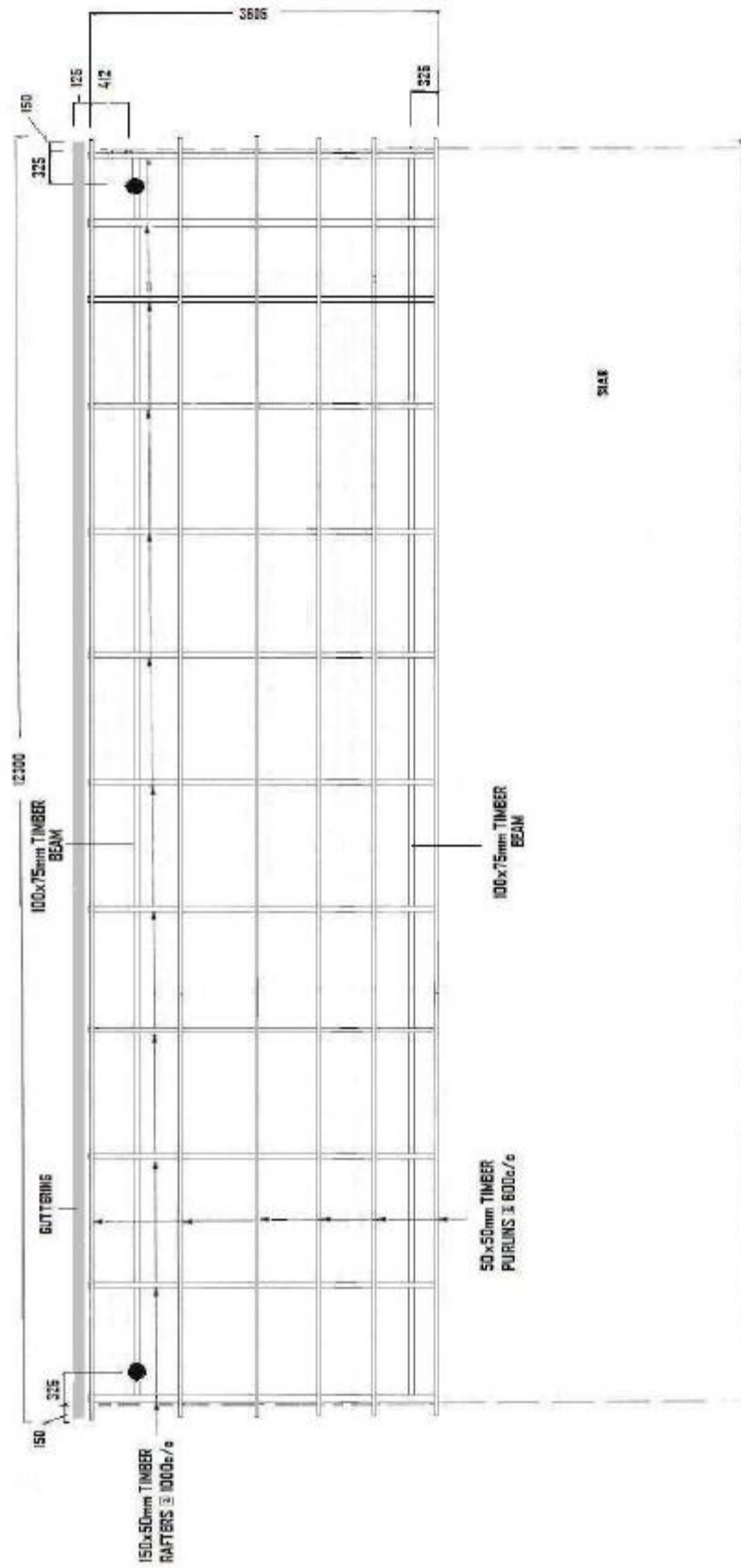


Figure 2.22: 500 persons IWMC Roof Frame



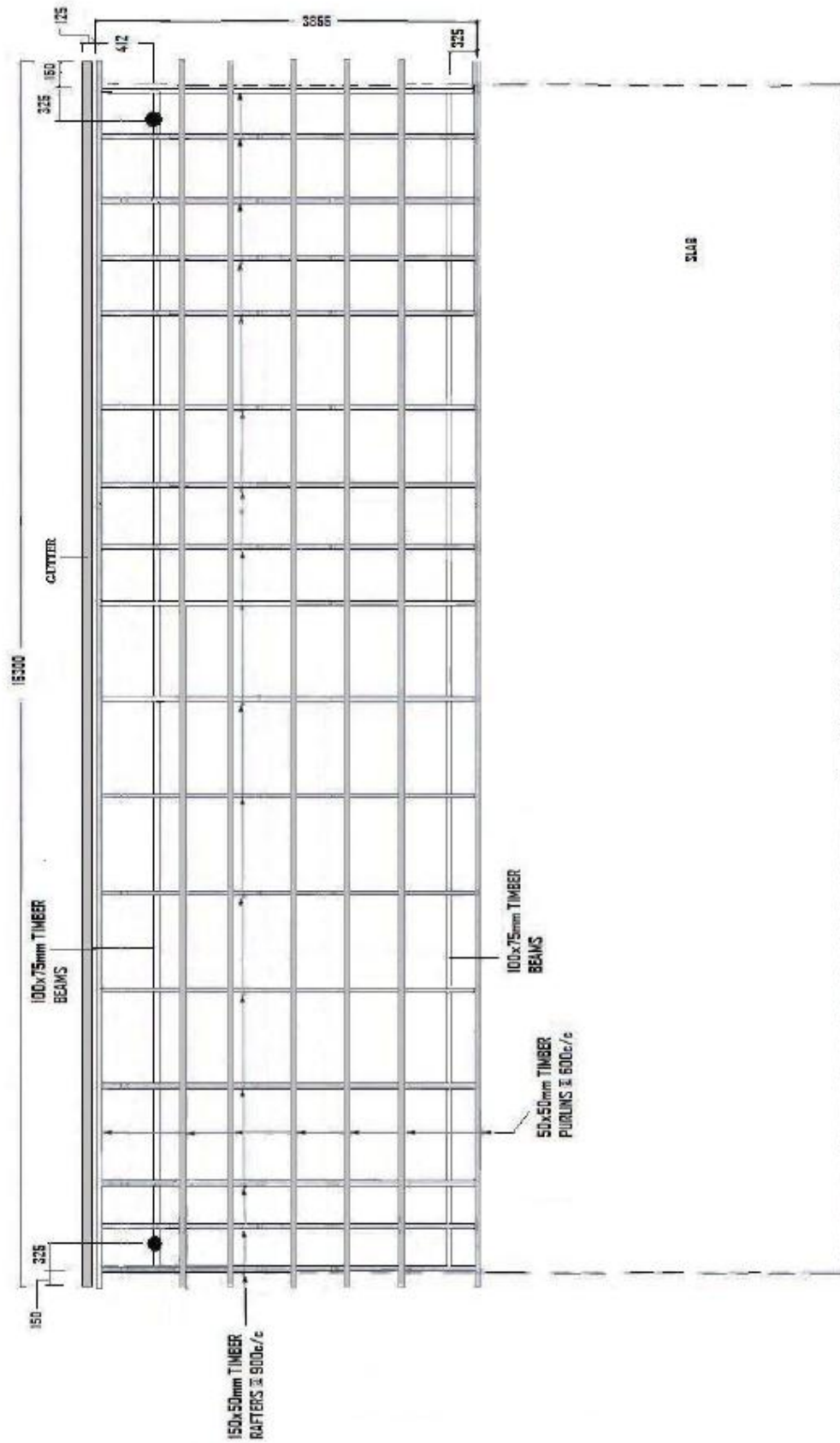


Figure 2.24: 1000-person IWMC Roof Frame





## REVIEW OF REGULATORY AND INSTITUTIONAL FRAMEWORK

### 2.4 Republic of Maldives Environmental Policies and Legislation

#### 2.4.1 Introduction

The Ministry of Environment, Energy and Water originally held the mandates for protection and preservation of environment. Under a reorganisation of the ministries in December 2008, the responsibility for the environment was taken over by the Ministry of Housing, Transport and the Environment. Subsequently, in January 2011, the ministries were further reorganised, and the Ministry for Housing and Environment took responsibility for the environment. With the next reorganization, the current Ministry of Environment and Energy (MEE) is now responsible in the formulation and regulation of policies, law, regulations and rules on environmental protection and conservation.

The Project will be required to comply with the national environmental legislation, in particular that relating to protected areas, EIA for engineering works, compensation for loss of land and the cutting down of trees. The key aspects of the legislation and policies are described in the following sections.

#### 2.4.2 The Environment Protection and Preservation Act (4/93)

The basic environment law, Law No.4/93 as amended in respect of article 3 under 12/2014 Environment Protection and Preservation Act of Maldives (EPPA) was enacted in April 1993 as an umbrella law to protect and preserve the environment of the country. The main elements of the EPPA are as follows:

##### Introduction:

1. The natural environment and its resources are a national heritage that needs to be protected and preserved for the benefit of future generations. The protection and preservation of the country's land and water resources, flora and fauna as well as the beaches, reefs and lagoons and all natural habitats are important for the sustainable development of the country

##### Environmental Guidance:

2. The concerned government authority shall provide the necessary guidelines and advise on environmental protection in accordance with the prevailing conditions and needs of the country. All concerned parties shall take due considerations of the guidelines provided by the government authorities.

##### Environmental Protection and Conservation:

3. The protection of the environment, biodiversity, fresh water aquifers and associated wetlands and mangroves and protection from waste and pollution including air pollution are mandated to the Ministry responsible for the environment. Making and enforcing all the policies, plans and regulations related to the protection of the environment lies within the Ministry responsible for the Environment. Protected Areas and Natural Reserves:

4.(a) The Ministry of Environment, Energy and Water [*now the Ministry of Environment and Energy*] shall be responsible for identifying protected areas and natural reserves and for drawing up the necessary rules and regulations for their protection and preservation.

(b) Anyone wishing to establish any such area as mentioned in (a) of this clause, as a protected area or a reserve shall register as such at the ministry of Environment, Energy and Water [*now the Ministry of Environment and Energy*] and abide by the rules and regulations laid by the Ministry.

##### Environmental Impact Assessment (EIA):

5.(a) An impact assessment study shall be submitted to the Ministry of Environment, Energy and Water [*now the Ministry of Environment and Energy*] before implementing any development project that may have a potential impact on the environment

(b) The Ministry of Environment, Energy and Water [*now the Ministry of Environment and Energy*] shall formulate the guidelines for EIA and shall determine the projects that need such assessment as mentioned in paragraph (a) of this clause.

#### The Termination of Projects:

6. The Ministry of Environment, Energy and Water [*now the Ministry of Environment and Energy*] has the authority to terminate any project that has any undesirable impact on the environment. A project so terminated shall not receive any compensation

#### Waste Disposal, Oil and Poisonous Substances:

7.(a) Any type of waste, oil, poisonous gases or any substance that may have harmful effect on the environment shall not be disposed within the territory of the Maldives.

(b) In case where the disposal of the substance stated in paragraph (a) of this clause becomes absolutely necessary, they shall be disposed only within the areas designated for the purpose by the government. If such waster is to be incinerated, appropriate precautions shall be taken to avoid any harm to the health of the population.

#### Hazardous/ Toxic or Nuclear Wastes:

7. Hazardous/Toxic or Nuclear Wastes that is harmful to human health and the environment shall not be disposed anywhere within the territory of the country. Permission shall be obtained from the relevant government authority at least 3 months in advance for any trans-boundary movement of such wastes through the territory of the Maldives.

#### The Penalty for Breaking the Law and Damaging the Environment

9.(a) The penalty for minor offenses in breach of this law or any regulations made under this law shall be a fine ranging between MVR 5.00 (five Rufiyaa) and MVR 500.00 (five hundred Rufiyaa) depending on the actual gravity of the offence. The fine shall be levied by the Ministry of Environment, Energy and Water [*now the Ministry of Environment and Energy*] or by any other government authority designated by the ministry.

(b) Except for those offenses that are stated in (a) of this clause, all major offenses, under this law shall carry a fine of not more than Rf 100,000,000.00 (one hundred million Rufiyaa) depending on the seriousness of the offense. The fine shall be levied by the Ministry of Environment, Energy and Water [*now the Ministry of Environment and Energy*]

#### Compensation:

10. The government of Maldives reserves the right to claim compensation for all the damages that are caused by the activities that are detrimental to the environment. This include all the activities that area mentioned in clause 7 of this law as well as those activities that take place outside the projects that are identified here as environmentally damaging.

#### Definition:

11. This law:

(a) The “environment” means all the living and non-living things that surround and effects the lives of human beings.

- (b) A “project” is any activity that is carried out with the purpose of achieving a certain social or economic objective.

#### ***2.4.3 The Regulation on Environmental Liabilities (Regulation No. 2011/R-9)***

The objective of this regulation is to prevent actions violating the Environmental Protection and Preservation Act 4/93 and to ensure compensations for all the damages that are caused by activities that are detrimental to the environment.

The regulation sets mechanisms and standards for different types of environmental liabilities and equal standards that shall be followed by the implementing agency while implementing the regulation.

According to this regulation the Government of Maldives reserves the right to claim compensation for all the activities which have breached the Environmental Protection and Preservation Act 4/93.

#### ***2.4.4 Environmental Impact Assessment Regulations, 2007***

Any requirement to carry out civil engineering works, such as construction of additional drainage channels, or changes to the operation of the existing drainage channels (the four on Fuvahmulah and the one on Hithadhoo) would need to comply with the requirements of the Environmental Impact Assessment Regulations, 2007 as elaborated under the EIA regulation of 2012.

The requirement for and the regulations relating to the preparation of Environmental Impact Assessments are set out in the Environment Impact Regulations, 2007 which are enforced under Environment Protection and Preservation Act (Law No. 4/93) as amended in 2014.

#### ***2.4.5 Regulation on Sand and Aggregate Mining***

This regulation addresses sand mining from islands and bird nesting sand bars. Sand and aggregate mining from beaches of any island whether inhabited or uninhabited is banned for protection of the islands. Permissions for sand and aggregate mining from other areas shall be obtained from the relevant authorities.

#### ***2.4.6 Regulation on Coral Mining (1990)***

This regulation is only applicable to coral mining from the ‘house reef’ of islands and the atoll rim reefs.

#### ***2.4.7 Law of Fisheries (No. 5/68)***

Coral reef and coastal marine resources are managed by the MFAMR and regulations for the management of reef resources. All types of fisheries and marine activities are permitted and regulated by the MoFAR under this law.

#### ***2.4.8 Tourism Act: Law no. 2/99.***

Although the large part of this Law relates to the establishment and operation of Resort Islands, the section ‘On Tourist Hotels and Tourist Guesthouses’ will be relevant. The clauses of the Act which would be applicable to the establishment of small hotels or guesthouses, the approach favoured by the islanders on Fuvahmulah, are as follows: (The clause numbers are those in the particular sections of the Act).

17. Neither a tourist hotel nor a tourist guesthouse shall be operated in the Maldives except after registering the same at the Ministry of Tourism and after obtaining a licence issued by the Ministry to operate such establishments.
18. A licence to operate a tourist hotel or a tourist guesthouse shall be issued to those establishments that satisfy the following conditions:-
  - (a) the building and facilities are in accordance with guidelines made by the Ministry of Tourism;

- (b) the services determined by the Ministry of Tourism to be necessary at such an establishment are made available at the tourist hotel or tourist guesthouse;
  - (c) the registration fee prescribed in section 21 of this Act is paid; and
  - (d) the establishment is situated on an island determined pursuant to section 4 of this Act for the development of tourism.
19. Where the Government leases any land for development as a tourist hotel or a tourist guesthouse, such a lease shall be made in accordance with the provisions of this Act relating to the leasing of islands or land for development as tourist resorts. Furthermore, the provisions of this Act relating to tourist resorts shall also apply [equally] in respect of tourist hotels and tourist guesthouses.
20. No tourist shall be provided accommodation for payment in any establishment other than a tourist hotel or tourist guesthouse registered and licensed under this Act or a tourist resort or tourist vessel licensed under this Act.
21. Every tourist hotel or tourist guesthouse shall be registered upon payment of a registration fee of MRf 10,000 in the case of a tourist hotel and MRf 5,000 in the case of a tourist guesthouse.

#### ***2.4.9 National Solid Waste Management Policy***

GoM announced a National Solid Waste Management Policy on February 3, 2008. The Policy has been prepared to reflect the current status of solid waste management in the Maldives. The policy contains strategic principles that create the underlying logical and philosophical structure of the policy. They also represent universally accepted practices in waste management:

- Polluter pays principle
- Integrated solid waste management
- Waste management hierarchy
- Best Practical Environmental Option (BPEO)
- Best Available Technology Not Entailing Excessive Costs (BATNEEC)
- Equity
- Proximity principle
- Private Sector Participation (PSP)

The overall policy framework for solid waste management is condensed into the following five Principle Objectives:

- Establishing and activating waste management governance;
- Creating waste producers' duties and responsibilities;
- Establishing waste management infrastructure;
- Activating the waste management system; and
- Influencing consumer choices and waste management practices.

Under the Principle Objectives are 12 policies and numerous strategies that systematically apply the strategic principles.

#### ***2.4.10 Waste Management Regulation (No. 2013/R-58)***

The Waste Management Regulation of the Maldives was enacted based on Article 22 of the Constitution of the Republic of Maldives and under powers vested in the Ministry of Environment and Energy under the Article 3 of the Environmental Preservation Act 4/93 in relation to Article 7 and 8 of the same Act.

The Regulation was gazetted on the 5<sup>th</sup> of August 2013 and became effective on the 5<sup>th</sup> February 2014. This regulation sets standards for the management of municipal, industrial and special waste, issuance of permissions in relation to waste management, transportation of waste, information sharing/reporting and penalizing for non-compliance. A copy of the regulation in local language is available from the following link:

<http://epa.gov.mv/images/stories/laws%20and%20Regulations/wasteregulation2013.pdf>

#### ***2.4.11 By-law - Cutting Down, Uprooting, Digging Out and Export of Trees and Palms from one island to Another***

Any removal of trees to improve the functioning of drainage channels or the construction of new channels would be required to comply with the regulations relating to the cutting down and/or removal of trees. Such projects relating to impacts on trees can only commence upon approval from Ministry of Housing and Environment.

Article 8 of the regulation requires permission to be obtained if more than ten coconut palms that have grown to height of 15ft are to be removed.

Article 2 (d) of the regulation also enforces replacement of the vegetation that is lost as a result of re-plantation.

Pursuant to the *Environmental Protection and Preservation Act* of the Maldives, the Ministry of Environment, Energy and Water has developed this by-law in order to educate and guide developers about acceptable practices for the management of trees and palms. The by-law prohibits the cutting down, uprooting, digging out and export of trees and palms from one island to another unless there is no other viable alternative. It also requires that for every tree or palm removed at least 2 should be replanted on the same island. The by-law also provides particular protection to the following:

- coastal vegetation extending 15 metres into the island;
- all trees and palms growing in mangrove and wetland areas;
- all trees and palms growing in Government protected areas; and
- trees and palms that are abnormal in structure.

#### ***2.4.12 Legislation on archaeological sites, findings of artifacts, sites of hisporical significance***

A Heritage Act (Act No: 27/29) was ratified on the 22nd of July 1979, which is basic and only prohibits the destruction and vandalising of such sites and articles (with an exception to the exploration of such sites and articles for research purposes under a government permission). No further developments on the management and protection of physical cultural resources have taken place.

#### ***2.4.13 Other Policies which may be related to the Projects***

- Ministry of tourism regulations and circulars
- Agriculture Development Master Plan, as contained in the National Development Action Plan (NDAP)

### **2.5 Role of Ministry of Environment and Energy**

The Project will be carried out under the auspices of the Ministry of Environment and Energy, which was established by the President under the powers granted to him by the Constitution of the Republic of Maldives. The Environmental Protection Agency (EPA) is an independent regulatory organisation affiliated to the Ministry of Environment and Energy and operates under the guidance of a governing board. The EPA would be the body responsible for overseeing most of the project activities, particularly in relation to impacts on the environment.

### ***2.5.1 Mandate of the Environmental Protection Agency***

The mandate of the EPA is as follows<sup>ii</sup>.

- (i) Planning and administering the protection of places and living species that are designated to be protected according to the provisions of the Environment Act
- (ii) Drawing up the guidelines and standards of the Environmental Impact Assessment that is required before the implementation of any project that may have an impact on the environment of the Maldives.
- (iii) Carrying out all tasks related to the implementation of the Maldives Environment Act.
- (iv) Implementing the Environmental Impact Assessment Regulation.
- (v) Carrying out the conservation processes deemed necessary based on data gathered regarding the erosion of islands due to natural or human activity.
- (vi) Drawing up the guidelines and standards for environmentally safe procedures for waste management, and monitoring to ensure that these guidelines and standards are met by those carrying out waste management.
- (vii) Introducing a system of valuation of the environment in order to recoup any loss to the environment, and implementing this activity.
- (viii) Implementing the regulations set by the Ministry for the protection of the island environment, and monitoring adherence to the regulations and legislation developed for the protection of the environment by government and private parties, and providing advice to relevant government organizations on these issues.
- (ix) Issuing licenses for water and sanitation services, and the management of solid waste and sewerage, and to ensure that parties issued such licenses comply with the terms of the licenses.
- (x) Drawing up guidelines, regulations and standards for the management of solid waste and sewerage, and ensuring that providers of water services follow these standards.
- (xi) Setting the standards for fee-charging by private providers of water services and providers of solid waste and sewerage disposal or destruction, issuing permits for such charges, checking on the submissions of the users of such services, and taking action to protect the interests of both sides.
- (xii) Carrying out scientific research and experiments, developing a knowledge base in this area, and disseminating this data to those who require it.
- (xiii) Researching the changes to the beaches of islands and the causes of beach erosion, and providing advice to solve these issues.
- (xiv) Obtaining data on the formation and changes to the islands of the Maldives through the use of satellite imagery and aerial photography, obtaining the data needed for the geographic information system, and providing for the dissemination of this data.
- (xv) Identifying the impacts of land reclamation, harbour development and reef blasting, researching ways of carrying out such activity in an environment-friendly manner, and providing the data and experience gained to relevant organizations.
- (xvi) Conducting research and experiments on the environmental pollution in the Maldives, and providing data and professional advice.
- (xvii) Conducting research on the taxonomy and habitats of living organisms, and providing data and sharing the experiences with relevant organizations.

- (xviii) Conducting research and experiments regarding environmentally friendly biotechnology and biosafety, and providing data and professional advice
- (xix) Conducting research and experiments regarding the implementation and monitoring of various projects on energy, developing a knowledge base in this area and disseminating this data to those who require it.
- (xx) Planning, administering and monitoring issues relating to the physical oceanography of the Maldives.
- (xxi) Monitoring the gases, smoke and particulates in the atmosphere, gathering and monitoring data on these issues, and making it available to relevant parties.
- (xxii) Conducting scientific research into the available sources of potable water in the Maldives, monitoring such data, and making it available to relevant parties.
- (xxiii) Conducting research to identify natural sources of energy in the Exclusive Economic Zone (EEZ) of the Maldives.
- (xxiv) Accumulating the environmental data required for the planning of development projects, developing a knowledge base in this area, and disseminating this data to those who require it.

## **2.6 Republic of Maldives Social Regulations**

### **2.6.1 Land**

The 2008 Constitution vests all land in the State and bans foreign ownership of land. It is understood that Government is reviewing land-related legislation to bring it into line with the constitution and current development policy. Meanwhile, matters relating to land are governed by the provisions of the Maldivian Land Act and Regulations of 2002, as subsequently amended.

The Act empowers Government to allocate land for five purposes:

- The construction of households and buildings for residential purposes;
- For commercial use;
- For social use;
- For environmental protection;
- For government use.

Under the Act, all Maldivian citizens who do not have a place of residence are entitled to a parcel of land for residential purposes, entitled a "state dwelling". Such parcels are issued by the respective Atoll Office and must not exceed 4,000 ft<sup>2</sup> (372 m<sup>2</sup>). The parcel is forfeit if not developed ("settled") within five years. State dwellings are heritable and divisible, down to no smaller than 600 ft<sup>2</sup> (56 m<sup>2</sup>).

State dwellings can be privatised by purchase from the government. Conversion to non-residential purposes is possible subject to compliance with land use policy, and a permit. Sales of private land attract a 15% tax.

Buildings, trees and other assets on land belong to the owner of the land or official user of the land, unless third-party ownership can be proven under Shari'ah.

Land for agriculture is allocated to residents by island administrations on an annual renewable basis. The land remains government property. No rent is paid, but the plots are generally small and the system provides little security or incentive to invest in and improve the land<sup>iii</sup>. It is understood that the Ministry of Fisheries and agriculture (MoFA) is preparing an Agricultural Land Act to address these issues, with assistance from the UN Food & Agriculture Organisation (FAO).

When land is required for public projects, it is understood that the legal owner or registered user is compensated on a land-for-land basis, with fixed assets being paid for at fair market price.

According to a recent President's Office Press Release (Ref. No. 2011-374), the Cabinet has established the Maldives Land and Survey Authority. The Authority will conduct surveys and collect and update information on the most beneficial use of lands, lagoons and reefs of the Maldives, and formulate and implement cadastral survey standards.

## 2.6.2 Gender

The 2008 Constitution bans discrimination on grounds of sex except as prescribed by Islamic Shari'ah. This sits uneasily with the Maldives' earlier commitments to international agreements including the Convention on the Elimination of All Forms of Discrimination (CEDAW) in 1993 and the CEDAW Optional Protocol in 2006 (with reservations on Articles 7 (a) and 16). The Maldives is also signatory to a number of international instruments addressing gender equality including the Commonwealth Action Plans on Gender Equality, and is party to all major human rights treaties, with the exception of the Conventions on the Rights of Migrant Workers and their Families<sup>iv</sup>.

A National Policy on Gender Equality was passed in 2006, and as of 2009 was being revised: the National Gender Equality Policy (draft 1) was founded on the fundamental principle of Equality for All, enshrined in the 2008 Constitution. The vision is "a just society where...., women enjoy fundamental rights and freedoms on a basis of equality of men and women.... participate in and benefit from democracy and development both in public and private life" (UNDP, 2010). A National Policy on Gender Equality of Women and Men is available from the Ministry of Gender and Family's website, in Dhivehi.

The President acts as the Gender Focal Point for the National Planning Council and is dedicated to gender leadership and the implementation of gender strategies, policies and plans. Gender Focal Points have been established in all line-Ministries to co-ordinate and network leading to a coherent approach to gender mainstreaming in their respective ministries (UNDP, 2010). Formerly, the Department of Gender and Family Protection Services of the Ministry of Health and Family (MoHF) was the lead agency for gender mainstreaming and promoting gender equality in national government, but it is now the Ministry of Gender and Family (MoGF).

Analyses of gender issues in the Maldives are available in, for example, ADB's 2007 Gender and Development Assessment<sup>v</sup> (ADB, 2007), UNDP's 2010 Situational Analysis (UNDP, 2010), and FAO's factsheet on Women in Agriculture, Environment and Rural Production (FAO, undated).

## 2.6.3 Other Social Laws

Legislation relating to human rights and labour is listed in Table 2.1 below.

**Table 2.1: Human Rights and Labour Law**

Year	Name	Details
1984	<i>International Convention on the Elimination of All Forms of Racial Discrimination</i>	Accession 24 April 1984
1990	<i>Prevention of Terrorism Act (Act No.10/1990)</i>	The Act prohibits acts of terrorism, and imposes severe punishment for offenders.
1991	<i>Convention on the Rights of the Child</i>	1991 Ratified 11 February 1991
1993	<i>Convention on the Elimination of All Forms of Discrimination Against Women</i>	Accession 1 July 1993

Year	Name	Details
2002	<i>Optional Protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography</i>	Ratified 10 May 2002
2004	<i>Convention Against Torture and other Cruel, Inhuman or Degrading Treatment or Punishment</i>	Accession 20 April 2004
	<i>Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict</i>	Ratified 29 December 2004
2006	<i>Human Rights Commission Act (Act No. 6/2006)</i>	Established the Human Rights Commission as an independent legal entity mandated to protect, promote and sustain human rights in the Maldives, and to assist NGOs.
	<i>Human Rights Commission of Maldives</i>	<p>The Human Rights Commission of the Maldives was first established on 10 December 2003 as an independent and autonomous statutory body by Decree by the President of the Republic of the Maldives. The Commission was later re-established under the Human Rights Commission's Act in 2006. The aim of the Commission is to lead the promotion and protection of Human Rights under the Maldives Constitution, Islamic Shari'ah and regional and international Human Rights Conventions ratified by the Maldives.</p> <p>Although the Human Rights Commission currently focuses mainly on the public sector, the Commission also works with the private sector, specifically in creating awareness on human rights issues.</p>
	<i>Optional Protocol to the International Covenant on Civil and Political Rights (OPICCPR)</i>	Ratified 19 September 2006
	<i>International Covenant on Economic, Social and Cultural Rights (ICESCR)</i>	Ratified 19 September 2006
	<i>Optional Protocol to the Convention on the Elimination of All Forms of Discrimination Against Women</i>	Ratified 13 March 2006
	<i>Optional Protocol to the Convention Against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment</i>	Accession 22 June 2006 (founding member)
2008	<i>Employment Act (Act No. 2/2008)</i>	Specifies the rights and duties of employers and employees. The Employment Act specifically prohibits forced labour, discrimination at the work place, and child labour.

Year	Name	Details
2009	<i>Pension Act (Act No. 8/2009)</i>	Mandates upon every employer to enrol all employees on a defined contribution pension scheme.
	<i>Employment Tribunal</i>	The Tribunal was established pursuant to the Employment Act with the objectives of examining and arbitrating legal matters arising in the work environment between the employer and employee and any matters ascribed to the Employment Tribunal pursuant to the Employment Act or any other Act or regulation or under any agreement, in an expeditious and simple manner.
2010	<i>The Convention on the Rights of Persons with Disability (CRPD)</i>	Ratified 1 April 2010
	<i>Sexual Harassment Bill [under development]</i>	Defining sexual harassment in work place and assigns responsibilities for prevention of different stakeholders of such acts and sets out penalties for the offenders.
other	<i>The President of Maldives Award for Human Resource Development in the Tourism Industry</i>	The Award was established to encourage hoteliers and resort operators to invest and contribute towards training and development of staff in order to demand for qualified staff within the tourism industry.

Source: FJS Consulting (2010)

## 2.7 World Bank Safeguard Policies

The World Bank has a number of Operational Policies (OPs) and Bank Procedures (BPs) concerning environmental and social issues, which together are referred to as the Bank's 'Safeguard Policies'. If, during the development of a project, it is considered that it is possible that a proposed project activity could be the subject of one of the safeguard policies, that policy is considered to have been 'triggered'. In the subsequent development of the project, that activity must be considered in more detail to determine whether it is actually of no concern or adequate mitigation can be applied to address the concern, or the activity should be removed from the project (or the whole project should be dropped). The sections below address those Safeguard Policies that have been triggered by the project under review, and the actions that have been taken to ensure that the requirements of those policies will be satisfied in the further development of the project.

Safeguard Policies Triggered by the CCA Project	Yes	No
Environmental Assessment (OP/BP 4.01)	√	
Natural Habitats (OP/BP 4.04)	√	
Pest Management (OP 4.09)		√
Physical Cultural Resources (OP/BP 4.11)	√	
Involuntary Resettlement (OP/BP 4.12)	√	
Indigenous Peoples (OP/BP 4.10)		√
Forests (OP/BP 4.36)		√

Safety of Dams (OP/BP 4.37)	√
Projects in Disputed Areas (OP/BP 7.60)	√
Projects on International Waterways (OP/BP 7.50)	√

### **2.7.1 Environmental Assessment (OP/BP 4.01)**

Any negative environmental or social impacts associated with the CCA project were expected to be limited, i.e. they would be site-specific, few (if any) would be irreversible, and in most cases they could be readily mitigated. The project was therefore screened by the World Bank as Category B in relation to environmental assessment (EA) requirements, and the project triggers the Environmental Assessment safeguard policy (OP/BP 4.01).

The Environmental Assessment safeguard policy acknowledges that the assessment required for Category B can be narrower than the Environmental & Social Impact Assessment (ESIA) stipulated for a Category A project. The nature of the assessment will vary from project to project, and in the case of the CCA project an Environmental & Social Management Framework (ESMF) was deemed to be appropriate at the time of project preparation.

### **2.7.2 Natural Habitats (OP/BP 4.04)**

OP/BP 4.04 – Natural Habitats was triggered because the project area includes the Protected Area of Eidhigalhi Kilhi (lake/wetland) in Hithadhoo and the Fuvahmulaku Bandara and Dhandi Magu Kulhis in Fuvahmulah. The main concern of this safeguard policy is whether the project ‘will involve the significant conversion or degradation of critical natural habitats’ (each of the terms in this phrase is defined in OP 4.04). As it is made clear in the technical parts of this report, none of the interventions considered / proposed within the project would cause such conversion or degradation. In addition, screening protocols and mitigation guidelines have been provided to ensure that any interventions considered in future within the project itself will not cause conversion or degradation of the wetlands, or adverse social implications arising therefrom. Moreover, recommendations have been made for actions that should be taken to reverse or reduce the effects of past activities that have resulted in conversion and/or degradation of parts of the wetland habitats and associated ecosystem, and for actions that will contribute to the future conservation of the protected areas.

The coral reef monitoring component was not expected to lead to significant adverse environmental or social issues. Certain operational environmental, health and safety issues were expected to arise during the monitoring work. These have been anticipated within the ESMF study, and guidelines (based on existing international best practices) have been provided. The present report also identifies the need for basic training in precautionary practices for the co-operating professional resort divers who will be conducting the monitoring work.

The activities under the SWM will be mostly technical assistance to develop an integrated solid waste management system with minor investment activities. While the current practices of SWM are detrimental to natural habitats, the proposed actions will help the Addu City and Fuvahmulah to manage solid waste better and reduce the negative impacts associated with waste generation.

### **2.7.3 Physical Cultural Resources (OP/BP 4.11)**

OP/BP 4.11 – Physical Cultural Resources has been triggered because during the CCTF phase I ESIA process, few significant sites were identified, particular within protected and environmentally sensitive areas of these of Addu and Fuvahmulah which required protection. Given the phase II of CCTF will also continue to invest on these areas, protection of these existing resources and any chance finds will be important.

#### **2.7.4 Involuntary Resettlement (OP/BP 4.12).**

OP/BP 4.12 – Involuntary Resettlement was triggered because it was considered that some of the potential investments in the wetland areas might lead to the loss of land or structures and/or the loss of access to areas of importance for livelihood support. These issues have been taken into consideration whilst conducting the ESMF, and none of the interventions that have been considered / proposed by the project would cause such problems. Moreover, the screening protocols and mitigation guidelines referred to under OP/BP 4.01 above will ensure that any interventions considered in future within the project itself will not cause involuntary resettlement. As an ‘insurance’ for this issue, an outline Resettlement Policy Framework (RPF) has been provided (see section 4.4.5 below), so that if any resettlement issues should arise they can be resolved satisfactorily.

#### **2.7.5 Resettlement Policy Framework**

##### Introduction

It is not expected that people will be displaced by actions undertaken as part of the projects. Indeed, the avoidance of a need for resettlement is one of the sub-component screening criteria. However, given that the sub-components to be developed, especially integrated solid waste management, cannot be known at the ESMF stage, a Resettlement Policy Framework (RPF) has been provided below as an ‘insurance’ that resettlement issues can be addressed in the event that they do arise during project implementation or as a result of technical assistance for SWM after the project completion.

This RPF is generic. The detailed social impacts of individual sub-components cannot be known until the sub-components are proposed and designed. Similarly, it is not possible to include material such as an entitlement matrix at this stage, because that would also be specific to the sub-component concerned.

##### Broad Principles

This ‘framework’ aims to outline the principles to be applied in the resettlement and rehabilitation of any project affected persons (PAPs) so that they do not suffer adverse effects from the project and they improve, or at the minimum retain, their previous standard of living, earning capacity and production levels. The resettlement actions should minimise dependency and be sustainable socially, economically and institutionally. Special attention must be paid to improvement of the living standards of any vulnerable or marginalised groups. The broad principles of the policy are as follows:

- Adverse impacts on persons affected by the project should be avoided to the extent possible.
- Where adverse impacts are unavoidable, the PAPs will be assisted in improving or regaining their standard of living. Vulnerable groups will be identified and assisted to improve their standard of living.
- All information related to resettlement preparation and implementation will be disclosed to all concerned, and community participation will be included within planning and implementation.
- Individuals losing land, house or other assets will be consulted for mitigation measures well before the required land is taken.
- Persons affected by the project who do not own land or other property but who have an economic interest in it or will lose their livelihoods (e.g. tenants and squatters), will be assisted as per the broad principles of this policy.
- A valuation exercise will be undertaken in advance of project implementation in order to value any land or assets that may be needed by the project, either temporarily or permanently.
- A census and socio-economic survey of affected communities will also be undertaken.

- PAPs who will permanently lose land or access to land should be offered alternative land if practicable, or financial compensation if not.
- Any financial compensation should be at full present market replacement cost, including all legal and removal fees.
- All replacement land and compensation payments should be provided before the start of any project work.
- Any PAPs losing their homes will be provided with assistance with removal and ongoing rehabilitation.
- If PAPs are to be resettled, the host community, if any, should be consulted in advance and, if needed, specific measures should be provided to address their concerns.
- If necessary, an entitlement framework of different categories of PAPs should be prepared and budgeted for. (However, anyone moving into the project area after a specific cut-off date will not be entitled to compensation or assistance.)
- An appropriate grievance redress mechanism will be established at project level to ensure the prompt resolution of any complaints or disputes.
- All activities related to the planning, implementation, and monitoring of resettlement should include the involvement of women and vulnerable groups.
- All consultations with PAPs shall be documented. Consultations will continue during the implementation of resettlement and rehabilitation.
- If appropriate, a Resettlement Action Plan (RAP) will be prepared by the proponents, including a fully itemised budget and an implementation schedule.

### Definitions

The following definitions are used in the documents and/or can be used during the project:

- (i). **Cut-off Date:** The cut-off-date shall be the date of start of the census and socio-economic survey undertaken by the project authority.
- (ii). **Project Affected Person:** PAPs are those who stand to lose all or part of their physical and non-physical assets including homes, productive land, community resources, commercial properties; livelihood; and socio-cultural network.
- (iii). **Project Displaced Person:** A displaced person is a person who is compelled to change his/her place of residence and/or workplace or place of business, due to the project.
- (iv). **Project Affected Family:** A family whose primary place of residence or other property or source of livelihood is adversely affected by the acquisition of land for a project or involuntary displacement for any other reason
- (v). **Family:** A 'family' is a man and woman sharing a household, along with their dependants including parents and children.
- (vi). **Vulnerable Person:** A person who is poor, physically or mentally disabled/handicapped, destitute, disadvantaged for ethnic or social reasons, an orphan, a widow, a person above sixty years of age, or a woman heading a household.
- (vii). **Entitled Person:** A person adversely affected by the project who is entitled to some kind of assistance as per the project entitlement framework

- (viii). Host Community: People living in or around areas to which people physically displaced by a project will be resettled who, in turn, may be affected by the resettlement.

## The Process

### Declaration of the project and its impact zone

As the first step in the process, the Government of Maldives or the City, Atoll or Island Council will inform the community well in advance about the project, its features and its likely adverse and positive impacts.

### Social Screening: Identification and Categorization of Impacts

The purpose of screening is to provide an overview of the nature, scale and magnitude of the issues, in order to determine the need for conducting a Social Impact Assessment (SIA) and preparing a Resettlement Action Plan (RAP). After identifying the issues, the applicability of the Bank's social safeguard policies is established, along with the local regulatory requirements. Based on this screening, the boundaries and focus areas for the SIA, along with the use of specific instruments, are determined.

### Social Impact Assessment (SIA)

The project will undertake a survey for the identification of the persons and their families likely to be affected by the project. The survey must include:

Members of families who are residing, practicing any trade, occupation or vocation in the project affected area

Project Affected Families who are likely to lose their house, homestead, commercial establishment, agricultural land, employment or are alienated wholly or substantially from the main source of their trade, occupation or vocation, or who will lose any other immovable property or their source of livelihood.

People losing access to private property or common property resources.

The survey results will be disseminated among the affected community.

### Resettlement Action Plan (RAP)

Based on the social impact assessment survey, the project will prepare an action plan to minimise and/or mitigate the adverse impacts as identified during the survey. The draft mitigation plan in the form of a comprehensive resettlement action plan (RAP) will be again disseminated among the affected individuals / community. The feedback received from the affected groups will be incorporated to the extent possible before finalisation of the RAP. The RAP will take into account the magnitude of impacts and accordingly prepare for Bank approval a resettlement plan that is consistent with the above principles before the sub-project is accepted for Bank financing. The cost of RAP implementation will be entirely dependent upon the nature and scale of the social mitigation / compensation required for the subject sub-project.

RAPs should include the following details:

- (i). The extent of the area to be taken for the sub-project;
- (ii). A list of project affected families and the likely number of persons to be displaced by impact category;
- (iii). The extent and nature of land and other immovable property in the affected zone, by family;
- (iv). A list of the names of persons whose livelihood depends on the natural resources of the project area;

- (v). A list of persons who have lost or are likely to lose their employment or livelihood, or who have been alienated wholly and substantially from their main sources of occupation or vocation consequent upon the acquisition of land and / or structures for the project;
- (vi). A list of occupiers, to include tenants and informal occupiers / 'squatters'.
- (vii). Quantified impacts by types of impact and type of affectees
- (viii). A list of public utilities and Government buildings which are likely to be affected
- (ix). A comprehensive list of compensation and benefit packages which are to be provided to project affected families by impact category;
- (x). Details of the extent of land available for resettling and allotting land to the project affected families;
- (xi). Details of the basic amenities and infrastructure facilities which are to be provided for resettlement;
- (xii). Grievance Redress Mechanism
- (xiii). The time schedule for shifting and resettling the displaced families;
- (xiv). The ongoing support to be provided to resettled families, including any necessary help in re-establishing their livelihoods;
- (xv). Arrangements for monitoring the resettlement process.

#### Benefits for Project Affected Families

Resettlement and rehabilitation (R&R) benefits must be extended to all the Project Affected Families. The details of such benefits should be defined within an entitlement matrix. The entitlement matrix given below will guide preparation of Resettlement Action Plan (RAP).

Type of Impact	Unit of entitlement	Eligibility	Mitigation measures
Loss of agriculture land	Household	Legal land owner	Compensation for loss of land or land of same size and quality If loss of land is less than 10 % of total land holding, three months of average income as subsistence grant If loss of land is between than 10 to 25 % of total land holding, six months of average income as subsistence grant If loss of land is more than 25 % of total land holding, one year of average income as subsistence grant
Loss of residential land	Household	Legal owner of land	Compensation for loss of land or land of same size and quality
Loss of residential structure	Household	Legal owner of structure; tenants; non titleholders	Compensation for loss of structure Six months of rental allowance at market rate
Loss of commercial structure	Household	Legal owner of structure; tenants; non titleholders	Compensation for loss of structure Six months of rental allowance at market rate
Loss of livelihood	Individual	Employee of commercial	Six months of income

<b>Type of Impact</b>	<b>Unit of entitlement</b>	<b>Eligibility</b>	<b>Mitigation measures</b>
		structure, labour in agriculture fields; non titleholders; etc	
Loss of community / public structure / facility	Community		Project to replace any structure / facility impacted by the project

### 3 BASELINE CONDITION OF PROPOSED PROJECT SITES

There are two key areas, Fuvahmulah and Addu within which project activities will be carried out.

#### 3.1 Fuvahmulah

##### 3.1.1 *Physical Environment*

###### 3.1.1.1 *Geology*

Fuvahmulah is single reef-top island formed on a raised oceanic atoll. It is the third largest island in Maldives with an area of 484 Hectares (4.84 km<sup>2</sup>) and has a coastline of approximately 15.3 km. Fuvahmulah is approximately 4.42 km long and 1 to 1.4 km wide. The house reef of Fuvahmulah could be described as saturated, with the island almost reaching the edge of reef flat. The island occupies about 82% of the reef flat. Reef edge and reef flat is more pronounced on the southern side of the island (See figure 4.1). The maximum distance between coastline and reef flat edge is about 200 m. A steep drop off of about 1000 m occur approximately 2.5 – 3 Km off the eastern side of the reef and a gradual sloping reef extends to about 2 km on the south eastern side at a depth of approximately 5 – 10 m.

The influence of Indian Ocean oceanographic and climatic factors on the geologic setting and environment is likely to be more pronounced in Fuvahmulaku than most islands of Maldives. Exposure of the island to strong wave energy and strong southwest monsoon wind makes the island more susceptible to environmental forcing. Fuvahmulah has hard underlying bedrock on its outer rim areas, composed primarily of hardened coral and sand conglomerates. It is reported that the settlements were initially located on the rim of the island, but difficulties in farming due to the hard subsurface led to the gradual retreat of settlement into low-lying wetland areas (Luthfy, 1994). Observation of wells around the rim areas shows evidence of the hard subsurface and only a small area is dug at the bottom of the well.

It is also believed that Fuvahmulah once had a lagoon inside it and that about 150-200 years ago, the channel closed naturally and the lagoon areas became what today we observe as freshwater lakes or Kulhi's (Luthfy, 1994). At that time Fuvahmulah was itself a small coral atoll with an opening to the sea at the southern end at a location known as Diyarehifaando. The partially enclosed saltwater lagoon formed a natural harbour. There is evidence from the name of a part of the southern end of the present island that, at the southern end of the lagoon there was a separate small island. The blockage of the opening to the sea by large coral boulders led to the cessation of the direct inflow and outflow of sea water. As a result of rainfall, the lagoon lost its saltiness and the lagoon began to change to wetland as plants encroached on the margins and sediment of terrestrial origin started to accumulate. The formation of the present island by this process has resulted in an island concave in vertical section, with a coralline rock rim surrounding a lower lying wetland. This is unusual since most of the islands in the atolls are convex in vertical section with a coralline rock core.

Our observation did not find any physical evidence supporting this claim although the presence of a natural harbour area outside the island coastline on the southeast corner looks a possibility, however. It is also possible that the kulhi's were once lagoon areas as it a process that has occurred in some of the northern islands of Maldives and in some pacific islands (Woodroffe, 1989).

The EIA prepared for the airport development<sup>vi</sup> carried out field surveys and assessments which revealed that the environment of the island system had been impacted both by natural and anthropogenic causes to varying degrees. The impact due to the tsunami on 26<sup>th</sup> December 2004 was identified as generally not significant, based on surveys of the reef, beach, coastal and inland vegetation and general environment.

Major negative anthropogenic impacts include clearance of significant areas of vegetation for farming, coastal modification by construction of the harbour and sand mining from the beach on the southern side of the island. Aerial and satellite images for the island for the years 1968, 1998 and 2004 are shown in Figure 4.1.



*Figure 4.1: Images of Fuvahmulah in years 1968, 1998 and 2004*

The images show that the farming areas in south-west and north-east had been cleared prior to 1969. Some development of the roads and urban area took place in the 29 years between years 1968 and 1998 with visible road systems around each of the wetlands and expansion of the urban area between the north and south wetlands. During the six years between years 1998 and 2004 significant development took place, with a significant increase in the urban area on the west side of the island. The harbour and the paved road along the west side of the island were constructed in the year 2002, and the construction of the airport in the south west corner of the island is in progress (although construction has been halted).

Whilst there has been growth in the area of land under agriculture and urban development, the area of free surface water in the wetlands appears to have changed little over the same period of time. This indicates a slow rate of extension of the marginal shallow water rooted plants surrounding the open water.

### **3.1.1.2 Meteorology**

#### **3.1.1.2.1 Climate**

The climate in Maldives is warm and humid, typical of the tropics. The average temperature ranges between 25°C to 30°C and relative humidity varies from 73 percent to 85 percent. The annual average rainfall is approximately 1,948 mm. As Maldives lies on the equator, Maldives receives plenty of sunshine throughout the year. Significant variation is observed in the climate between the northern and the southern atolls. The annual average rainfall in the southern atolls is higher than the northern atolls. In addition, greater extremes of temperature are also recorded in the southern atolls. On average southern atolls receive 2,704 hours of sunshine each year. Table 4.1 provides a summary of key meteorological findings for Maldives.

**Table 4.1: Key Meteorological Information of the Maldives**

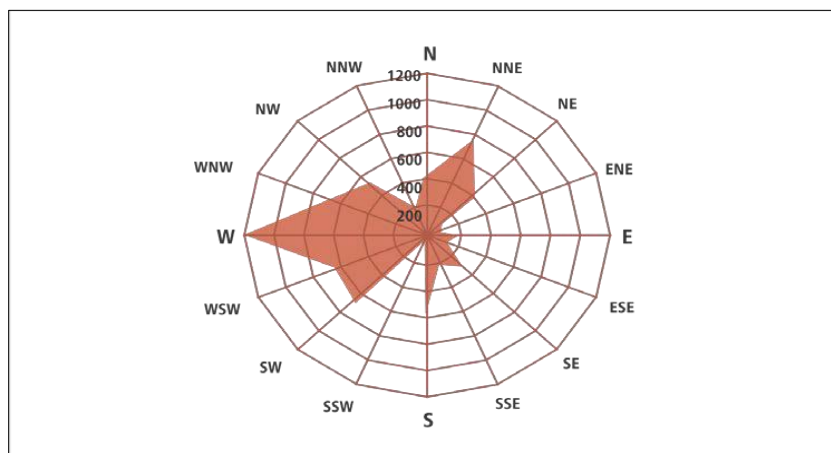
Parameter	Data
Average Rainfall	9.1mm/day in May, November; 1.1mm/day in February
Maximum Rainfall	184.5 mm/day in October 1994
Average temperature air	30.0 C in November 1973; 31.7 C in April
Extreme Temperature Air	34.1 C in April 1973; 17.2 C in April 1978
Average wind speed	3.7 m/s in March; 5.7 m/s in January, June
Maximum wind speed	W 31.9 m/s in November 1978
Average air pressure	1012 mb in December; 1010 mb in April

### 3.1.1.2.2 Monsoons

The climate of Maldives is characterized by the monsoons of the Indian Ocean. Monsoon wind reversal significantly affects weather patterns. Two monsoon seasons are observed in Maldives: the Northeast (Iruvai) and the Southwest (Hulhangu) monsoon. The parameters that best distinguish the two monsoons are wind and rainfall patterns. The southwest monsoon is the rainy season while the northeast monsoon is the dry season. The southwest monsoon occurs from May to September and the northeast monsoon is from December to February. The transition period of southwest monsoon occurs between March and April while that of northeast monsoon occurs from October to November.

### 3.1.1.2.3 Wind

The winds that occur across Maldives are mostly determined by the monsoon seasons. The two monsoons are considered mild given that Maldives is located close to the equator. As a result, strong winds and gales are infrequent although storms and line squalls can occur, usually in the period May to July. During stormy conditions gusts of up to 60 knots have been recorded at Male'. Wind has been uniform in speed and direction over the past twenty-plus monsoon seasons in the Maldives (Naseer, 2003). Wind speed is usually higher in central region of Maldives during both monsoons, with a maximum wind speed recorded at 18 ms<sup>-1</sup> for the period 1975 to 2001. Mean wind speed as highest during the months May and October in the central region. Wind analysis indicates that the monsoon is considerably stronger in central and northern region of Maldives compared to the south (Naseer, 2003). Winds recorded at Gan Meteorological Center indicates that heavy windy conditions occurred during south-west monsoons (see Figure 4.2).



**Figure 4.2: 24 Year Wind Frequency Recorded at Gan Meteorological Center.**

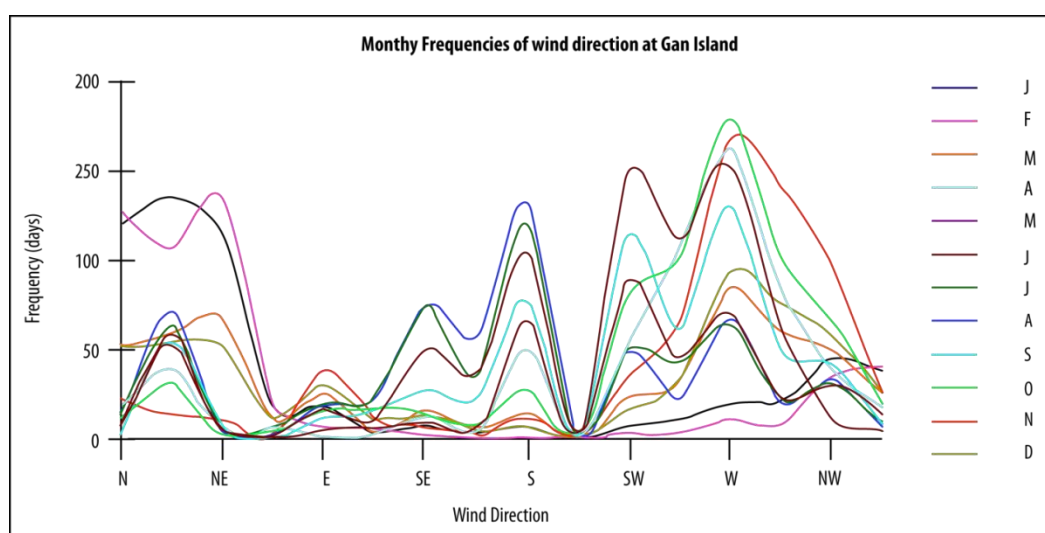
Wind gusts of 35 mph to 45 mph were occasionally recorded when effects of cyclones from Arabian Sea were felt in the country. Direction of wind changes predominantly from north-east in the northeast monsoon to west and south-west in the southwest monsoon and variable direction of wind are experienced in the monsoon transition periods (see Table 4.2).

In terms of severe events, data from 1978 to 2001 reports a maximum of 63 km/h. The data also shows that there were four similar events - albeit of smaller intensity - over this period. The reports for the period 2001 to 2007 provide a different picture, however. During this period, individual events reaching 70 km/h or more have been report for each of the 7 years (DoM, 2005).

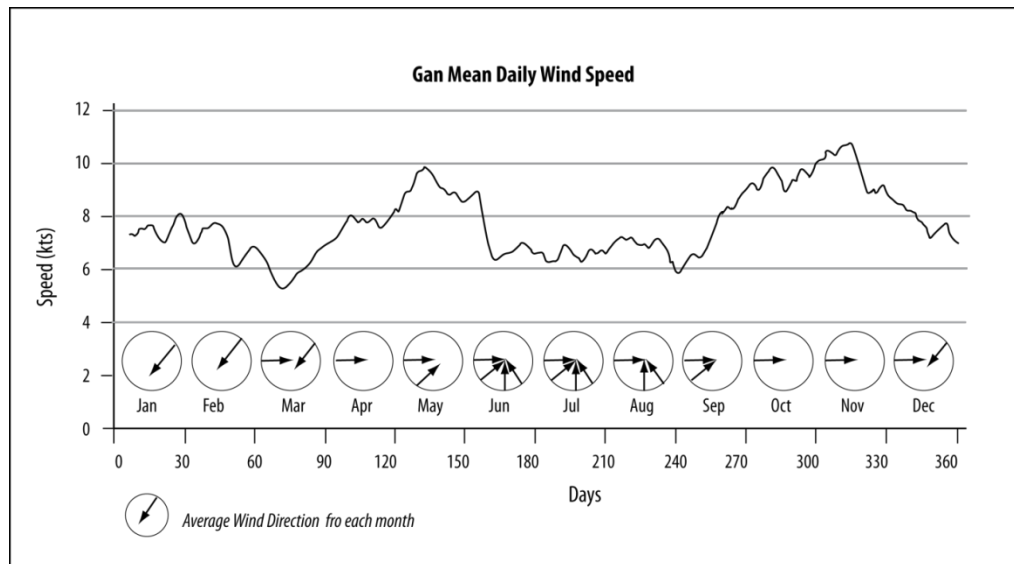
**Table 4.2 Summary of General Wind Conditions from Gan Meteorological Center**

Season	Month	Wind
NE - Monsoon	December	Predominantly from NW-NE. High Speeds from W
	January	
	February	
Transition Period 1	March	From all directions. Mainly W. High Speeds from W.
	April	
SW - Monsoon	May	Mainly from W. High Speeds from W.
	June	
	July	
	August	
	September	
Transition Period 2	October	Mainly from W. High Speeds from W
	November	

Figure 4.3 and 4.4 shows the description of wind speeds and predominant monthly directions for the period between 1978 and 2004. The monsoonal wind speeds in the south are generally known to be weaker and more uniform in yearly distribution (Naseer, 2003). However, the occasional strong monsoonal activity or localised low depressions generate wind speeds capable for causing substantial damage to vegetation and weak housing structures.



**Figure 4.3: Monthly Frequencies of Wind Direction in Gan Meteorological Center (1978-2004)**



**Figure 4.4: Mean Daily Wind Speed and Direction Recorded at Gan Meteorological Centre (1978 – 2004)**

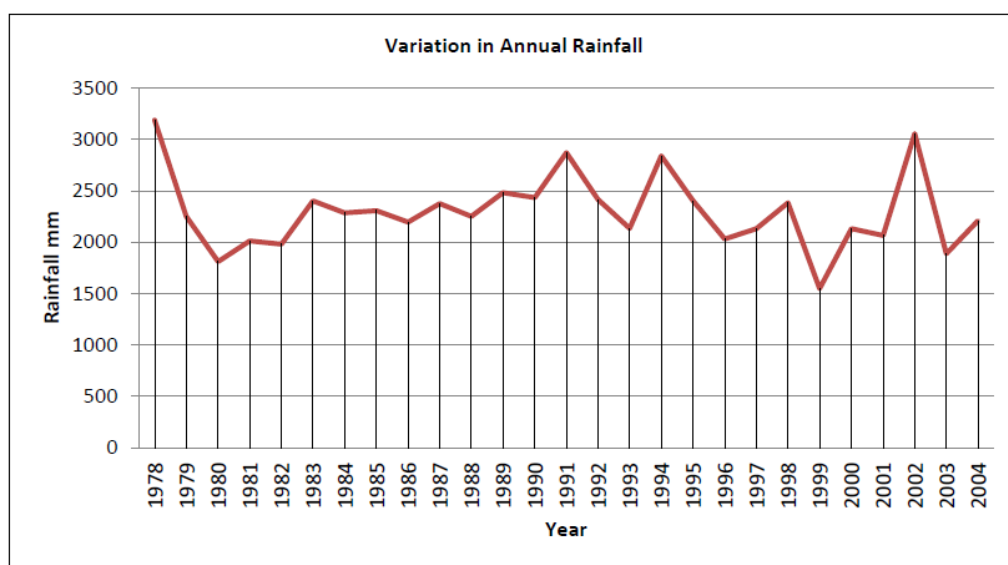
The Disaster Risk Profile of Maldives (UNDP, 1006) reports 11 cyclonic events over the Maldives in the last 128 years and only one event over the central Maldives. All of these events were of Category 1 cyclones. There have been no cyclonic events since 1993. Fuvahmulah Island is located in the zone with the least risk from cyclone-related hazards (UNDP, 2006). The project site is expected to receive regular annual strong winds during the peak SW monsoon.

#### **3.1.1.2.4 Rainfall**

The annual average rainfall for Maldives is 2,124mm. Southern atolls on average receive 2,299.3 mm while northern atolls receive 1,786 mm of rainfall annually. Lowest annual rainfall recorded in the last 30 years is 1,346 mm in 2002 at Hanimaadhoo Airport in Haa Dhaalu Atoll and the highest rainfall is 3,185mm in 1978 at Gan Airport in Addu Atoll. The highest rainfall recorded within 24 hours to date is 220 mm on 9 July 2002 at Kaadedhdhoo Airport, in Gaafu Dhaalu Atoll. (Meteorology, 2006).

Fuvahmulah is located in the highest rainfall region of the Maldives. The mean annual rainfall in Gan Meteorological Station, as noted above, is 2299.3 mm with a Standard Deviation of 364.8 mm and a mean monthly rainfall of 191.6 mm. Rainfall varies throughout the year with mean highest rainfall during October, December and May and lowest between February and April. The mean annual rainfall data from 2006 - 2011, collected by the Fuvahmulah council office shows a steady decline in rainfall over this period.

Year to year variation in Gan is very large and it varies from +38.5% in 1978 to -32.6% in 1999. There have been 4 specific years in the recorded meteorological data where rainfall has deviated over 20% of the mean values. These variations are often caused by significant rainfall events rather than an equally distributed increase in monthly rainfall. Fluctuation of rainfall in Maldives mostly depends upon general monsoon conditions and movements of the Inter Tropical Convergence Zone (ITCZ) with embedded disturbances and frequency of thunderstorms (UNDP, 2006).



**Figure 4.5: Variations in Annual Rainfall – Gan Island**

Probable maximum precipitation (PMP) for 24-hour period is an important parameter for designing drainage system or development activities that may alter the topography. The Disaster Risk profile of Maldives (UNDP, 2006) gives the PMP values for Gan as provided in Table 4.3, which is the highest for any part of Maldives.

The Disaster Risk Profile Report calculates the PMP by fitting a theoretical distribution to the extreme daily rainfall for three stations using Gumbel's type I extreme value distribution (EVD) function. The EVD is then used to estimate the probabilities and the return period of rainfall for 50-, 100-, 200- and 500-years.

**Table 4.3: Probable Maximum Precipitation for various Return periods in Gan**

Station Name	Return Period			
	50 year	100 year	200 year	500 year
Gan	218.1	238.1	258.1	284.4

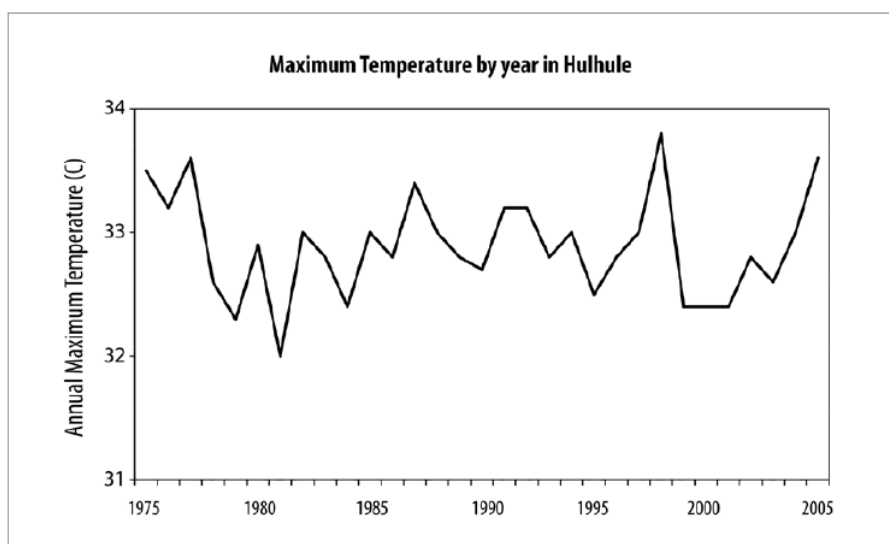
Source (UNDP, 2006)

It would be possible to identify threshold levels for heavy rainfall for a 24 hour period in Fuvahmulah, which could cause flooding or disruptions to operations. However, it does require observation of historic, daily rainfall data which at present is unavailable.

#### **3.1.1.2.5 Temperature**

Daily temperatures of Maldives vary little throughout the year with a mean annual temperature of 28°C. The annual mean maximum temperature recorded for Male' during the period 1967-1995 was 30.4°C and the annual mean minimum temperature for the same period was 25.7°C. The highest recorded temperature for Male' was 34.1°C on 16th and 28th of April 1973. The hottest month recorded was April 1975 with a maximum monthly average temperature of 32.7°C, the next highest being 32.6°C in April 1998. The lowest minimum average temperature of 23.7°C was recorded in July 1992.

There is considerable inter annual variability in extreme temperatures for Hulhule as shown in Figure 4.6. A maximum temperature of at least 33.5°C is rare at Hulhule and has a return period of 20 years (Hay, 2006).



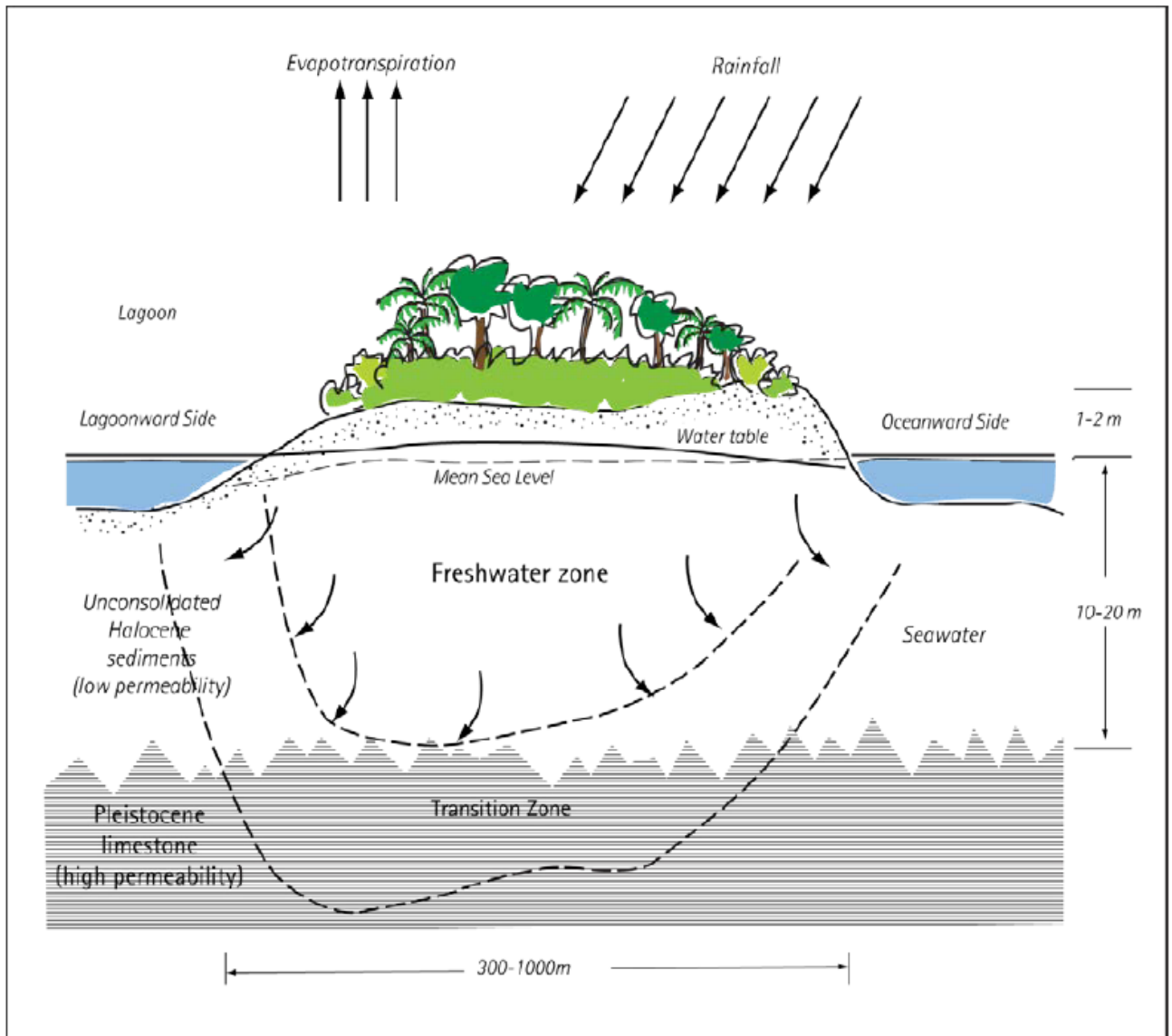
*Figure 4.6: Maximum Temperature by year in Hulhule'- 1975-2005 (Source: Hay, 2006)*

### **3.1.1.3 Groundwater**

#### **3.1.1.3.1 Hydrogeology**

Studies carried out by Falkland in Seenu Hithadhoo (Falkland,2001) is used as the island is comparable to Fuvahmulah. The groundwater system of Hithadhoo was studied in detail by Falkland (Falkland, 2001) and remains the most authoritative assessment in the region to date. This study uses the findings of Falkland as basis and updates the variable parameters using quantitative assessments in the field. Key on site assessments include water quality, water depth and salinity issues.

Ground water systems in coral islands occur as thin lens of fresh water floating over saline water (Singh and Gupta, 1999). Generally, in the absence of rain, the seawater within islands would be at sea level. However rainwater which penetrates and percolates through the unconsolidated Holocene sediments that floats on the denser salt or brackish water that permeates the base of the island. It is termed the Ghyben–Herzberg lens (Whittaker, 1998, Menard, 1986). The generalized model of groundwater system is presented in Figure 4.7.



**Figure 4.7: Cross-section of a coral island showing the main features of groundwater system (Adapted from Falkland, 1999)**

**Groundwater Size and Thickness:** The areal extent of Fuvahmulah Island area is 484 Ha at low tide level. The size of the original study island, Hithadhoo, was 550 Ha. The freshwater lens boundary is estimated at 50 m from the coastline. The total lens area is calculated at 440 Ha.

The approximate volume of fresh water lens could be estimated from: (i) estimated lens thickness; (ii) estimated specific yield and; (iii) estimated fresh water lens aerial extent (Falkland, 2001).

- The freshwater thickness in Hithadhoo was estimated by Falkland (2001) as 8 m after conducting borehole tests. This figure has been used for the assessment in Fuvahmulah given the similarities between the two islands. It has to be noted that the freshwater thickness estimated by Al-Habshi (2002) based on theoretical modelling gives a figure 30 m.
- The aerial extent of freshwater lens as estimated above is 440 Ha
- The specific yield was estimated by Falkland (2000, 2001) based on studies conducted on effective porosity (or specific yield) in other similar setting such as Kiribathi and Cocos Keeling. The specific yield estimated for Maldives is 0.3.

The calculation of freshwater lens is done by multiplying lens thickness, lens area and yield values. Table 4.4 shows the result of the calculations for Fuvahmulah.

**Table 4.4: Estimated size of freshwater lens**

	Estimated fresh water lens thickness (m)	Estimated freshwater lens area (Ha)	Estimated Specific Yield	Estimated Volume of fresh water lens
Low	6	440	0.3	7,920
Medium	8	440	0.3	10,560
High	10	440	0.3	13,200

The calculation above uses low, medium and high values based on variations to the estimated fresh water lens. This provides a better understanding of the maximum and minimum ranges of the size of water lens. The minimum value is about 7,920 ML and the maximum values are about 13,200 ML. The best guess estimate is 10,560 ML.

These values indicate that Fuvahmulah Island has one of the second largest fresh water reservoirs in the Maldives. The Figures for Hithadhoo Island is 7,750 ML and is and for Gan Island (the largest reservoir in Addu Atoll) is estimated at 11,250 ML.

**Average Residence Time:** Average residence time for the fresh water lens of an island (or the fresh water zone within lens) is a measure of time taken for the water to move through the island lens. Falkland (1999) estimated the residence time as 2 years for Hithadhoo Island. This has been considered as intermediate by Falkland but given the higher population of Hithadhoo Island drought years will have significant implications for availability of potable water.

**Recharge Rate:** Ground water recharge rate is the quantity of groundwater that enters into the ground water system over a year. It can be expressed as yearly input (ML per year) or daily input (ML per day). The rate is calculated based on the extent of open area on the island and the yearly total rainfall. This assessment is based on the 50% of average annual rainfall of 2000 based on vegetation cover and surface water at the time.

**Table 4.5: Average recharge estimate for each island**

	Percentage of annual rainfall	Depth mm/year	Volume (ML/Day)
Low	40	2000	9.6
Medium	50	2000	12.1
High	60	2000	14.5

1 ML = Million Litres

The above recharge rates in volumetric units are calculated by multiplying the depth of rainfall (in m) with freshwater lens area (in sq m) and dividing the values by the number of days in a year. These estimates show average values per day but will vary throughout the year depending on the season. The fluctuations

due to ground water extraction for water use are unlikely to affect the water salinity in Fuvahmulah Island due to the moderate residence times and the high recharge rates.

#### 3.1.1.4 Water Quality

Water samples taken from several sites on various dates (Table 4.6 and 4.7) indicate that concentration of nutrients and microbial count to be higher in general. Water samples from the high ground area or settlement area particularly show greater contamination possibly attributed to the existing sewage disposal system of the island and seepage of fertilizers due to unsustainable farming practices.

**Table 4.6: Water Test results of Water bodies (samples taken on)**

Parameters	Bandaarakilhi 1 (G1)	Bandaarakilhi 2 (G2)	Dhandimagu Kilhi 1 (G3)	Dhandimagu Kilhi 2 (G4)
pH	7.5	7.28	7.58	7.32
Conductivity ( $\mu\text{S}/\text{cm}$ )	412	272	141	352
Salinity (%0)	0.20	0.13	0.07	0.17
Phosphate (mg/L)	0.68	1.50	0.70	0.49
Temperature C	15.9	16.2	17.1	16.9
Turbidity (NTU)	15.1	4.80	0.907	1.900
Sulphate(LOQ 10 mg/L)	<10	<10	<10	<10
Biological Oxygen Demand (mg/L)	10	7	8	7
Total Coliform (CFU/100 ml)	TNTC	TNTC	TNTC	TNTC
Faecal Coliform (CFU/100ml)	0	0	0	0

**Table 4.7: Water Test Results (samples taken on 30/06/2013)**

Parameters	Bandaarakilhi (G5)	Dhandimagu Kilhi (G6)
Physical Appearance	Clear	Clear
pH	8.55	9.02
Conductivity ( $\mu\text{S}/\text{cm}$ )	1097	277
Turbidity	0.775	3.920
Chloride(mg/L)	256	58
Nitrate (mg/L)	0.5	0.5
Phosphate (mg/L)	0.02	0.04
Biological Oxygen Demand (mg/L)	5.19	7.00
Total Coliform (CFU/100 ml)	TNTC	0
Faecal Coliform (CFU/100ml)	35	0

*TNTC: Too Numerous To Count*

Overall the pH of the water samples taken from various locations ranges from a minimum value of 7.2 to 9.0 indicating that the water is basic, which is a natural trend in the Maldives as the bed rock and soil is composed of calcium carbonate.

Turbidity reveals the concentration of suspended matter consisting of; silt, clay, fine particles of organic and inorganic matter, soluble organic compounds, plankton and other microscopic organisms in water. Hence, it controls the transparency of the water, water being clear and attainment of low levels of turbidity in most of the sites except for Site 1 (turbidity 15.1 NTU, at Bandaarakilhi) indicates that water contains less suspended particles and hence light will be available for photosynthetic organisms in the water making water body healthy. (The normal range of values of turbidity is from 1 to 1,000 NTU). In most of the reference values for turbidity, less than 5 NTU is considered desirable.

The conductivity is sensitive to variation in dissolved solids, mostly mineral salts. Conductivity of most freshwaters ranges from 10 to 1,000  $\mu\text{S cm}^{-1}$ . The conductivity of water of the tested water bodies are situated well within the range given for fresh water bodies. However, the conductivity recorded in Bandara Kilhi in early 2013 is slightly higher, indicating that it is receiving large quantities of land run-off and could be prone to water pollution.

Considering the nutrient content of waters tested, the nitrate levels at both water bodies is 0.5 mg/l, showing high levels of nutrient in water. Nitrate ion ( $\text{NO}_3^-$ ), the common form of combined nitrogen found in natural waters is an essential nutrient for aquatic plants. However, concentrations exceeding 0.1 mg/l  $\text{NO}_3\text{-N}$  indicate influx of municipal and industrial waste leachates from waste disposal sites and sanitary landfills and also inorganic nitrate fertilizers that is used by the farmers. Present nitrate level in the water bodies is an indication of water pollution that can cause excessive plant growth and decay.

Phosphorus is another essential nutrient for living organisms and exists in water bodies as both dissolved and particulate species, concentration ranging from 0.005 to 0.020 mg/ l  $\text{PO}_4\text{ -P}$  with an average of 0.02 mg/ l  $\text{PO}_4\text{-P}$ . The phosphate levels in the water at Bandarakilhi and Dhandimagukilhi is 0.02 and 0.04 respectively and can be considered as at normal levels.

The amount of organic matter present at the water bodies were obtained by measuring the biochemical oxygen demand (BOD) which is defined by the amount of oxygen required for the aerobic micro-organisms present in the sample to oxidise the organic matter to a stable inorganic form. The BOD of the water bodies are relatively high, ranging from 5 to 10 mg/l. This also indicates that the water bodies are receiving wastewaters of various organic contents.

The total and faecal coliforms were also measured to identify the degree anthropogenic influence on the water bodies and the measurement of faecal coliform indicate the presence of organic pollution of human origin. Faecal coliform tested in 2013 (Table 4.8) indicates that Bandarakilhi is highly exposed to animal faecal matter can contain a variety of intestinal pathogens which cause diseases, a high level 35 CFU/100 ml of faecal coliforms was observed. High levels of total coliforms in most of the sites indicate the presence of other naturally present micro- organisms, such as the algal and protozoan communities, a few of which are known to produce toxins and transmit, or cause, diseases. Though this water is not used for consumption purposes, there is still a risk of accidental ingestion of intestinal pathogens as well as a risk of other infections, particularly in the eyes, ears and nose.

**Table 4.8: Ground water quality results**

Parameters	G7	RO plant (G8)	Alternative STP and RO plant (G9)	Vacuum station (G10)
pH	7.27	7.38	7.47	7.37
Conductivity ( $\mu\text{S}/\text{cm}$ )	1088	710	850	986
Chloride(mg/L)	153	55	122	47
Nitrogen Ammonia (mg/L)	0.36	1.17	0.70	9.00
Nitrate (mg/L)	0.3	1.5	0.3	7.3
Nitrite (mg/L)	0.002	0.011	0.001	2.560
Sulphate(mg/L)	37	3	18	31
Sulphide (mg/L)	0	0	0	0
Chemical Oxygen Demand (mg/L)	27.6	27.5	26.6	23.1
Total Coliform (CFU/100 ml)	>100	>100	>100	16
Faecal Coliform (CFU/100ml)	>100	>100	>100	>100

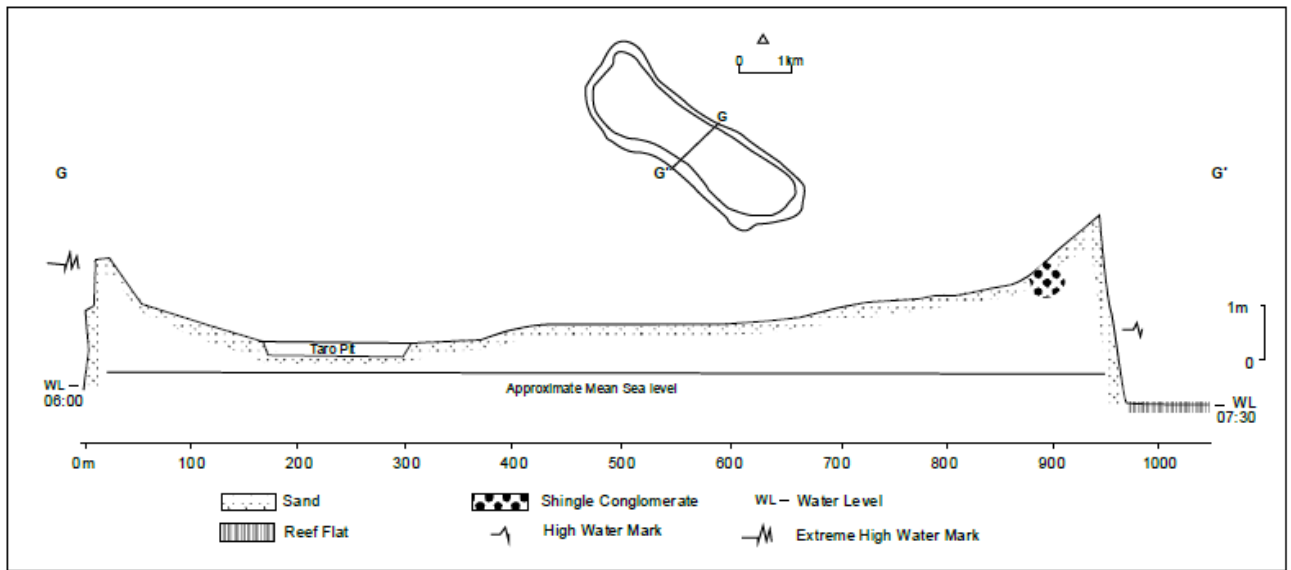
Though the pH level is within a normal range, ground water quality for most parameters appears to be at elevated levels. The average Sulphate level ranges between 3 mg/L – 37 mg/L, this can be considered to be in normal range as sulphate concentrations in natural waters are usually between 2 and 80 mg/l. concentration of Nitrogen from various nitrogenous species is at high level. Chemical Oxygen Demand of all the water samples varies between 23.1 to 27.6 mg/l which is higher than expected levels. The COD level is higher than the optimal range denotes the level of organic nutrients in the water as COD is the amount of oxygen required for oxidation of organic nutrients to inorganic forms. All these results signifies the increased levels of organic nutrients in the water tested, indicating that the organic load that percolates into the ground water is high and there is need to minimize the organic components.

Increased amount of faecal coliforms is observed in the tests under taken for ground water which indicates high levels of water contamination as natural ground waters should contain no faecal bacteria unless contaminated. The high levels of coliforms could attribute to the existing sewerage disposal regime and mishandling of septic tanks. In addition poor well construction or poor maintenance can also increase the risk of groundwater contamination. Overall, the ground water of the island is in a much deteriorated condition.

### 3.1.1.5 Topography

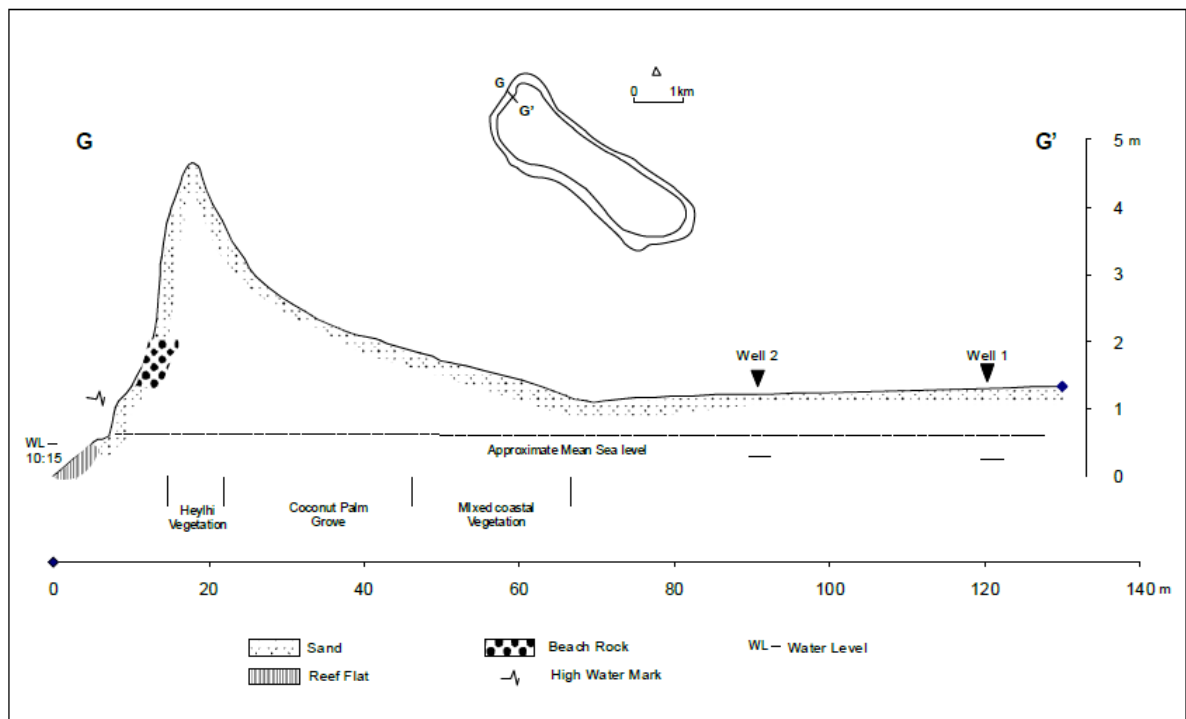
Fuvahmulah has a low-lying centre and is saucer-shaped with unusually high ridges around the island. Much of the low lying interior is occupied by wetland areas with two prominent fresh water lakes or *Kulhi*. Transects taken by Woodroffe (1989) and Digital Elevation Model (DEM) prepared by Hidria/Aquatica (2013) shows this prominent topographic feature of Fuvahmulah (see Figure 4.8 and Appendix A). The dry areas of low-lying centre lies 40-55 cm above mean sea level. This essentially means that, central areas lie below highest tide levels. The surface water areas are approximately 1-2 m deep. It also provides some evidence for the theory that states the central areas were once a lagoon surrounded by land. The low-lying centre becomes a flooding hazard zone during heavy rainfall as water drains to these areas. Over flow drains to sea have been constructed along four points of the island with manually controlled flood-gates. One of these gates has been closed during airport construction project. In addition, the drainage systems themselves

becomes a hazard if the flood gates are accidentally left open during high spring tides, as sea water can rush to the low lying centre.

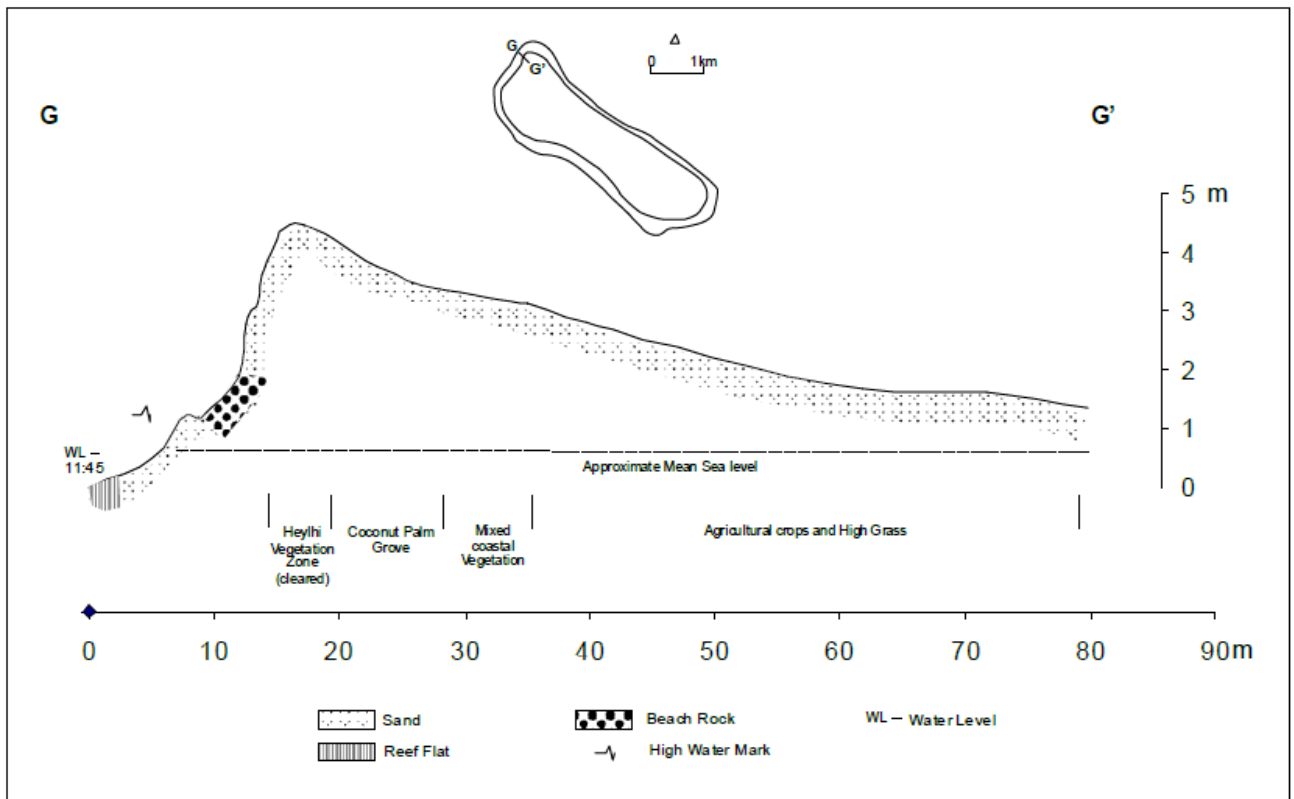


*Figure 4.8: A transect across Fuvahmulah (from Woodroffe (1989))*

Similar to the prominent central depression, well established, extremely high ridges were observed around the island, especially on the north-western and western sides (see Figures 4.19 and 4.10, and Appendix A). It was also reported that the present harbour area (SW side) contained similar ridges. Maximum heights were observed in the range of 3-4.5m above mean sea level, one of the highest ridges found anywhere in Maldives. These ridges are believed to be the natural defence system adopted by Fuvahmulah Island, in the face of strong wind wave and swell action reaching the island. Similar pattern exist in Hithadhoo Island, Addu atoll.



*Figure 4.9: A topographic transect across North-eastern end*



*Figure 4.10: A topographic transect across the northern end*

### 3.1.1.6 Soil Condition

The soil conditions in the proposed site on average comprised of a +1 m layer of mixed coral sand with 30% coral fragments and 70% sand, followed by black fine sand and silt. The characteristics of the four culvert sites are summarized in table below.

*Table 4.9: Soil characteristics at project sites*

Site	Elevation	Dredge fill layer depth	Secondary layer	Water Level (m from surface)
Bandaarakilhi Culvert 1	+1.13	0.9	black fine sand and silt	0.8
Bandaarakilhi Culvert 2	+0.95	0.7	black fine sand and silt	0.7
Dhandimagu Kilhi 1	+1.10	0.85	black fine sand	0.8
Dhandimagu Kilhi 2	+0.99	0.9	black fine sand and silt	0.8

### 3.1.1.7 Land Use

The existing land use and master plan of Fuvahmulah is presented in Appendix B. The main features of the present land use are summarized below.

- Fuvahmulah is the third largest inhabited island, in terms of its land boundary with 484 Ha. It also contains the largest wetland in the Maldives with an estimated area of over 141 Ha comprising about 30% of the island. The habitable land is estimated at about 300 Ha.
- Fuvahmulah Island is also the third largest population centre in the Maldives with 7,636 persons. The population growth rate has slowed down over the last few years owing to out migration to Male' (see Section 4.3 for more details).
- The population density of Fuvahmulah is excluding the wetland area is 22 persons per Ha which is very low compared to most islands of Maldives.
- The settlement footprint covers 65-70% of the total habitable area. Hence, a large portion of the land available is currently being used for housing, economic establishments and socio-economic infrastructure on the island. A large portion of the remaining areas also comprise of the coastal buffer zone, which is declared a development free zone for environmental reasons.
- Future housing requirements pose a challenge to the island and particularly to some wards. Public consultations revealed a need to move into wetland areas (by reclaiming land) to cater for additional housing requirements.
- Traditionally, the housing plots allocated in Fuvahmulah are quite large, with some plots in around 8,000 ft<sup>2</sup>. This has left the old settlement areas with large areas of underutilised land. Some of these plots are uninhabited as well, as their owners have migrated to other islands, namely Male'. Newly allocated plots size has been revised to 2000 - 3000 ft<sup>2</sup>.
- The newly developed harbour area in 2003 has become the new industrial and commercial zone of the island. The fish market, boat building and some engineering activities are located in this area. There are plans to lease more land for commercial activities in this region.
- There is no Central Business District (CBD) or a central commercial zone on the island. Most establishments are distributed along the main road that runs around the island. The highest spatial concentration is in the central areas of the island.
- The key economic infrastructure on the island is the harbour, main roads, communications infrastructure, utilities, commercial port, fish market, boat yard, and fuel supply.
- Majority of the land is utilised for housing and agricultural activity.
- The recent construction of the airport has taken a large chunk of available land on the island. Agricultural activities in the airport area were ceased for its construction. This has created a shortage of land for agricultural activities.
- Backyard agriculture is practiced across the island and open agricultural plots are located in the northern end of the settlement. Most households have taro pits in their backyard.
- Fuvahmulah Island was one of the first islands to have a master plan for urban development. New developments on the island have gone generally according to the master plan.

### ***3.1.2 Biological Environment***

A detailed terrestrial environment assessment of the island was undertaken by Hidria/Aquatica 2013. The following extracts are based on the findings of the report.

#### ***3.1.2.1 Flora***

The flora consists of nine types of trees, two types of shrubs. A total of 16 species have been recorded in the area, but there are more that have not been identified in Hidria/Aquatica's work. In addition, several ornamental species were observed along the agricultural area, but they were not recorded in the inventory as they are introduced species by the farmers.

**Species of importance and potential uses:** Many of the species found in the protected area are used by the local community for traditional medicine or other uses (see Table 4.10). Coconut stands (*Cocos nucifera*) serve a wide variety of purposes such as dry palm leaves (for thatch making), firewood, charcoal, coconuts, timber, building, mats, ropes, baskets, etc. The species can also be used to revive the culture of “toddy tapping” in Addu Atoll (‘toddy’ is a beverage produced from the sap of the coconut palm) and to process “Virgin Coconut Oil” as part of the development of agriculture in the area. In addition, coconut plantations also provide a habitat for Coconut Crabs (*Birgus latro*).

The noni plants (*Morinda citrifolia*) found in the agricultural area can be utilized for their high value as a processed product as part of the development of agriculture in the area. They are also of medicinal use for blood pressure and pain from arthritis and from menstruation.

Other species are used as a source of firewood, timber or shade. The mango tree is abundant in the protected area and on the whole island. It has a good economic value due to its fruit but still has not achieved its total economic value since there are no organized harvesting and processing initiatives to commercialize the production.

### 3.1.2.2 Fauna

A summary of the fauna found in Fuvahmulah is provided in Table 4.11. During the field work by Hidria/Aquatica (2013) and for this EIA on Fuvahmulah, bird populations observed were limited. It only was possible to observe some specimens of grey heron, water hen and crows. Hidria/Aquatica (2013) reported the following on fauna found on the island.

The custom of catching birds is widespread. This has probably contributed to the decline of many bird species and is one of the causes of such small numbers. However, other factors must also play a role, including increasing disturbances due to uncontrolled access to the areas around the kilhis. Locals report that there used to be a fresh water shrimp in the kilhis. But it has not been possible to see it and it is probably now extinct because nobody mentioned its presence during field work. This has probably also affected bird populations as it is a loss of food resources.

HiIDRA/Aquatica reports four species of fish are found in both kilhis. “Three of them are introduced species and only one is native. The introduced species are the Tilapia or Footu mas (*Oreochromis sp.*). It is believed that it was introduced in the seventies to be used as bait fish; however, it proved to be ineffective for this purpose. The other species of fish introduced is the milkfish or Beyngu (*Chanos chanos*).

Another introduced species present in other island kilhis is the Mosquito fish or Fena mas (*Gambusia affinis*) but this has not been observed in the Fuvahmulah kilhis during the survey. The only native fish found in the kilhis is the Bengal eel (*Angilla bengalensis spp*). Eels are catadromous fishes. This means that they grow and live in fresh water and migrate to the sea to spawn; later on, the larvae (glass eels) come back to the fresh water body (river or lagoon) where their parents came from”.

**Table 4.10 Vegetation inventory of Fuvahmulah**

		Family	Scientific	English	Dhivehi	Dhandimagu Kilhi	Dhandimagu area	Bandaara area	Bandaara Kilhi	
1	Tree	Anacardiaceae	<i>Mangifera indica</i>	Mango Tree	Dhivehi An'bu gas	-	Abundant	Abundant	-	Commonly grown in the households of both kulhi areas
2		Arecaceae	<i>Cocos nucifera</i>	Coconut palm	Dhivehi ruh	-	Occasional	Occasional	Occasional	Commonly grown in the households of both kulhi areas
3		Clusiaceae	<i>Calophyllum inophyllum</i>	Alexander Laurel wood	Funa	Occasional	Abundant	Abundant	Occasional	Found mixed with dhan'bu in area between the households and the marshes
4		Combretaceae	<i>Terminalia catappa</i>	Country almond	Midhili	-	Occasional	Occasional	-	Common around household boundaries
5		Myrtaceae	<i>Syzygium cumini</i>	Jambolan, Indian Blackberry	Dhan'bugas	Common	Abundant	Abundant	Common	Found mixed with midhili in area between the households and the marshes
6		Malvaceae	<i>Hibiscus tilaceus</i>	Sea hibiscus	Dhiggaa	Occasional	Common	Common	Occasional	-
7		Pandanaceae	<i>Pandanus leucanthus</i>	Screw pine	Maa Kashikeyo	Rare	Occasional	Occasional	-	Highly valued fruit crop cultivated in backyards
8		Pandanaceae	<i>Pandanus</i>	Screw pine	Boa kashikeyo	Abundant	Abundant	Abundant	Abundant	-
9		Rubiaceae	<i>Guettarda speciosa</i>	Nit pitcha	Uni	Occasional	Common	Common	Occasional	-
10	Shrubs	Mimosaceae	<i>Leucaena leucocephala</i>	Leucaena	Ipil-ipil	-	Frequent	Common	-	Highly invasive species, but an excellent soil fixing plant (under controlled conditions)

		Family	Scientific	English	Dhivehi	Dhandimagu Kilhi	Dhandimagu area	Bandaara area	Bandaara Kilhi	
11		Rubiaceae	<i>Morinda</i>	Noni	Ahi	Rare	Common	Common	Rare	-
12	Others (ground cover / vines)	Asteraceae	<i>Wedelia calendulacea</i>	-	Mirihi	-	Occasional	Occasional	-	-
13		Convolvulaceae	<i>Ipomoea pes-caprae</i>	Goat's foot creeper	Bodu veliveyo	-	Frequent	Occasional	-	-
14		Lauraceae	<i>Cassytha filiformis</i>	Love-vine	Velan'buli	Occasional	Occasional	Occasional	-	Highly invasive species, spreading over the marshes
15		Turneraceae	<i>Turnera ulmifolia</i>	Yellow alder	Bakari-nukaa	-	Common	Occasional	-	-
16		Verbanaceae	<i>Stachytarpheta indica</i>	Vervain	Rakimaa	-	Common	Occasional	-	-

Source: Hidria/Aquatica 2013

**Table 4.11 Fauna inventory of Fuvahmulah**

Name(s)						Distribution				
Class	Order	Family	Species	English	Dhivehi (MLE)	DK	DSM	BK	BSM	FA
Actinopterygii	Cyprinodontiformes	Poeciliidae	<i>Gambusia affinis</i>	Mosquitofish	Fen meeru mas	C		O		
	Perciformes	Cichlidae	<i>Tilapia sp.</i>	Tilapia	Thelapia	O		A		
	Gonorynchiformes	Chanidae	<i>Chanos chanos</i>	Milk Fish	Beyngu			R		
	Anguilliformes	Anguillidae	<i>Anguilla bengalensis</i>	Freshwater eel	Ven	C		O		
Aves	Ardiformes	Ardeidae	<i>Ardea alba</i>	Great White Egret	Iruvaahu dhu	O	R	O	R	
			<i>Egretta garzetta</i>	Little Egret	-	O	R	O	R	
			<i>Ardea cinerea</i>	Grey Heron						

Name(s)						Distribution				
Class	Order	Family	Species	English	Dhivehi (MLE)	DK	DSM	BK	BSM	FA
			<i>Ardeola grayii</i>	Indian Pond Heron	Dhivehi Raanbon dhi	C	C	C	C	
	Gruiformes	Rallidae	<i>Amaurornis phoenicurus</i>	White-breasted WaterHen	Kambili	A	A	O	O	A
			<i>Gallinula chloropus</i>	Common Moor Hen		F	F	O	O	F
	Passeriformes	Corvidae	<i>Corvus splendens</i>	Maldivian house crow	Kaalhu	F				
	Passeriformes	Sturnidae	<i>Acridotheres tristis</i>	Common Myna	Maina		C		C	C
Mammalia	Carnivora	Felidae	<i>Felis catus</i>	Cat	Bulhaa					C
	Rodentia	Muridae	<i>Rattus sp.</i>	Rat	Meedha a		C		C	C
	Scandentia	Tupaiidae	<i>Tupaia sp.</i>	Garden shrew	Hikandhi		R		R	R
	Chiroptera	Pteropodidae	<i>Pteropus giganteus ariel</i>	Indian Flying Fox	Vaa	C	C	C	C	A
Reptilia	Squamata	Agamidae	<i>Calotes versicolor</i>	Common garden lizard	Bondu		A		A	A
		Gekkonidae	<i>Hemidactylus sp.</i>	Gecko	Hoanu					C
		Colubridae	<i>Lycodon aulicus</i>	Common Wolf Snake	Nannug athi					O
		Scincidae	<i>Lygosoma albopunctata</i>	White-spotted Supple Skink	-					R
		Typhlopidae	<i>Ramphotyphlos braminus</i>	Island blind snake	-					R
Amphibia	Anura	Dicroglossidae	<i>Sphaerotheca rolandae</i>	Frog	Boh	C	O	C	O	O
		Bufonidae	<i>Duttaphrynus melanostictus</i>	Toad	Boh	O	A	O	A	A

Source: Hidria/Aquatica 2013

**Legend:** **DK** Dhandimagu Kilhi; **DSM** Dhandimagu Surrounding Marshes; **BK** Bandaara Kilhi; **BSM** Bandaara Surrounding Marshes; **FA** Forested Areas (outside the wetlands); **CSA** Community Settlement Areas; **CA** Coastal Areas;

### **3.1.3 Wetland Environment**

As noted before, the Fuvahmulah Wetland is the largest in the Maldives. There are two wetland areas on the island: Dandimagu Kilhi on the north and Bandaara Kilhi on the South (See Figure 4.1). IDRIA/Aquatica (2013) reports that there are three main biotopes found in the both wetlands:

- a) open water bodies (to which the name “kilhi” is properly applied);
- b) the marshes covered by a thick peat layer and the shrubs and forests;
- c) shrubs and forests where bush surface is formed by young trees.

#### **3.1.3.1 Water bodies or kilhi**

The water bodies have a variable depth ranging from 1.20 to 1.50 cm in the areas where measured. The bottom corresponds to the substrate of sand and coral stone of the island and the water surface, with variations, is stratified with a first layer of about 15-20 cm of clean water and a thicker layer of about one metre of water with a lot of solids in suspension and high concentrations of methane, which emerges when the water is shaken. This indicates that there is very little exchange between surface water and the bottom sediments probably because being water bodies surrounded by vegetation of a certain height with a little extension of surface, are little affected by the effect of wind and maintain its stratified structure during most of the year.

#### **3.1.3.2 The Marshes**

The marsh is formed by a layer of peat of varying thickness which does not exceed the maximum depth of water and is between 1.50 m and a few centimetres on the edges. This shows that both wetlands are in a relatively quick process of encroachment. This fact is endorsed by growth of masses of shrubs and trees that are scattered in the marshland.

Vegetation covering the marshes is mainly formed by an exotic invasive fern not identified and *Cladium sp.* Both wetlands are surrounded by tall trees, most remarkably on their northern shores (see maps). These thickets are the main sites for the bats and birds to roost and nest. There are dense spots of shrubs inside the marsh that will probably evolve into forest. Those shrub areas have noni (*Morinda citrifolia*), uni (*Guetarda speciosa*), palms and jambolans (*Syzygium cumini*). On the edges of the wetlands, shrubs, ferns, trees and banana plantations are mixed in among them and it is difficult to say when the marsh and the forest begin.

#### **3.1.3.3 Agriculture in the marshlands**

There are plantations of taro along most of the edges of the marshes and along the two roads which cross both marshes. On the edges of the roads there are also shrubs and trees and banana trees.

Taro plantations do not seem to create serious damage to the marsh as they are planted in the water and no fertilizers or pesticides are used for the plant's cultivation. It should be taken into consideration that the marshes have been massively transformed by invasive species and there is no reason to think that they are a better habitat for waterfowl, amphibians and eels than taro plantations. The only real advantage they have is that they are not disturbed by the presence of humans and that they naturally evolve to shrub and forest hence helping carbon fixation.

#### **3.1.3.4 Vegetation Classification**

A detailed vegetation classification of the wetland areas were under taken by HIDRIA/Aquatica (2013). The classification map is presented in Figure 4.11 and Figure 4.12, and the details of the classification scheme are presented in Appendix C.

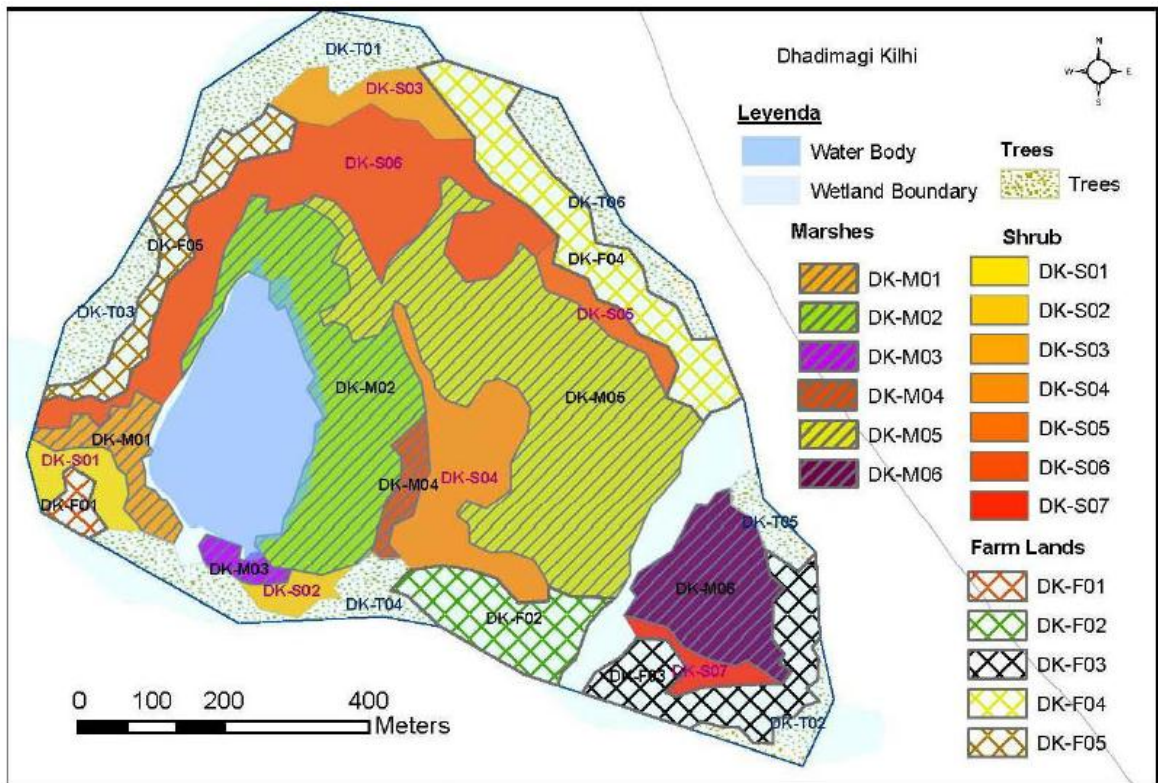


Figure 4.11: Vegetation Classification for Dhandimagi Kilhi (Source: HIDRIA/Aquatica (2013))

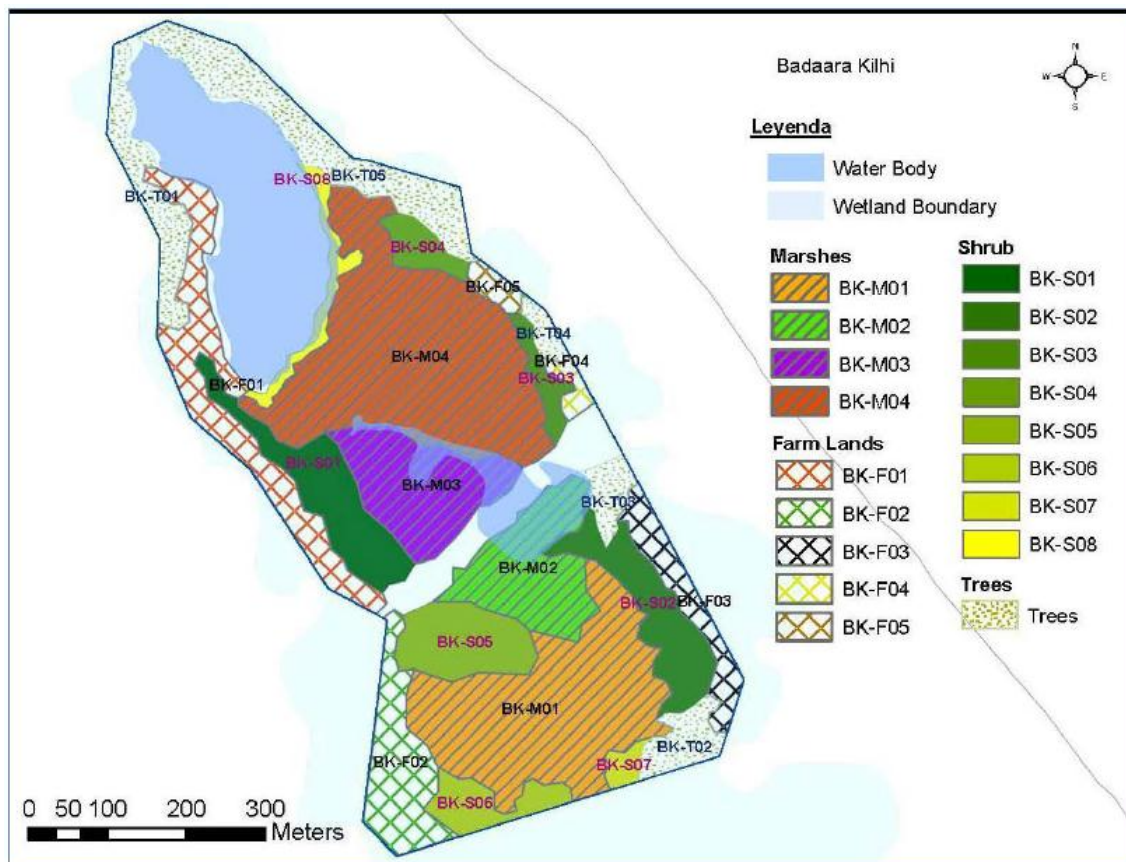


Figure 4.12: Vegetation Classification for Bandaara Kilhi (Source: HIDRIA/Aquatica (2013))





*Figure 4.13: Photos of vegetation found in the wetland area*

#### **3.1.3.5 The wetland drainage system**

The upper free water surface level in the wetland is controlled by means of a drainage system that was built in 1984 under funding by FAO. The Ministry of Housing and Environment have searched for a copy of the design report or ‘as built’ drawings of the drainage channels without success. A request to the FAO for copies also proved unsuccessful. The drainage system consists of four drains from the wetlands to the sea. These are described in detail with illustrative photographs in Appendix D.

Because of the shallow gradients between the level of the wetland and the sea, there is a risk that during extreme high tides and storm surges seawater could flow into the wetlands. In order to prevent this, wooden stop-logs are in place in the slots at the seaward ends of the drains to prevent intrusion of sea water. The stop-logs are not completely water tight, and in order to provide additional security the channels have been further closed off by means of piles of coral fragments and sand to the landward side of the stop-logs

At the seaward end of the drains the outlet structures are often completely blocked by coral rubble and sand which has been transported by wave action and longshore drift.

The Island Council employs two islanders for each drain to maintain them and ensure that the stop-logs and sand are in place at times of extreme high tides or during storm surges. Based on an interview with one of the people employed to manage one of the drains, the practice is to leave the stop-logs and sand in place and only to remove them in the event of flow from the wetland towards the sea.

A significant change has been imposed on the existing drainage system by the start of construction of the new airstrip on the south-west corner of the island. Prior to the start of site preparation works, the area to be occupied by the airport was farmland and dense vegetation. The area of dense vegetation contained the diffuse surface water flow system for the overflow from the southern part of the Bandaara-Kilhi. The flow from the wetland was carried by a culvert under the Naibu thunththu hingun between Dhoodighan and the northern part of the island into the diffuse system. At the coastal ridge a concrete structure gathered the water and channelled it through the coastal ridge to finally discharge into the sea. The Environmental Impact Assessment carried out for the airport<sup>vii</sup> makes no reference to the important function of this area. Measures for the disposal of surface water run-off from the paved areas of the airport are described in the EIA, but the need to maintain the flow path between the wetland and the coastal discharge structure is not addressed. This is an issue which the EPA should address with the utmost urgency before the site preparation works are completed; culverting under the airstrip will definitely be needed. The straight-line path between the existing culvert under the road and the structure at the coastal ridge is close to the touch-down point for aircraft approaching runway one-one (incorrectly labelled as two-nine in Figure 26 of the EIA). Consequently the design of any culvert following the straight-line path under the runway must take account of the touchdown forces at maximum landing weight of aircraft which may land at the airport.

The formal structures described above are at the seaward end of the drainage system and act as collectors to route excess water through the coastal ridge. Inland of these structures, water flow takes the form of shallow overland flow between hollows and ridges in the dense marginal vegetation surrounding the open water bodies.

It should be noted that the Island Office has recently built concrete structures along some of the drainage channels and wetlands, not as flow management structures, but to mark the boundaries between properties and the adjacent wetland area, with the intention of controlling the use of marginal wetland areas and thereby preventing uncontrolled reclamation of the wetland. These marginal areas are the basis for an important part of the island economy, as they are composed of managed taro fields whose success is dependent on the maintenance of a free surface water level in the wetland. Significant changes in water level would adversely affect the ability of people to grow taro in the present locations.

#### **3.1.3.6 Protected Area Status.**

The conservation values of the two wetland areas on Fuvahmulah and an area of coastal waters have been assessed by the EPA. The EPA has then assigned protected area categories based on the IUCN protected area classification scheme.

The two wetland areas overall have been assigned to Category IV with an inner area in each wetland, containing both open water and marginal land, assigned Category Ia. The coastal marine area has been assigned to protected area Category III. The indicative locations of the different category areas are shown in Figure 4.14 below.

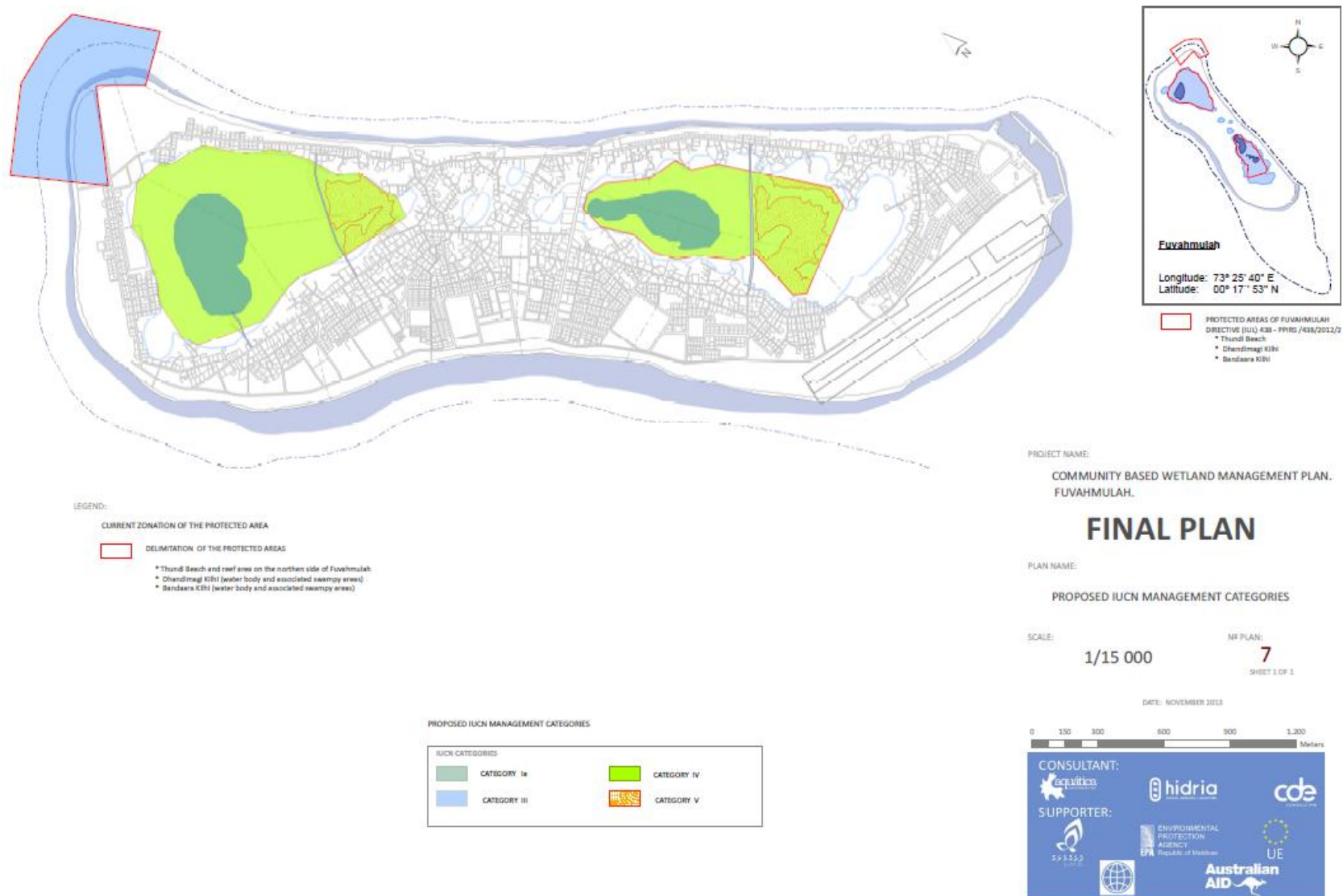


Figure 4.14: IUCN category areas within the wetland

The Thundi area is a marine area and therefore does not form part of the wetland system. However access to and from the area would involve passing close to the boundary of the Dhandimagu Kili. Any management plan developed for the wetland should therefore take account of the proximity of the Thundi area to the wetland.

The areas contained within each category are shown in Table 4.12 below:

**Table 4.12: Areas Contained Within the IUCN Protected Area Categories**

Area	Cat- IV	Cat-III	Cat-Ia
Dhandimagu Kili	37.11 ha		19.19 ha
Bandaara Kili	26.62 ha		7.32 ha
Thundi Area		35.18 ha	

The proposed Protected Areas have not yet been formally gazetted under the Environmental Protection and Preservation Act of Maldives Act No. 4/1993. The necessary documentation is being prepared. During June 2011 the proposed boundaries of the core protected areas and their respective buffer zones were surveyed in detail by EPA staff. Geographical Positioning System (GPS) co-ordinates of all buildings and property boundaries adjacent to the buffer zone were recorded to enable the boundaries to be set and represented accurately on maps. It is expected that the documents will be put before the Parliament in 2011.

### **3.1.4 Socio-economic Environment**

#### **3.1.4.1 Population Structure and Migration Characteristics**

##### **3.1.4.1.1 Population and Growth Rate**

According to census 2006, the total population residing in *Fuvahmulah* is 7,636, with 3,557 males and 4,079 females. *Fuvahmulah* population contributed to 2.6% of the total population of Maldives during that period. The registered population data from Fuvahmulah Atoll Council indicates that as of February 2014 the total population of the atoll is 12,006 comprising of 6,060 males and 5,946 females.

**Table 4.13 Average Annual Growth Rate, Gn. Fuvahmulah, Census 2006**

	Census 2000	Census 2006	Percentage Change in Population (2000-2006)
Total Population	7,528	7,636	1.43%
Male	3,464	3,557	2.68%
Female	4,064	4,079	0.37%

Source: Ministry of Planning and National Development, census 2000 & 2006

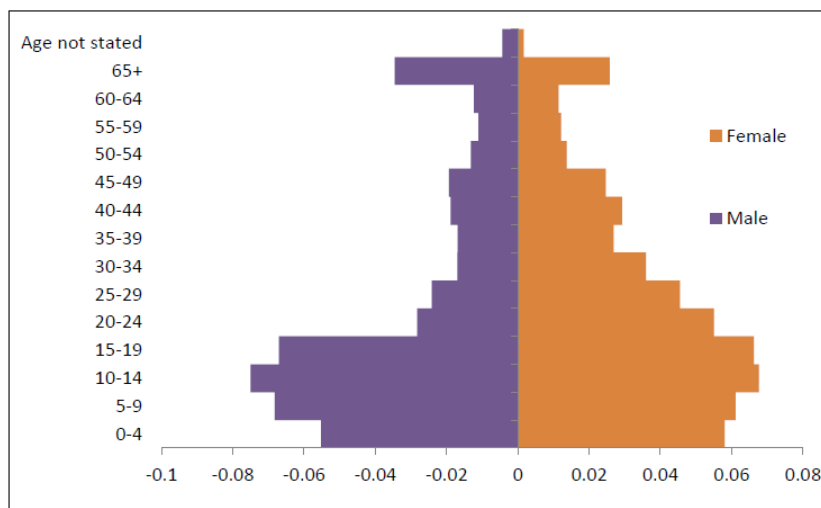
Table 4.13 above shows the average annual growth rate for *Fuvahmulah*. There was a slight positive population growth rate between 2000 and 2006 at a rate of 1.43%. Compared to 2000, the population of *Fuvahmulah* increased by 108 people in the year 2006.

### 3.1.4.1.2 Sex Ratio

According to the census 2006, National Sex Ratio for the country shows that there were more men than women in the Maldives (103 male per 100 females). However in *Fuvahmulah*, population of women outnumbered that of men (87 male per 100 female).

### 3.1.4.1.3 Population Structure

Figure 4.15 below is the population pyramid for *Fuvahmulah* in 2006. The most dominant age group for this population is between the ages of 10-14 years. The dependent population is at 45% with 39% children and 6% elderly. The working age population comprises of more than half of the population with 55%.

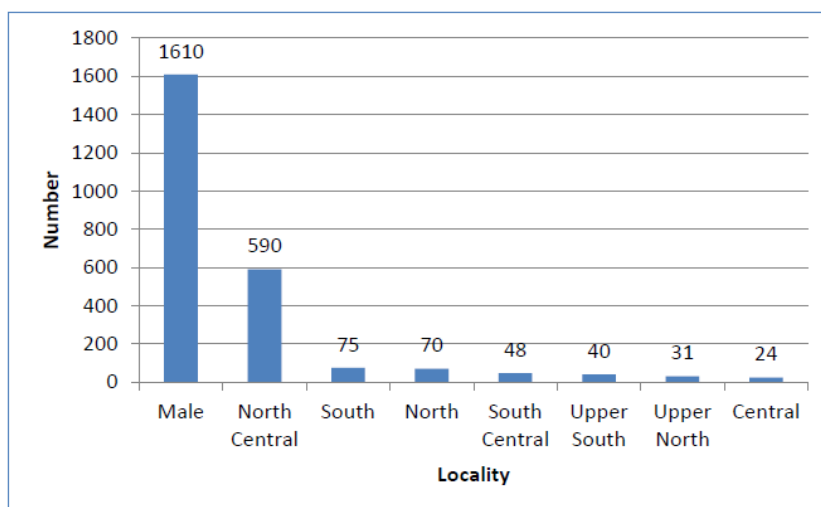


Source: Ministry of Planning and National Development census 2006

**Figure 4.15 Population Pyramid of Gn. Fuvahmulah, Census 2006**

### 3.1.4.1.4 Migration

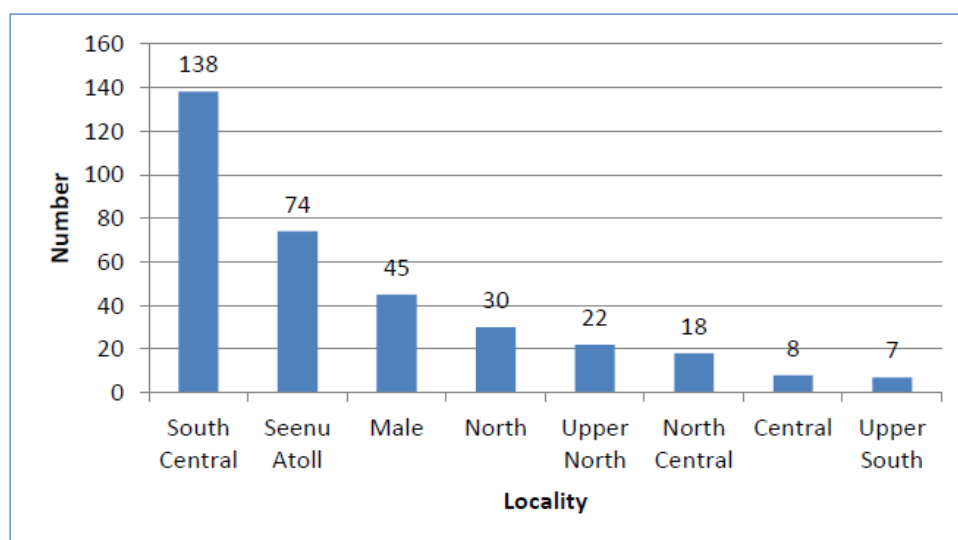
According to Census 2006, the registered population of *Fuvahmulah* was 9,705 people, out of which 74% resides in *Fuvahmulah*. From the 26% of persons migrated from *Fuvahmulah*, 17 percent live in Male'. Figure 4.16 below shows the number of out-migration of *Fuvahmulah* population by place of enumeration.



Source: Ministry of Planning and National Development, Census 2006

**Figure 4.16: Out migration of Gn. Fuvahmulah population by place of enumeration**

According to Census 2006, there were three main reasons for *Fuvahmulah* population to migrate. 10% of them reported the purpose as for education, while another 10% reported as for employment opportunities. A further 35% reported that they moved because they wanted to live in the island they migrated to. Majority of the people living in *Fuvahmulah* were registered in *Fuvahmulah*, however, 5% of people residing in *Fuvahmulah* were registered in other regions. Figure 4.17 below shows the number of persons residing in *Fuvahmulah*, however were registered in other localities.



Source: Ministry of Planning and National Development, Census 2006

**Figure 4.17: In-migration to Gn. Fuvahmulah population by place of registration**

### 3.1.4.2 Institutional and Administrative Structure

After the elections in 2008, Government embarked on a twofold programme of regionalisation and decentralisation to establish a local governance system with the aim of strengthening local democracy and addressing economic and social development issues arising from highly centralised government. The current institutional and administrative structure is based on the principles of decentralised administration laid out in Chapter Eight of the 2008 Constitution. Government envisions the establishment of a three-tier sub-national governance structure with Province Offices at regional level, Atoll Offices at atoll level and Island Offices at Island level.

In 2010 a major milestone was passing of the Decentralisation Act, creating 21 separate atoll administrations and paving way for the country's first ever local council elections in February 2011.

**Region or Province:** the country was regrouped into seven regions with the aim of achieving efficient and effective service delivery at local levels. The objective was to group two or more atolls to form a region or province to provide more effective and efficient planning, co-ordination and management as a means to facilitate effective administrative decentralisation and accelerate development in the islands. This would in turn, reduce the social, economic and developmental disparities between the capital island, Male', and the rest of the country.

Community consultation workshops to familiarize the public with the concept of regionalisation and decentralisation have been conducted in all seven provinces. The Province Offices established in each administrative province act as the government representatives in their respective region. The Province Offices are responsible for formulating and co-ordinating regional development programmes in accordance with national level policies and establishing a mechanism for efficient delivery of services at regional, atoll and island levels in coordination with sector ministries at the national level. The Province Offices are headed by a

State Minister. A newly established Local Government Authority (LGA) is responsible for local government. Under this programme Fuvahmulah has been grouped with Seenu atoll under the South Province, with the regional office at Seenu Hithadhoo (Addu atoll).

**Atoll:** the senior government body on the island is the Atoll Council. This comprises six elected councillors, including a President and Vice-President. The council is supported by a small secretariat.

**Island:** despite its small size, Fuvahmulah has another level of government, the ward councils. These comprise three elected councillors in each of the island's eight Wards:

- |               |               |
|---------------|---------------|
| 1. Dhanimagu  | 5. Funadu     |
| 2. Miskimmagu | 6. Maadhandu  |
| 3. Malegan    | 7. Hoadhandu  |
| 4. Dhundigan  | 8. Dhiguvandu |

The largest ward is Dhanimagu and the most populous is Dhundigan. Technically, a ward council is the same rank as an island council on other atolls. Like the island councils of other atolls, the ward councils of Fuvahmulah act as separate administrative constituencies (a function previously carried out by the Island Chief). However they also co-operate as an overall Island Council with 24 councillors and its own secretariat. Questions have been raised as to the purpose, utility and cost of this additional level of government on such a small and uniform island (the councillors are salaried). Clearly, political decisions have been taken at a higher level. The interplay between the two levels of council is just beginning, and hopefully will be smooth.

#### 3.1.4.3 *Physical Cultural Heritage*

On Fuvahmulah physical cultural heritage includes both Islamic and pre-Islamic features. The most significant pre-Islamic site is a Buddhist stupa in the north-west part of the island, known locally as *Havitta*. It is in poor condition and completely overgrown. Photographs of the stupa cleared of vegetation in 1922 are included in Bell's Monograph<sup>viii</sup> (Bell, 1940). It is some 10 m in height. A smaller mound, some 5 m high, is located nearby. There is also the *Vasho-Veyo*, an ancient circular bath with stone steps. The stone pool reveals great craftsmanship in the cutting of coral rock.

Note: in 2010 a small figurine (Figure 4.18), safely resting on a bed of cowrie-shells packed inside a limestone box and several pieces of a human skeleton were uncovered 3 to 5 feet in the ground, close to Kudhu Haviththa, about 20 feet to the east. The figure is about 6 inches tall, has a feline appearance from the front, but a simian primate like appearance from the sides given the length of the limbs. The box is about a foot tall and a foot square. There must be around a thousand small shells, one larger shell and a conch. The bones have started fragmenting and had a very dark brown colour on the first day they were pulled out from under the earth (hasaeed81 blog, 03 Nov. 2010).

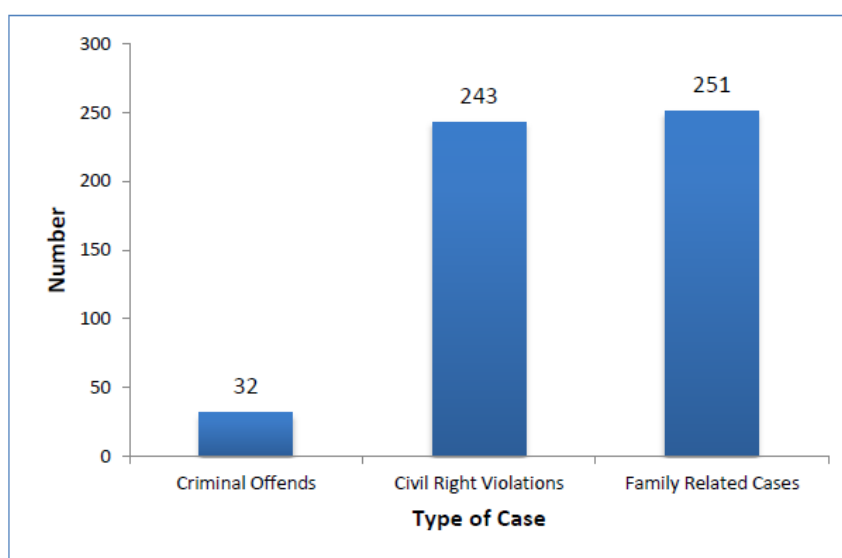


**Figure 4.18: Figurine and shells excavated near Stupa, 2010**

### 3.1.4.4 Law and Order

#### 3.1.4.4.1 Crime Rate

In 2008, majority of cases reported to *Fuvahmulah* magistrate courts were related to family issues (48%). Some of the most common family related cases reported include petition for dissolution of marriage by wife, establishment of divorce/female and established debt. The second common type of cases reported to the *Fuvahmulah* magistrate courts is civil rights violations (46%). In 2008, there were 243 cases reported out of which most commonly included cases related to establishment of ownership, endowment and execution of estate deceased. The least common type of cases was reported on criminal offenses (6%). Some of the most common cases of criminal offenses include theft (minor), fornication, disobeying lawful order and unlawful assembly. Figure 4.19 below shows the number of cases filed at *Fuvahmulah* magistrate Court in 2008.



Source: Department of Judicial Administration, 2012

**Figure 4.19: Percentage Distribution of Cases filed at Gn. Fuvahmulah Magistrate Court, 2008**

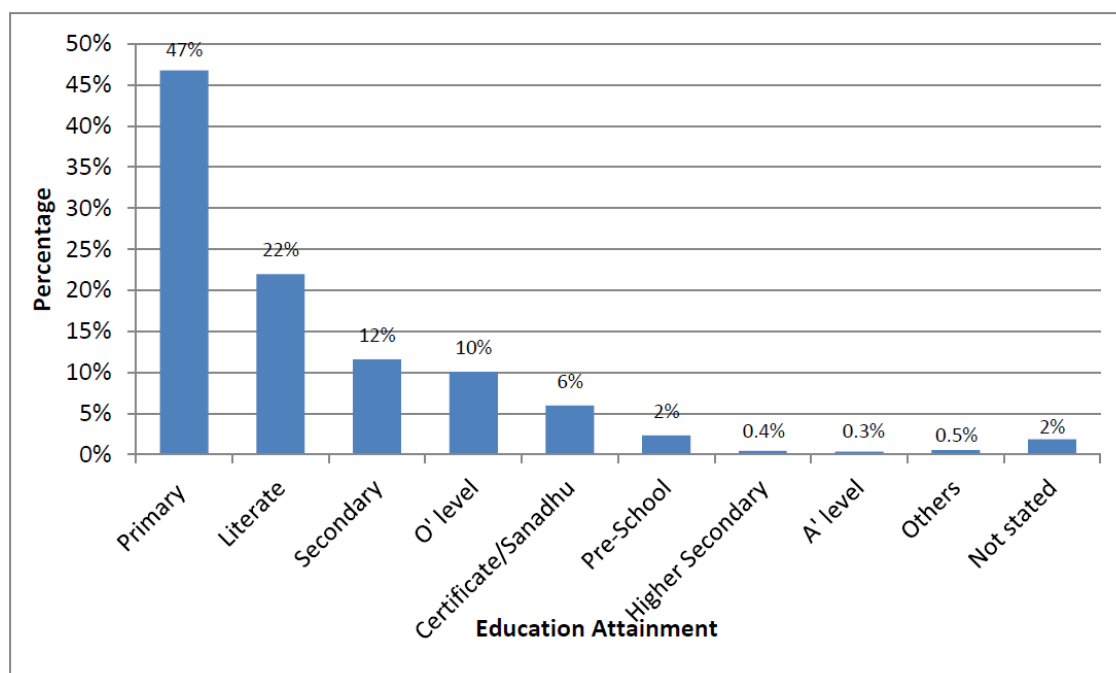
### 3.1.4.5 Education

As of March 2010, there were a total of 10 schools in *Fuvahmulah* out of which 5 are government schools, 1 community school and 4 private schools. The 10 schools comprises of 6 pre-schools, 3 primary schools and a secondary school. Gn. Atoll Education Centre, the only secondary school serving the island is the largest education centre in the island. The 3 primary schools of Fuvahmulah include Fuvahmulaku School, Madharusathu-Sheik Mohammed Jamaaluddeen and Hafiz Ahmed School. As of March 2010, there were a total of 220 teachers which includes 183 trained and 37 untrained teachers. A total of 2,649 students were enrolled in the island schools and the student transition rate from primary level education to secondary education was at 108% (the rate exceeds 100% due to students' migration from other island schools). According to Census 2006, literacy rate for *Fuvahmulah* is 96% and women have a higher literacy rate (97%) compared to that of men (95%).

#### 3.1.4.5.1 Education Attainment Levels

The majority of the population over the age of 6 has obtained primary education (47%). However, there is a huge drop in the number of persons attending secondary education and further. The percent of population who have received secondary education is 12% with 10% completing GCE O'Level examination. While further 6% completed certificate level education, only 0.3% of this population completed GCE A'Level examination. 0.5% of others include education attainment of Diploma level,

Degree and Masters Level. Figure 4.20 below indicates the levels of education attained by *Fuvahmulah* population over the age of 6.



Source: Ministry of Planning and National Development, Census 2006

**Figure 4.20: Education attainment rate, Gn. Fuvahmulah, Census 2006**

### **3.1.4.6 Employment and Economic Structure**

#### **3.1.4.6.1 Labor Force Participation**

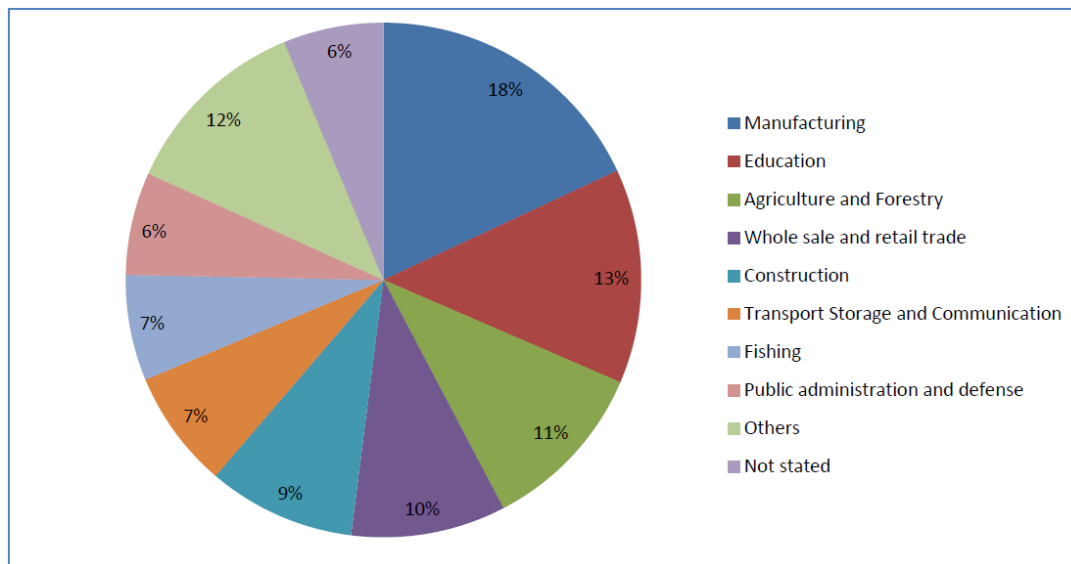
Labor force participation rate for *Fuvahmulah* population over the age of 15 years is 62.1%. More than half of the male population is engaged in the labor force with a rate of 69.1%; while labor force participation rate for women is relatively low at 56.6%.

#### **3.1.4.6.2 Unemployment Rate**

According to Census 2006, the unemployment rate for the population of Maldives over the age of 15 years is 16.2% while the unemployment rate for *Fuvahmulah* is much higher (25.1%). Overall, unemployment rate is significantly higher among females than that of males in *Fuvahmulah*. The total unemployment rate for men and women is 13% and 36.3% respectively.

#### **3.1.4.6.3 Employment by Industry**

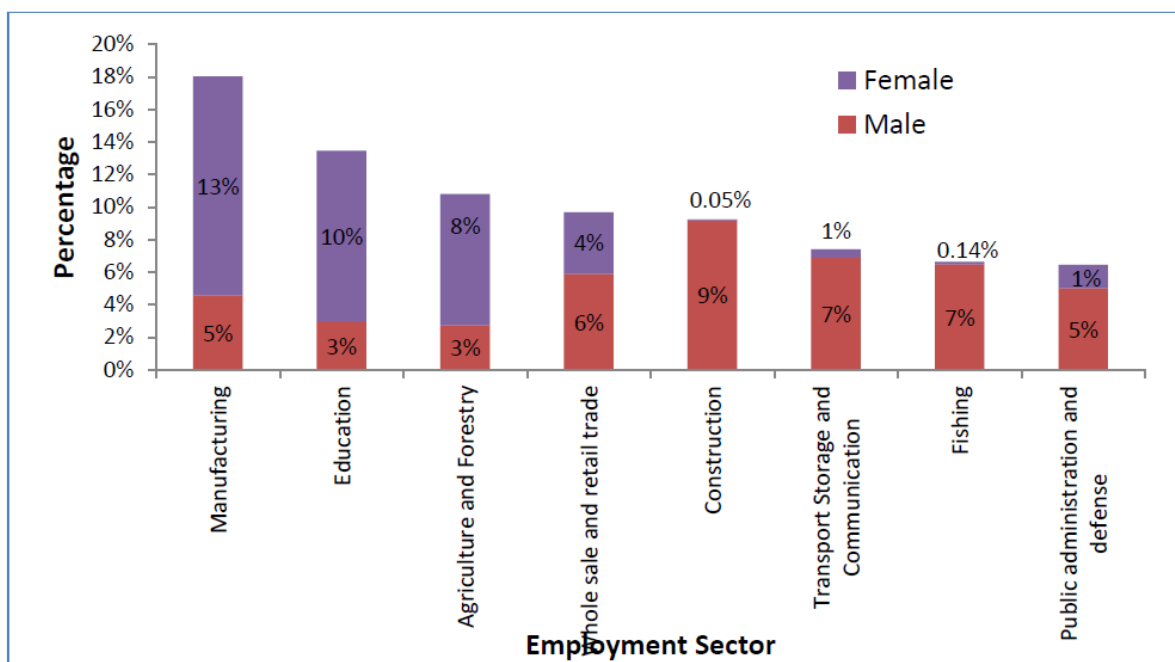
The four most common economic sectors in *Fuvahmulah* include Manufacturing (18%), Education (13%), Agriculture and Forestry (11%), Wholesale and Retail Trade (10%) and Construction (9%). Other active economic sectors also include Transport Storage and Communication (7%), Fishing (7%) and Public Administration and Defense (6%). Figure 4.21 below represents the most common economic sectors in *Fuvahmulah*.



Source: Ministry of Planning and National Development, census 2006

**Figure 4.21 Employment by economic activity, Gn. Fuvahmulah, Census 2006**

There are variations in economic activities with regard to sex as women and men are engaged in different economic activities. For instance, the percentage of share of women is seen more dominant in manufacturing and education sector. The two most common employment activities for men are Construction, Transport Storage and Communication and Fishing. Female labor participation is the lowest in Construction and Fishing industry while male labor participation is lowest in Education and Agriculture and Forestry. Figure 4.22 below presents the differences in the economic activities with regard to sex in *Fuvahmulah*.



Source: Ministry of Planning and National Development, Census 2006

**Figure 4.22 Workforce by industry and gender Gn. Fuvahmulah, Census 2006**

### 3.1.4.7 Fisheries, Agriculture and Tourism

#### 3.1.4.7.1 Fisheries

According to the Ministry of Fisheries and Agriculture there were 98 fishermen in *Gnaviyani Atoll* in 2008. A total of 52 vessels were engaged in fishing including 28 mechanised *masdhoni*, 17 mechanized rowboats and 7 rowboats. Table 4.17 below present the total number of fish catch in *Fuvahmulah Island* in 2006 to 2008, the percentage share and percentage change over the previous year.

**Table 4.17 Fish catch, Gn. Fuvahmulah, 2006 - 2008 (In metric tons)**

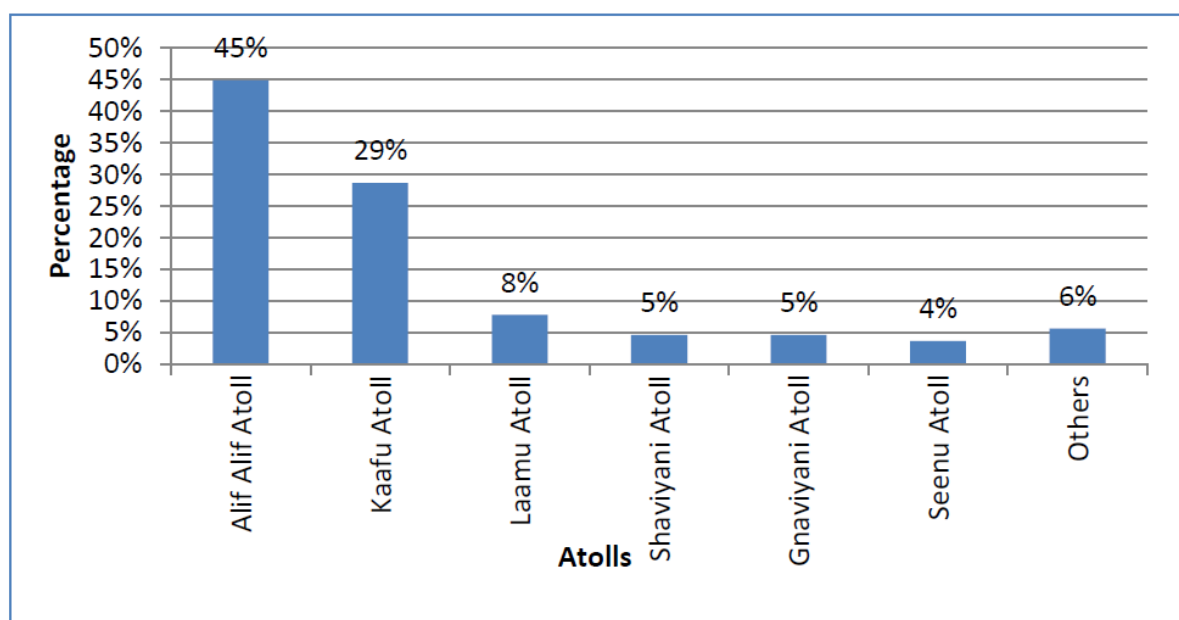
Fish Catch			Percentage share			Percentage change over previous year	
2006	2007	2008	2006	2007	2008	2007	2008
821.06	381.28	764.3	0.45%	0.26%	0.58%	-54%	100%

Source: Ministry of Fisheries and Agriculture, Statistics 2012

According to the table 6-2, there was a huge decline (-54%) in the number of fish catch between 2006 and 2007, however, in 2008 the number of fish catch went up again by 100%. Fish catch in *Gnaviyani Atoll* contributed to only 0.45% of the total fish catch in the country in 2006, 0.26% in 2007 and 0.58% in 2008.

#### 3.1.4.7.2 Agriculture

Figure 4.23 below shows the percentage share of agricultural products traded in Male market by atolls in 2009. According to the Ministry of Fisheries and Agriculture, *Fuvahmulah* contributed to 5% of agricultural products traded in Male' in 2009 where as in 2008, *Fuvahmulah* contributed to 8% of the agricultural products traded in Male' markets.



Source: Ministry of Fisheries and Agriculture, 2012

**Figure 4.23: Agricultural products traded in Male' by Atolls, 2009**

From 2005 to 2009, there has been a significant drop of 44% in the agricultural products traded in Male market that are produced by *Fuvahmulah*. Young coconuts, coconuts, bananas, yam, pumpkin, butternut and watermelons are types of agricultural crops produced in *Fuvahmulah*. In 2009, *Fuvahmulah* was the second largest producer of bananas in the Maldives next to *Seenu* Atoll.

### 3.1.4.7.3 *Tourism*

Tourist resorts are nonexistent in *Gnaviyani Atoll*, as *Fuvahmulah* is the sole island in the atoll. *Fuvahmulah* is one of the most unique islands in the archipelago of Maldives due to the islands distinct natural features. In 2006, a 120 beds city hotel was leased for development to One and Half Degrees Maldives Pvt Ltd. It was never developed.

### 3.1.4.8 *Income Poverty*

According to the Maldives Vulnerability and Poverty Assessment, the human vulnerability index for *Fuvahmulah* is a little lower than the vulnerability index for the whole country (0.25 for Maldives compare to 0.21 for *Fuvahmulah*). Likewise, income poverty index for *Fuvahmulah* is also lower than that of the country average (0.1 for Maldives compare to 0.04 in *Fuvahmulah*). Hence in general, income poverty is less in *Fuvahmulah* compared to the general population of the country. See Table 4.18 below for information on income poverty for Maldives and *Fuvahmulah*.

**Table 4.18 Income poverty by locality in Gn. Fuvahmulah, NPA 2004**

Locality	2004	2004	2004	2004	1997	2004
	Head count ratio, percentage of the population with less than MRV 15 per person per day	Average income of the population with less than MRV 15 per person per day (RF)	Income Shortfall of the population with less than MRV15 per person per day (%)	Poverty gap index of the population with less than MRV 15 per person per day	Human vulnerability Index	Income Poverty Index
Maldives	21	10.6	29	0.06	0.25	0.1
<i>Gnaviyani Atoll</i>	10	10.9	27	0.03	0.21	0.04
<i>Fuvahmulah</i>	10	10.9	27	0.03	0.21	0.04

Source: Vulnerability and Poverty Assessment, Ministry of Planning and National Development, 2004

### 3.1.4.9 *Health Services*

The first Health Centre of *Fuvamulah* officially started its services on May 12, 1973 and since then there has been many developments in terms of the variety of services and infrastructure in the Health Centre. Given the increase in the population of the island and due to the geographical isolation of *Fuvamulah*, the government upgraded the Health Centre to a Hospital on June 11, 2001. Completion work for the new *Fuvahmulah* Atoll hospital building is planned by the Ministry of Health and Family and to be funded by the Public Sector Investment Program 2010- 2012 (Isles, Maldives).

Table 4.19 below shows the number of available health services with the distribution of doctors and nurses in each health service center in *Fuvahmulah*.

**Table 4.19 Medical facilities and distribution of doctors and nurses, Fuvahmulah**

MEDICAL	NUMBER	DOCTOR	STAFF NURSES	NURSE
Atoll Hospital	1			
Pharmacies	3			

#### **3.1.4.9.1 Infant Mortality Rate and Life Expectancy at Birth**

In 2004, according to the Maldives Vulnerability and Poverty Assessment II the life expectancy at birth for *Fuvahmulah* population is 75 years, while it was 67 years for the total population of Maldives. Infant mortality rate for Maldives based on the Maldives Vulnerability and Poverty Assessment II was 41 per 1000 live births where as it was only 15 per 1000 live birth for *Fuvahmulah* in 2004. This is a significant improvement in comparison to 1997 statistics where it was 62 per 1000 live births for the Maldives and 34 per 1000 live births for *Fuvahmulah*.

#### **3.1.4.10 Infra-structure and Accessibility of Services**

##### **3.1.4.10.1 Households**

According to the statistics of Fuvahmulah Atoll Council by February 2014 there were a total 2,722 households in the atoll. From the total households 2096 are used as living quarters while 626 are uninhabited. Total number of households in *Fuvahmulah*, according to Census 2006 is 1332, and 98% of the households were used as living quarters. Other types of households include collective living quarters and mobile units such as boats. Majority of the households in *Fuvahmulah* are occupied by the owner of the households (96%). However, there are a small number of households occupied by renting tenants (0.4%). Currently there are plans for development of 300 units of affordable housing in *Fuvahmulah* (Isles, Maldives).

##### **3.1.4.10.2 Access to Household Goods and Services**

Majority of *Fuvahmulah* households have washing machines and refrigerators (89% and 65% respectively). However, at the time of Census 2006, only 2% of households had air conditioning. Most of the households have bicycles and motor cycles (66% and 49%). A further 3% of the total households in *Fuvahmulah* also have cars or jeeps for transportation. Telephone and Television services are easily available in the atoll as majority of the households have mobile phone (81%), fixed line (64%) and Television (88%). Satellite services are also commonly used in *Fuvahmulah*. 46% of the households have access to cable TV connection and 24% of the households have access to computer. However, only 7% of households have access to internet and 2% have access to newspapers.

##### **3.1.4.10.3 Power**

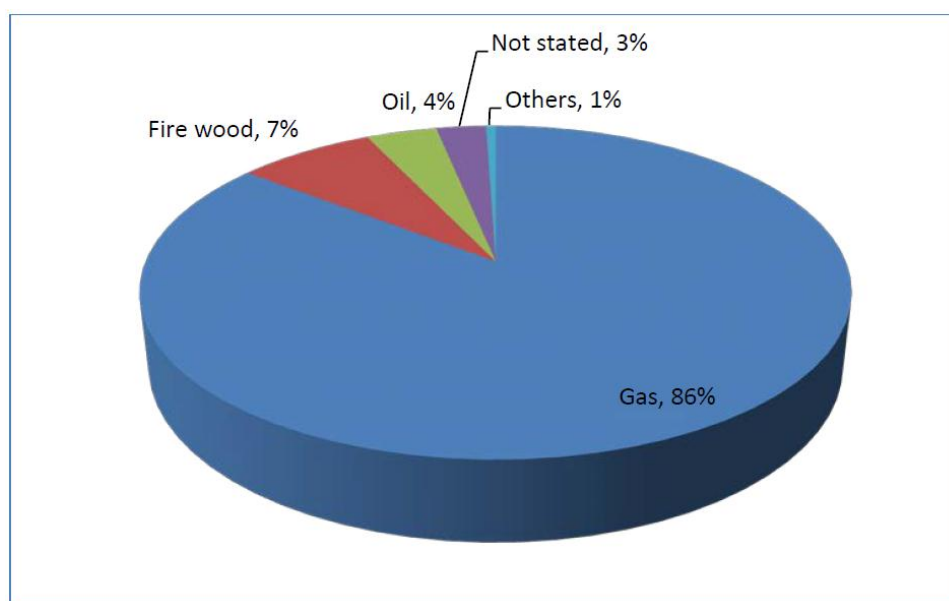
Almost every household in *Fuvahmulah* city have electricity services available. According to Census 2006, 97.6% of households in *Fuvahmulah* had access to electricity. Out of which, almost 100% had their own generators.

##### **3.1.4.10.4 Water Supply**

According to Census 2006, majority of households in *Fuvahmulah* use rain water as the major source of drinking water (98% of households). Other types of drinking water used in *Fuvahmulah* include mineral water (0.2%), desalinated water (0.2%) and well water (0.1%). However, only 6% of the household use treated water while 94% uses untreated water for drinking. Major methods of treatment used for drinking water included boiling (3%) and filtering (0.5%). In 2005, under the project name 'Boafen Hidhumai Mashroou-Phase I) funded by the International Federation of Red Cross and Red Crescent (IFRC), 2500 liters wate tank was provided for 1761 houses in the island.

#### 3.1.4.10.5 Cooking

Majority of the households in *Fuvahmulah* use gas as the main source of fuel for cooking (86 %). Other sources of fuel used for cooking include firewood (7%) and oil (4%).



*Figure 4.24: Classification of types of fuel used for cooking by total households in Gn. Fuvahmulah, Census 2006*

#### 3.1.4.10.6 Sanitation Facilities

92% of the total households in *Fuvahmulah* have toilets connected to septic tank. However, a few numbers of households (3%) use reserved compounds of the house (*gifili*) and 1% of household use toilet connected to sea. Currently, there are plans to develop water and sewerage systems in the island.

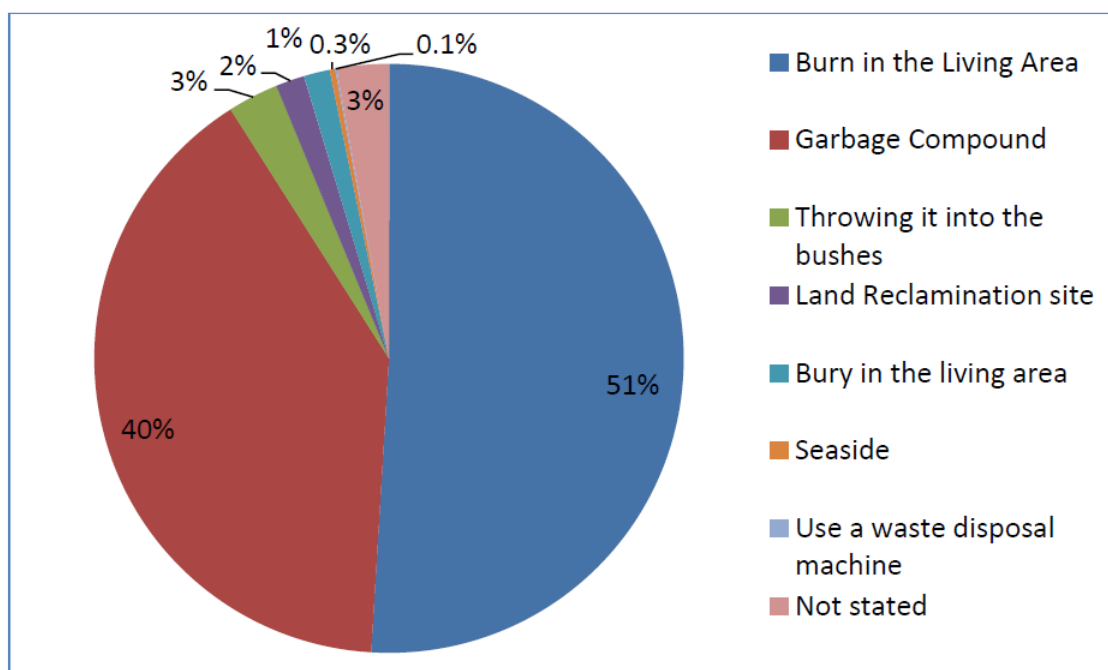
#### 3.1.4.10.7 Waste Management

Majority of household in *Fuvahmulah* use the practice of burning in the living area for waste disposal (51%) or Garbage Compound (40%). A few percent of households also throw rubbish in to the bushes, seaside and land reclamation site. Figure 4.25 below indicates waste disposal practices in *Fuvahmulah*. At present, there is a waste site established on the island. However, the sites lacks the necessary equipment, manpower and other resources required to operate efficiently.

Key points arising from a workshop on environmental issues on Fuvahmulah in 2010 were (CDE Consulting, 2010):

- Waste management is among the most serious environmental issues faced by Fuvahmulah.
- No effective system for waste collection or management exists on the island.
- There is no Island Waste Management Centre (IWMC) on the island.
- More than 85% of waste generated on the island is organic waste, mainly green waste; soft green waste such as leaves is generally used as mulch.
- Food waste is sometimes buried in backyards.
- Other waste is dumped all over the island littering the beaches and roadsides.

Note: there is a rudimentary waste collection service operated by Southern Utilities Ltd. under contract to the Atoll Council. Collected and privately-delivered mixed waste is hand-sorted at a small, insecure compound near the main road on the west coast; but there is no subsequent disposal and the wastes are accumulating.



Source: Ministry of Planning and National Development, census 2006

**Figure 4.25: Household classified by way of waste disposal, Fuvahmulah, Census 2006**

### 3.1.4.10.8 Transport and Communication

Gn. Atoll Fuvahmulah Domestic Airport operations began at the end of 2011. Also, there are plans for the development of Gn. Fuvahmulah roads funded by Abu Dhabi. In addition to this, plans are underway for Gn. Fuvahmulah harbor breakwater head repairmen funded by Public Sector Investment Program 2010-2012 under the Ministry of Housing and Environment. The two main communication services provided in Fuvahmulah are by Dhiraagu and Wataniyya service centers.

### 3.1.5 **Gender Issues**

Although Maldivian law, which is a combination of common law and Islamic *Shari'ah*, discriminates against women in some areas including property rights, inheritance and provision of legal evidence, Maldivian women are among the most liberated in South Asia and the Islamic world (ADB, 2007). However there are many obstacles facing their progress including geographic isolation, limited mobility, personal safety issues and increasing conservatism. These factors hinder access to work and training opportunities in the formal labour sector and the participation of women in the public sphere (UNDP, 2010). For example, women are under-represented in the national parliament with only 5 of the 77 seats held by women, and only 15% of senior officials and managers are women (UNDP, 2010). At the local level this is more pronounced with no women among the 15 Atoll Councillors and only 2 female councillors among the 167 Island Councillors (1 of them in Fuvahmulah Island Council).

Traditionally Maldivian women stayed at home and cared for the household and children. Men went out and earned the household income, typically by fishing. Women processed the catch by cooking and drying. Some fish were consumed in the household while excess catch was sold in the home island and in Male'. With development in the 1970s and the mechanisation of boats fishermen were able to sell their catches to fish factories, reducing opportunities for fish processing by women.

Since the 1970s the development and expansion of tourism has opened up many new and diverse economic opportunities for Maldivians, but due to cultural norms and pressures women make up just 5% of the tourism labour force (ADB, 2007).

In the areas of education and health services and also jobs in the public sector there is no institutional discrimination (ADB, 2007). A lot of progress has been made in the area of health services, especially maternal and child health services. Access to basic health services is the same among both men and women (ADB, 2007). School enrolment rates are nearly the same for boys and girls in primary and secondary school. However, at the tertiary level cultural norms dictate lower educational attainment for girls (UNDP 2010) since few islands have tertiary schools and young women are now expected to stay at home and not travel to Male' or abroad for studies. Traditionally girls as well as boys used to be sent to Male' for higher studies, lodging at homestays (girls predominantly studied nursing and education, limiting their professional employment options). However, with many girls attaining low grades at school and with increasing social risks, only those that can afford to move to Male' with their entire family now go there for tertiary and higher education.

Women receive equal pay for equal work although there are fewer women in decision-making jobs, especially in sectors such as finance, tourism and economic development (UNDP, 2010). Women are mostly employed in the public sector and in manufacturing and also account for 70% of employment in the agricultural sector (ADB, 2007). Unemployment is more evident among women (24%) than men (8%) and a lack of childcare facilities makes it challenging for women to stay employed after they have children (UNDP, 2010).

Some commentators consider that as Maldivian society has become more affluent the need for all women to generate incomes has lessened. At the same time, since men are away from home for long periods of time leaving women to care for the family on their own, women's traditional gender role as home managers and child care providers has been reinforced (ADB, 2007). The domestic burden of women is high and there are limited employment opportunities for women in the atolls. The percentage of female-headed households in the Maldives is among the highest worldwide and these households are more disposed to poverty (ADB, 2007): almost half of all households are headed by women as men work away from the islands in Male', the resorts or at sea, and one sixth of women are either widowed or divorced.

There are no data on these topics disaggregated to island level so the position on Fuvahmulah and Hithadhoo remains conjectural. However, the limited available information and personal observations support this generalised analysis. There is some evidence that girls and women on Fuvahmulah have increased personal freedom and mobility compared to Hithadhoo (for example, there is very widespread use of motorcycles by girls and women), which may be due to the island's isolation and freedom from strangers.

### ***3.1.6 Hazard Vulnerability***

The primary sources of natural hazard risks in Maldives are strong winds during monsoons or freak storms, earthquakes, island interior flooding caused by heavy rain, coastal flooding caused by high surf, storm surge, prolonged strong monsoonal wind, high astronomical tides or tsunamis, and sea level rise (Pernetta and Sestini, 1989, RMSI, 2005, Severe weather events in 2002 2003 and 2004, (2005), Woodroffe, 1989). Coastal flooding related flooding and wind damage can be considered as the most frequent natural hazards that occur in Maldives (see Maniku (1990), Luthfy (1994)). Most of these risk factors (apart from earthquake, wind damage and rainfall flooding), stems from the extremely low elevation of all Maldivian islands: the average elevation is 1.5 meters above sea level. In spite of the occasional natural hazards, Maldives in general is relatively from high risk natural disasters.

Spatial variations in hazards are evident across Maldives (Maniku, 1990, RMSI, 2005, Shaig, 2005). Northern atolls are more exposed to intense storm systems, increasing the risk of wind damage in these atolls. In comparison, southern atolls experience less storms systems, but are more exposed to flooding events, probably as a result of exposure to intense South Indian Ocean storm surges and wind-waves during south west monsoons. Southern atolls are also more likely to experience earthquakes. In this context,

Fuvahmulah lies in a zone which is more exposed to sea induced flooding, rainfall related flooding and earthquakes.

Historical records suggest that Fuvahmulah has been on the receiving end of flooding events, both from rainfall and storm surges (see Table 4.20). Southern atolls receive on average receives approximately 2,300mm of rain annually and could reach up to 3000mm annually. Due to the centrally depression topography of Fuvahmulah, there is a strong risk of flooding rainfall related flooding. Measures have been put in place as concrete viaducts to drain flood water into sea. The project site doesn't have a direct risk of rainfall flooding, but operations may be effected in case of flooding in other settlements.

**Table 4.20: Flooding incidents in Fuvahmulah since 1977 (Maniku (1990), Luthfy (1994))**

<b>Date</b>	<b>Flooding Type</b>
9-12 Jul 1977	Rainfall related flooding
8-13 Aug 1977	Sea induced flooding
28-29 Dec 1977	Rainfall related flooding
2-3 Jan 1978	Rainfall related flooding
21-22 Jul 1978	Rainfall related flooding
5 Feb 1979	Rainfall related flooding
27 Aug 1980	Sea induced flooding
24 May 1982	Rainfall related flooding
3 June 1987	Sea induced flooding
18 Jan 1989	Rainfall related flooding

In addition to the above numerous other events are known to have occurred on the island although there are no written records on them. The most recent severe events were in 6 November 2012. A detailed analysis of this event by Hidria/Aquatica (2013 a) shows that flooding becomes severe if the rainfall exceeds 50 mm in 3 hours or 120 mm for 20 hours.

Sea induced flooding is minimal compared to the high risk of sea induced flooding in the southern atolls. Past sea-induced flooding events effected coastal settlements near the two dredged channels. The project site is one of the best protected sites in Fuvahmulah with regard to sea induced flooding. The areas natural defence system is a remarkable example of adaptation of coral islands to sever weather events. Its effectiveness was demonstrated during the tsunami, when waves failed to reach above the ridge system. The project site's natural defence system is, in fact, higher than any engineered breakwater in the Maldives, including Male' and Ga.Viligilli. Hence, there is low risk of sea induced flooding in the project site. There exists a risk from wind damage, usually monsoonal winds rather than storm winds. Strong winds have been measured in Fuvahmulah.

A detailed risk assessment study undertaken in Hithadhoo Island, Addu City (UNDP 2009), could be considered as an indicator of the type of impacts on Fuvahmulah. However, caution should be raised to the fact there are number of parameters which determine the actual hazard vulnerability of an island. Based on the reports, the Hithadhoo could be exposed to swell waves, storm surges, tsunami, heavy rainfall and strong winds (see Table 4.21 below).

**Table 4.21 Predicted disaster risks in S. Hithadhoo Island (Source DHRAM 2 – UNDP & MPND)**

**Rapid onset flooding hazards**

Hazard	Max Prediction	Impact thresholds			Probability of Occurrence		
		Low	Moderate	Severe	Low Impact	Moderate Impact	Severe Impact
Swell Waves (wave heights on reef Average Island ridge height +3.6 m above reef flat)	NA	< 4.0m	> 4.0m <sup>1</sup>	> 5.0m	Moderate	Low	Very Low
Tsunami (wave heights on reef flat)	3.0m	< 2.0m	> 2.0m <sup>2</sup>	> 3.0m	Moderate	Low	Very low
SW monsoon high seas	2.0m	< 3.0m	> 3.0m	> 4.0m	Very High	Very low	Unlikely
Heavy Rainfall (For a 24 hour period)	284mm	<75m m	>75mm		High	Moderate	Low

**3.1.7 Stakeholder Analysis**

The main stakeholder categories on Fuvahmulah are listed in Table 4.22 and with some comments on features, interests, concerns, influence etc. The over-riding concern of island leaders is to develop and implement a strategy for development of the island that does not irreversibly compromise the island's natural resources and "way of life", whilst ensuring sustainable and equitable economic benefits for the residents.

**Table 4.22: Stakeholder Analysis, Fuvahmulah**

<b>Stakeholders</b>	<b>Main Features / Characteristics</b>	<b>Views / Interests</b>	<b>Worries / Fears</b>	<b>Experience in Wetland Management</b>	<b>Power / Influence</b>
National level: MoHE EPA	Line ministry, major responsibilities Environmental regulator	Want to prepare islands for climate change; responsible for land use plans and housing Preparation of practical project; protection of biodiversity; enforcement of regulations	Scale of responsibilities; low capacity especially away from capital; government cutbacks	Limited; held by individuals rather than as corporate knowledge	Significant influence on official planning; little influence on day-to-day decisions on the ground
Island level: Atoll Council Island Council / Ward Councils	Island-level governments with both strategic and day-to-day responsibilities	Strategic development of the island; day-to-day management of services and issues	Inappropriate development; degradation and/or irreversible loss of natural resources; low technical capacity for planning and management	None	Significant, especially under new decentralised approach; limited by lack of budgets and low technical capacity
Local residents	Relatively affluent; many female-headed households; significant gender division of roles; significant generational differences	Want economic development and employment opportunities; youth want more freedom	Social problems due to changing society and expectations; youth disenchantment and unemployment	None, except management of taro fields at edge of wetlands	Little, but personal actions have high cumulative impacts on the wetlands
NGOs and CBOs: Society for Environmental Awareness Others	Depend on a few active individuals	Varies according to organisation - education, health, social services, environmental protection, economic development	Increasingly materialistic society; increased social problems; lack of budgets and technical capacity	None	Potential for influence at local level

### 3.2 Addu with special reference to Hithadhoo

As many of the proposed activities are concentrated on Hithadhoo of Addu City, the data and related information has been presented in reference to Hithadhoo.

#### 3.2.1 Physical Environment

##### 3.2.1.1 Meteorology

Data related to Meteorology has been based on overall Maldives and Gan weather station in Addu City as presented under the section 4.1.1.1 above.

##### 3.2.1.2 Ground Water Quality

Water samples were taken from the proposed Visitor Centre location and the existing farm area. Results of the findings are summarized in Table (Table 4.23) below. Analysis of both samples indicates that the ground water quality, in general, is highly polluted. It showed higher concentration of nutrients and microbial count. Water samples from the farm area show substantial contamination possibly attributed to the seepage of fertilizers due to unsustainable farming practices.

The pH of the water samples value of 7.75 indicating that the water is basic, which is a natural trend in the Maldives as the bed rock and soil is composed of calcium carbonate.

**Table 4.23 Ground Water Test results**

Parameters	Visitor Centre Location (G2)	Farm area (G1)
pH	7.75	7.75
Salinity (%0)	0.28	0.22
Phosphate (mg/L)	0.28	0.51
Turbidity (NTU)	0.695	0.211
Sulphate(LOQ 10 mg/L)	14	36
Biological Oxygen Demand (mg/L)	47	48
Nitrate	0.2	<b>5.3</b>
Faecal Coliform (CFU/100ml)	51	40

Considering the nutrient content of waters tested, the nitrate levels at the farm area are 5.3 mg/l, which shows very high levels of nutrient in water. Nitrate ion ( $\text{NO}_3^-$ ), the common form of combined nitrogen found in natural waters is an essential nutrient for aquatic plants. However, concentrations exceeding 0.1 mg/l  $\text{NO}_3\text{-N}$  indicate influx of municipal and industrial waste leachates from waste disposal sites and sanitary landfills and also inorganic nitrate fertilizers that is used by the farmers. Present nitrate level in the water bodies is an indication of water pollution that can cause excessive plant growth and decay.

The amount of organic matter present at the water were obtained by measuring the biochemical oxygen demand (BOD) which is defined by the amount of oxygen required for the aerobic micro-organisms present in the sample to oxidize the organic matter to a stable inorganic form. The BOD of the water bodies is very high at 48 mg/l. This indicates that the water lens is receiving wastewaters of various organic contents.

The total and faecal coliforms were also measured to identify the degree anthropogenic influence on the water bodies and the measurement of faecal coliform indicate the presence of organic pollution of human origin. Both sites showed extensive levels of faecal coliform. The visitor centre area which is closest to the settlement has relatively higher faecal matter content (51 CFU/100ml) can contain a variety of intestinal pathogens which cause diseases. High levels of total coliforms in most of the sites indicate the presence of other naturally present micro- organisms, such as the algal and protozoan communities, a few of which are known to produce toxins and transmit, or cause, diseases. Though this water is not used for consumption purposes, there is still a risk of accidental ingestion of intestinal pathogens as well as a risk of other infections, particularly in the eyes, ears and nose.

### 3.2.1.3 Wetland Water Quality

Water samples were taken from the northern and southern side of the wetland surface water. Results of the findings are summarized in Table (Table 4.24) below.

**Table 4.24 Wetland Water Test results**

<b>Parameters</b>	<b>Kilhi east side (north site) (G3)</b>	<b>Kilhi – edge of main road (Addu W) – (G4)</b>
pH	8.74	8.39
Salinity (%0)	4.11	18.33
Phosphate (mg/L)	0.03	0.25
Turbidity (NTU)	1.11	3.70
Sulphate(LOQ 10 mg/L)	325	
Biological Oxygen Demand (mg/L)	48	9
Nitrate	0.1	0.6
Faecal Coliform (CFU/100ml)	25	0

Generally, the water is more saline in the south compared to north. The pH value is also slightly higher for both sites but well within the normal range. There were signs of contamination in both sites with the north site having higher faecal coliform and the south side having relatively higher nitrate and phosphate levels.

Turbidity reveals the concentration of suspended matter consisting of; silt, clay, fine particles of organic and inorganic matter, soluble organic compounds, plankton and other microscopic organisms in water. Hence, it controls the transparency of the water. The results indicate that water contains less suspended particles and hence light will be available for photosynthetic organisms in the water making water body healthy (the normal range of values of turbidity is from 1 to 1,000 NTU). In most of the reference values for turbidity, less than 5 NTU is considered desirable.

Phosphorus is another essential nutrient for living organisms and exists in water bodies as both dissolved and particulate species, concentration ranging from 0.005 to 0.020 mg/ l PO<sub>4</sub> –P with an average of 0.02 mg/ l PO<sub>4</sub>-P. The phosphate levels in the water at the north site were 0.03 and could be considered relatively normal. However, the value of 0.25 for the southern side showed higher than normal level.

#### 3.2.1.4 Seawater quality

Water samples were taken from the four sites with the lagoon waters surrounding the protected area. Results of the findings are summarized in Table (Table 4.25) below.

**Table 4.25 Seawater Test results**

Parameters	Koatney Area (W1)	Seagrass Area (W2)	Addu C (W3)	Addu U (W4)
pH	8.14	8.19	8.09	8.13
Salinity (%0)	31.89	25.99	30.20	28.10
Phosphate (mg/L)	0.04	0.07	0.09	0.07
Turbidity (NTU)	1.02	0.575	39.1	41.3
Sulphate(LOQ 10 mg/L)	2550	2000	1875	1725
Biological Oxygen Demand (mg/L)	10	9	3	3
Nitrate	0.5	0.4	0.4	0.4
Faecal Coliform (CFU/100ml)	2	0		
Nitrogen Ammonia			0.18	0.22
Total Dissolved Solids (TDS)			23300	21800

The results of the assessment show slightly better but polluted waters around the island. All sites showed higher levels of Phosphate and moderately higher levels of nitrate, indicating release of nutrients to the water from the island groundwater system.

#### 3.2.1.5 Soil Condition

The soil conditions in the proposed Visitor Centre site was analysed using a pre-dug well. The side of the well was scraped to reveal a fresh profile. The size of the well was 2m x 4m. The soil profile diagram derived from the assessment is presented in Figure 4.28. The soil conditions of the site were similar to soil conditions across the island (CDE, 2011), consisting considerable quantities of un-weathered corals as parent materials, coral rocks and sand. A moderate layer of humus/peat (up to 15 cm) was observed. Within this layer, several pieces of rock varying in sizes were also found. However, this can be attributed towards construction wastes that have been thrown in the area over the past years.

The soil found underneath the humus layer are coarse in texture with a top layer of dark soil (up to 55cm) followed by a transition zone of soil to coarse rocks (up to 40cm) down to the underlying bed rock. The bed rock is a thick hard-pan layer of cemented calcium carbonate (up to 30 cm). A good layer of top soil has allowed vegetation to develop in the area extensively, but the shallow bed rock prevents the penetration of the roots of most plants except for the larger tree species. The soil also exhibits elements of high porosity and high infiltration, indicating the site to have a generally poor water holding capacity. The water table

is reached at a depth of 1.3 meters. Normally, areas with high levels of humus and organic matter has a rather acidic soil, however this site has a pH value of 7.75 indicative of slightly alkaline soils. This is mainly due to the presence of excess calcium in the soil (at the depth of the water level).



*Figure 4.26: Soil profile at the visitor centre site*

### 3.2.1.6 Land Use

#### 3.2.1.6.1 Hithadhoo Island Land Use

The existing land use plan and the new land use master plan of Hithadhoo Island is presented in Appendix E. The Socio-economic risk assessment report (UNDP, 2009) summarizes the main features of the present land use as below.

- Hithadhoo is the second largest inhabited island, in terms of its land area, and second largest population centre in the Maldives. It contains large areas of habitable land as well as wetlands. Significant wetland and reef areas have already been reclaimed to accommodate demand for new land.
- The population density of Hithadhoo is 18 persons per hectare.
- The settlement footprint covers 65% of the total habitable area. Hence, a large portion of the land available is currently being used for housing, economic establishments and socio-economic infrastructure on the island.
- Traditionally, the housing plots allocated in Hithadhoo are quite large, with some plots in around 10,000 ft<sup>2</sup>. This has left the old settlement areas with large areas of underutilised land. Some of these

plots are uninhabited as well, as their owners have migrated to another islands, namely Male'. Newly allocated plots size has been revised to 3000 ft<sup>2</sup>.

- The newly reclaimed land from the reef has become the new industrial and commercial zone of the island. The local harbour is also located in this area.
- There is no Central Business District (CBD) or a central commercial zone on the island. Most establishments are distributed along the main road. The highest spatial concentration is close to the Regional Hospital Zone.
- The key economic infrastructure on the island are the harbour, Addu Link Road, communications infrastructure, commercial port, ice plant and fuel supply. Most of these facilities are located within 100 m of the coastline.
- Majority of the land is utilised for housing and urban services.
- Land allocation in the past did not consider land for economic activities. It was only recently, after land reclamation, that land was identified specifically for commercial purposes. Prior to it, land was only allocated as housing plots and business establishments had to rent or utilise fragmented housing plots. Hence, about 80% of the businesses are established within housing plots.
- Backyard agriculture is practiced across the island and open agricultural plots are located in the northern and southern end of the settlement.
- The development of the Addu Link Road has helped to develop new business establishments along it.

#### ***3.2.1.6.2 Wetland Area Land Use***

The land use patterns in wetland area are summarized in Appendix F. The following patterns of land use are observed.

- The wetland area is officially a declared protected area and therefore the City Council does not allow any legal construction of buildings or lease for commercial activities, except for agricultural purposes.
- Land has been leased for agricultural purposes in the past but the council has now ceased the activity. Plots already allocated for agriculture continue to utilise them. However, the ownership has unofficially changed for a number of these plots including unofficial subdivisions.
- Access to the farms is through the protected area, which can involve the use of trucks for transportation activities.
- There are a few buildings constructed and being constructed on site, which has been reported to have been constructed for accommodation purposes. However, the Addu City Council maintains that no construction is allowed in the Protected Area, even on the farmlands, except for small sheds.
- The Koathey area is used as a picnic area by locals. The site is accessed using motorcycles and four wheeled vehicles.
- The northern end of Hithadhoo Island reef and the Koathey area is used for bait fishing by locals.

### ***3.2.2 Biological Environment***

#### ***3.2.2.1 Terrestrial Environment***

A detailed terrestrial and marine environment assessment of the island was undertaken for this project (Hidria/Aquatica 2013a) with the participation of CDE Consulting. The following extracts are based on the findings of the report.

##### ***3.2.2.1.1 Flora***

Hithadhoo Protect Area has almost the same species as found in similar coastal areas and mangroves of the Maldives. The flora consists of seven types of trees, three types of shrubs, two true mangrove species and

one associated mangrove species. A total of five ground cover species were identified during field work, however as noted by Hidria/Aquatica (2013a), there may be more. The *Jack in the Box* (*Hernandia nymphaeifolia*) and the *Yellow Mangrove* (*Ceriops tagal*), which have been recorded in studies funded by AusAid (MEEW, 2006) were reported to be not found during field work. A total of 20 species have been recorded in the area. In addition, several ornamental species were observed along the agricultural area which was introduced species by the farmers.

**Species of importance and potential uses:** Many of the species found in the protected area are used by the local community for traditional medicine or other uses (see Table 4.26). Coconut stands (*Cocos nucifera*) serve a wide variety of purposes such as dry palm leaves (for thatch making), firewood, charcoal, coconuts, timber, building, mats, ropes, baskets, etc. The species can also be used to revive the culture of “toddy tapping” in Addu Atoll (‘toddy’ is a beverage produced from the sap of the coconut palm) and to process “Virgin Coconut Oil” as part of the development of agriculture in the area. In addition, coconut plantations also provide a habitat for Coconut Crabs (*Birgus latro*).

The noni plants (*Morinda citrifolia*) found in the agricultural area can be utilized for their high value as a processed product as part of the development of agriculture in the area. They are also of medicinal use for blood pressure and pain from arthritis and from menstruation. Iron wood (*Pemphis acidula*) and Black mangrove (*Lumnitzera racemosa*) can be utilized for restoring areas of the lake as well as for environmental education on the importance of mangrove species as a shelter belt, erosion control measure and protection against tsunamis.

**Vegetation Types:** Hidria/Aquatica (2013a) classified the vegetation with the protected area into four main groups. A map of vegetation classification is presented in Appendix G. A summary of the classes are provided below.

- Forest Communities: Identified mainly as the coconut groves extending up to Koathey and the small islands. Other species, identified include “Sea lettuce or Magoo (*Scaevola taccada*), Sea hibiscus or Dhiggaa (*Hibiscus tilaceus*) and Nit pitcha or Uni (*Guetarda speciosa*), forming the understory. This understory ranges from bare ground to a dense six meter tall mid-stratum of species. Occasionally, country almond or Midhili (*Terminalia catappa*) appears in the area. A closed forest of Sea poison tree or Kin’bi (*Barringtonia asiatica*) was also recorded along the coastal area of the northeastern tip of Eydhighali Kilhi.
- Shrub Communities: The shrub community was identified as been found on the northwestern coastal part of the protected area and on the eastern coastline of Eydhighali Kilhi. “The main species found in this community include Sea lettuce or Magoo (*Scaevola taccada*), Screw pine or Boa kashikeyo (*Pandanus tectoris*) and Sea hibiscus or Dhiggaa (*Hibiscus tilaceus*) with varying dominance of height and density of these three species in different parts of this community.
- Mangroves: Mangroves were reported as being found in two areas: around Eydhighali Kilhi and in the bay area and the outlying islands. The report states that “the mangrove community of Eydhighali Kilhi includes the Iron wood or Kuredhi (*Pemphis acidula*) and the Black mangrove or Burevi (*Lumnitzera racemosa*). Iron wood is an associated mangrove species. There are a few notable stands of (i) outlying pockets of Black mangrove in the middle of the lake providing an important roosting (and probably nesting) habitat for herons, and (ii) a dense closed forest of Black mangrove on the northern end of the lake, which is probably one of the oldest stands of black mangrove on the island. The mangrove community of the bay area and the outlying islands consists of one species, the Red mangrove or Ran’doo (*Rhizophora mucronata*). The largest of its distribution, a close forest of Red mangrove is found on the outer border of the protected area, along the bay area closer the community. Some more stands of these species are found on the inland side of the outlying islands as well as on the east of the sandy bay area.
- Mixed forest: These were identified as areas of mixed woodland, shrub and mangrove communities. Species recorded in this group include the Coconut tree, Sea hibiscus, Sea lettuce, Screw pine, Iron wood and Red mangrove. Mixed woodland and shrub communities were also recorded in the agricultural area. Species recorded include the Coconut, Alexander Laurel wood or Funa (*Calophyllum*

*inophyllum*), Sea hibiscus, Uni, Midhili, Noni or Ahi (*Morinda citrifolia*) and a wide range of ornamental plants.

### 3.2.2.1.2 Fauna

A summary of the fauna found in the protected areas as identified in the Hidria/Aquatica (2013a) is provided in Table 4.27.

**Birds:** Eidhigali Kilhi and surrounding areas are known as places where a number of birds are found and it is one of the reasons why it was declared as a protected area. Based on various studies, 23 species of terrestrial birds have been recorded, including two endemic subspecies; most them associated to the wetland habitats in Eydhigali Kilhi. Herons are reported as the most common group both in terms of species and numbers. Among these, Maldivian Pond heron (*Ardeola grayii phillipsi*) is recorded as an endemic subspecies which is resident and breeding in the area. Grey heron (*Ardea cinerea rectirostris*) was identified in relatively high numbers. The Great Egret (*Egretta alba modesta*), a very rare bird in the Maldives, was also identified in the area. Other interesting birds identified in the area are “*Amaurornis phoenicurus maldivus*, the endemic Maldivian water hen or Kabili (known as Kambilah in Addu) and the white-tailed tropic bird of Dhandifulu Dhooni (*Phaethon lepturus*). White tern or Dhondheeni (*Gygis alba*) has a special importance in Addu Atoll. Even though it is common across the tropical seas and in the Indian Ocean, in the Maldives, it is known to breed only in Addu Atoll.

**Fish:** Only one species of fish is recorded by Hidria/Aquatica (2013a) in Eydhigali Kilhi, is the tilapia or Footu mas (*Oreochromis sp.*). “It is believed that it was introduced in the seventies to be used as bait fish; however, it proved to be ineffective for this purpose”. Another identified as an introduced species present in the kilhi is Mosquitofish or Fena mas (*Gambusia affinis*).

**Reptiles and Mammals:** Records of reptiles and mammals are minimal. Five species have been identified in the protected area: it includes one gecko, the Common garden lizard, the Skink and the two snakes. Two amphibians: the Marbled Sand Frog, and one toad, Asian Common Toad, both named Boh in Maldives (Boka in Addu) have also been recorded in the area.

Table 4.26 Vegetation inventory of Hithadhoo Protected Area

Category	Name				Distribution (ACFORs)					Additional Info
	Family	Scientific	English	Dhivehi	Eydhigali Kilhi	Koathey	Farmland	Bay area	Islands	
Trees	Arecaceae	<i>Cocos nucifera</i>	Coconut palm	Dhivehi ruh	O	C	C	A	A	
	Clusiaceae	<i>Calophyllum inophyllum</i>	Alexander Laurel wood	Funa	-	-	O	R	-	Few large & old trees located in the abandoned farmland
	Combretaceae	<i>Terminalia catappa</i>	Country almond	Midhili	O	O	-	O	-	
	Hernandiaceae	<i>Hernandia nymphaeifolia</i>	Jack in the box	Kandhu	-	-	-	-	-	Found in past literature <sup>7</sup> , but not seen in the field.
	Lecythidaceae	<i>Barringtonia asiatica</i>	Sea poison tree	Kin'bi / Kim'bi	C	-	-	-	-	Distribution is restricted to the outer area of the Kulhi (northern side)
	Malvaceae	<i>Hibiscus tilaceus</i>	Sea hibiscus	Dhiggaa	C	C	C	F	-	
	Pandanaceae	<i>Pandanus tectoris</i>	Screw pine	Boa kashikeyo	A	A	O	O	O	
	Rubiaceae	<i>Guetarda speciosa</i>	Nit pitcha	Uni	C	F	O	O	-	
Shrubs	Goodeniaceae	<i>Scaevola taccada</i>	Sea Lettuce	Magoo	A	A	O	C	C	
	Mimosaceae	<i>Leucaena leucocephala</i>	Leucaena	Ipil-ipil	O	-	O	O	-	Highly invasive species, but an excellent soil fixing plant (under controlled conditions)
	Rubiaceae	<i>Morinda citrifolia</i>	Noni	Ahi	F	C	A	O	-	High population, but undocumented in past records, high value crop too
Others (ground cover/ vines)	Asteraceae	<i>Wedelia calendulacea</i>	-	Mirihi	-	C	C	C	-	
	Convolvulaceae	<i>Ipomoea pes-caprae</i>	Goat's foot creeper	Bodu veliveyo	-	C	C	C	-	
	Lauraceae	<i>Cassytha filiformis</i>	Love-vine	Velan'buli	-	O	O	O	-	Highly invasive species, undocumented in past literature
	Turneraceae	<i>Turnera ulmifolia</i>	Yellow alder	Bakari-nukaa	O	F	O	F	-	
	Verbanaceae	<i>Stachytarpheta indica</i>	Vervain	Rakimaa	-	F	Farm-	F	-	

Category	Name				Distribution (ACFORs)					Additional Info
	Family	Scientific	English	Dhivehi	Eydhigali Kulhi	Kaatey	Farmhan d	Bay area	Islands	
	Combretaceae	<i>Lumnitzera racemosa</i>	Black mangrove	Burevi	A	O	-	C	C	Found usually mixed with kuredhi species, a pure stand found on the northern side of the kulhi
	Lythraceae	<i>Pemphis acidula</i>	Iron wood	Kuredhi	A	O	-	C	C	Found usually mixed with burevi
	Rhizophoraceae	<i>Ceriops tagal</i>	Yellow mangrove	Karamana	-	-	-	-	-	Found in past literature, but not seen in the field.
<b>Mangroves</b>	Rhizophoraceae	<i>Rhizophora mucronata</i>	Red Mangrove	Ran'doo	-	-	O	O	O	Much of the species area is being destroyed for housing

Source: Hidria/Aquatica 2013a

NOTE: ACFOR scale: A: Abundant; C: Common; F: Frequent; O: Occasional; R: Rare

**Table 4.27 Fauna inventory of Hithadhoo Protected Area**

<b>Class</b>	<b>Order</b>	<b>Family</b>	<b>Species</b>	<b>DIVEHI NAME (Male' / Addu)</b>	<b>ENGLISH NAME</b>	<b>ENDEMIC (geog. scope)</b>
<b>Birds</b>	<i>Ciconiiformes</i>	Ardeidae	<i>Casmerodius albus</i>	Iruvaahudhu	Great White Egret	
			<i>Egretta garzetta</i>	Kuda lagana	Little Egret	
			<i>Ardeola grayii (phillipsi)</i>	Huvadhoo raabodhi	Maldivian Pond Heron	Maldives
			<i>Ardea cinerea (rectirostris)</i>	Maakanaa	Eastern Grey Heron	
			<i>Mesophoyx intermedia</i>		Intermediate Egret	
			<i>Bubulcus ibis (coromandus)</i>	Iruwaa hudhu	Cattle Egret	
			<i>Nycticorax nycticorax</i>	Raabondhi	Black-crowned Night Heron	
	<i>Gruiformes</i>	Rallidae	<i>Gallinula chloropus</i>	Olhuvalu Kanbili/Kulhee Kanbili	Common Moorhen	
			<i>Amaurornis phoenicurus (maldivus)</i>	Kabili / Kambilah	Maldivian Water Hen	Maldives
	<i>Passeriformes</i>	Sturnidae	<i>Acridotheres tristis</i>	Maina / Meyna	Common Myna	Introduced
		Corvidae	<i>Corvus splendens (maledivicus)</i>	Kaalhu	Maldivian House Crow	Maldives
	<i>Anseriformes</i>	Anatidae	<i>Anas querquedula</i>	Reyru	Garganey	
			<i>Anas acuta</i>		Northern Pintail	
	<i>Apodiformes</i>	Apodidae	<i>Apus affinis</i>	Forikey	Common Swift	
	<i>Charadriiformes</i>	Recurvirostridae	<i>Himantopus himantopus</i>	Theyravaa Iolhi	Black-Winged Stilt	
		Scolopacidae	<i>Arenaria melanocephala</i>	Rathafai	Black Turnstone	
			<i>Calidris temminckii</i>		Temminck's Stint	
			<i>Calidris minuta</i>		Little Stint	
			<i>Tringa stagnatilis</i>	Furedhdhe Iolhi	Marsh Sandpiper	
			<i>Numenius phaeopus</i>	Bulhi thumbi	Wimbrel	
			<i>Actitis hypoleucos</i>	Fidhana	Common Sandpiper	
		Laridae	<i>Gygis alba</i>	Dhondheeni	Common White Tern	
			<i>Gelochelidon nilotica</i>	Kanifulhu Dhooni	Gull-Billed Tern	
			<i>Chlidonias hybrida</i>	Valhoa Dhooni	Whiskered Tern	
	<i>Suliformes</i>	<b>Fregatidae</b>	<i>Fregata ariel</i>	Hoara	Lesser Frigate Bird	

<i>Class</i>	<i>Order</i>	<i>Family</i>	<i>Species</i>	<b>DIVEHI NAME</b> (Male' / Addu)	<b>ENGLISH NAME</b>	<b>ENDEMIC</b> (geog.
	<i>Psittaciformes</i>	Psittaculidae	<i>Psittacula eupatria</i>	Bodu guraa	Alexandrine Parakeet	
	<i>Phaethontiformes</i>	Phaethontidae	<i>Phaethon lepturus</i>	Dhandifulhu Dhooni	White-Tailed Tropic bird	
	<i>Phoenicopteriformes</i>	Phoenicopteridae	<i>Phoenicopiterus ruber</i>	Gudu gudaa dhooni	Flamingo	
<b>Mammals</b>	<b>CHIROPTERA</b>	Pteropodidae	<i>Pteropus hypomelanus maris</i>	Vaa / Vaula	Variable Flying Fox,	Maldives
				Island Flying Fox	(t ?)	
			<i>Pteropus giganteus ariel</i>	Vaa / Vaula	Indian Flying Fox	Maldives
	<b>RODENTIA</b>	Muridae	<i>Rattus sp</i>	Meedhaa / Meedhala	Rat	
	<b>SORICOMORPHA</b>	Soricidae	<i>Suncus murinus (TBC)</i>	Hikandhi / Hikandha	Asian House shrew	
<b>Reptiles</b>	<i>Squamata</i>	Agamidae	<i>Calotes versicolor</i>	Bondu / Bondah	Common garden lizard	
		Gekkonidae	<i>Hemidactylus frenatus (TBC)</i>	Hoanu / Hoana	Gecko	
		Colubridae	<i>Lycodon capucinus</i>	Nannugathi / Nannigatha	Common Wolf Snake	
		Scincidae	<i>Lygosoma albopunctata</i>		White-spotted Supple Skink	
		Typhlopidae	<i>Ramphotyphlops braminus</i>		Island blind snake	
<b>Amphibians</b>	<i>Anura</i>	Dicroglossidae	<i>Sphaerotheca rolandae</i>	Boh / Boka	Marbled Sand Frog	
		<i>Bufonidae</i>	<i>Duttaphrynus melanostictus</i>	Boh / Boka	Asian Common Toad	
<b>Fish</b>	<i>Cyprinodontiformes</i>	Poeciliidae	<i>Gambusia affinis</i>	Fen meeru mas / Fena mas	Mosquitofish	
	<i>Perciformes</i>	Cichlidae	<i>Oreochromis sp</i>	Thelapia / Footu mas	Tilapia	
	<i>Anguilliformes</i>	Anguillidae	<i>Anguilla sp (TBC)</i>	Ven / Kalha vema	Eel	
<b>Crustaceans</b>	<i>Decapoda</i>	Ocypodidae	<i>Ocypode ceratophthalmus</i>	Kiru kakuni	Ghost crab	
			<i>Uca sp.</i>		Fiddler crab	
		Sesarmidae	<i>Pseudosesarma moeshi</i>	Kulhi kakuni	Red Clawed Mangrove crab	
		Parapaguridae	Different species??		Hermit crab	
		Gecarcinidae	<i>Gecarcinus lateralis</i>	Vaarey fen kakuni	Black-backed crab	
		Coenobitidae	<i>Birgus latro</i>	Coconut crab		

Source: Hidria/Aquatica 2013



*Evidence wild papaya (farming) and bore hole*



*Signs of man-made pathways now blocked by vegetation*



*View from the roadside*



*Large amount of waste dumped at the site*



*Densely vegetated stand of Buveri*



*A mix of coconut palms, sea lettuce and hibiscus found in the area*

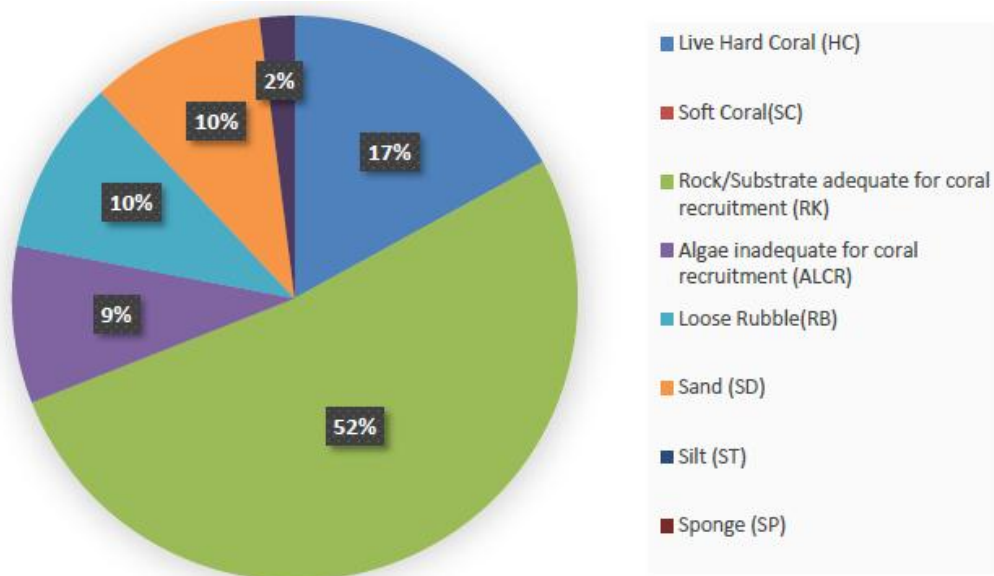
*Figure 4.27 – Photos of some significant sites*

### **3.2.3 Marine Environment**

The following reef transect data has been adapted from Hidria/Aquatica (2013a).

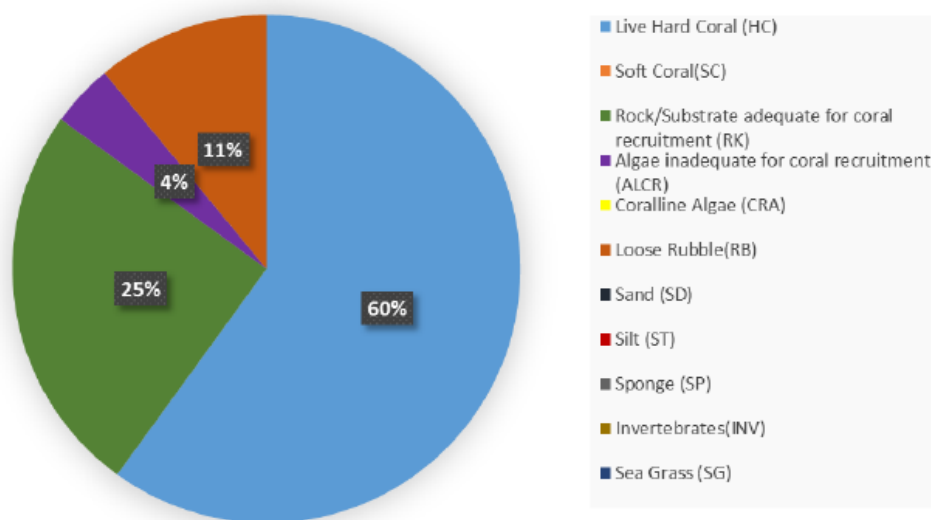
#### **3.2.3.1 Marine Transect 1**

**Reef slope:** Much of the site had rock substrate and dead corals, making up 52% of the reef flat in this site. This is most likely due to the high wave activity in the area. Live hard coral cover along the transect was low making up 17% of the area. 9% of the area was dominated crustose coralline algae (*Mysophyllum sp.*) suggesting a possible substrate for coral attachment. The rest of the area was covered with 10% loose coral rubble, 10% sand and 2% sea grass.



*Figure 4.28: Percentage benthic cover of the Reef flat at Transect 1*

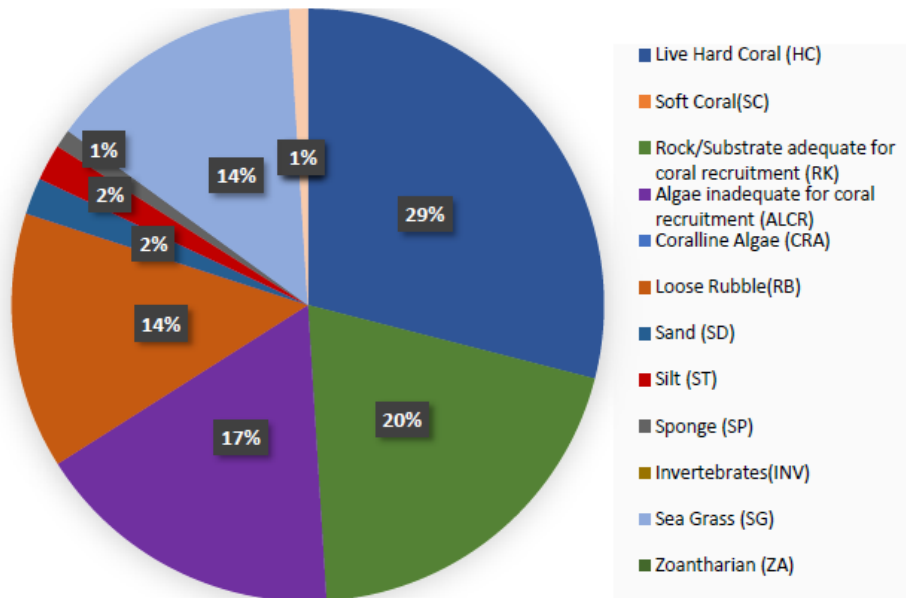
**Reef Crest:** The reef crest at Transect 1 has a high coral cover with 60% of the total surveyed area. 25% of the area was covered with bare rocks in which a small number of turf algae (4% of the area) were attached. Consolidated loose coral rubbles (11%) were found throughout the area.



*Figure 4.29 Percentage benthic cover of the Reef slope at Transect 1*

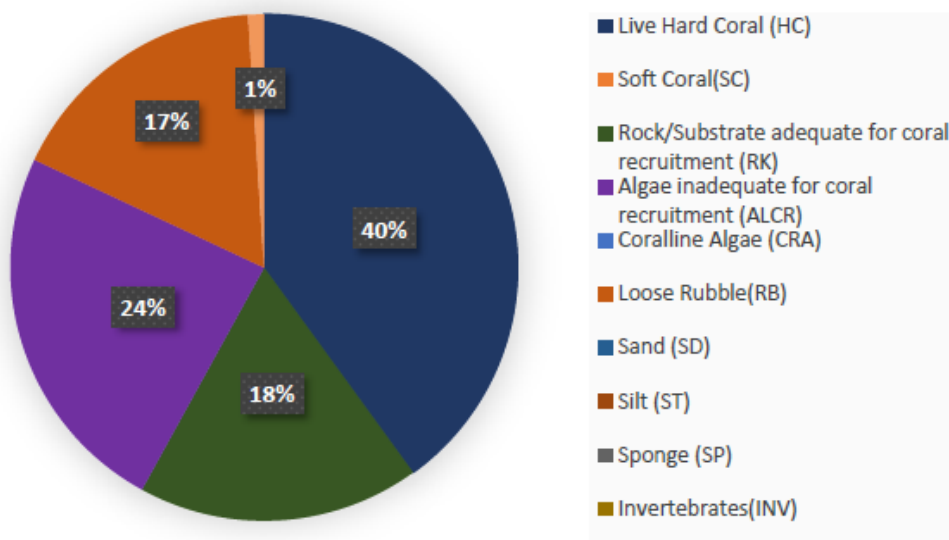
### 3.2.3.2 Transect 2

**Reef flat:** Live coral cover made up 29% of the survey area. The biotic forms competing for space and/or sunlight are higher. There are macro algae and turf algae with a combined 17 %. Corallimorphs (*Actinodiscidae*) and Zoanthids (*Zoanthidae*) were also found in this area. 14% of the area was covered with patches of sea grass. Almost all the large bare rocks (20%) in this area were covered with turf algae.



*Figure 4.30: Percentage benthic cover of the Reef flat at Transect 2*

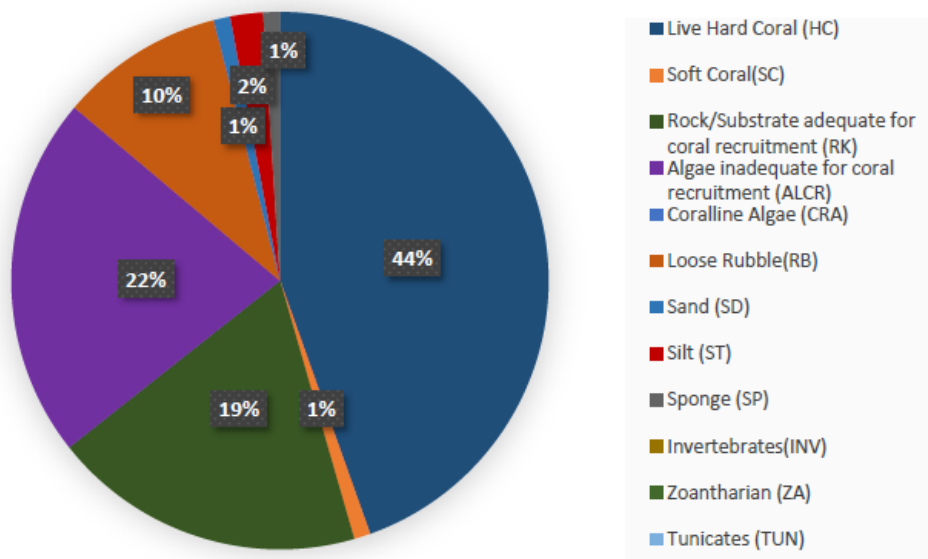
**Reef crest:** Live coral coverage in this area is high making up 40% of the survey area. 18% of the area was covered with bare rocks in which algae (24%) were attached.



*Figure 4.31: Percentage benthic cover of the Reef slope at Transect 2*

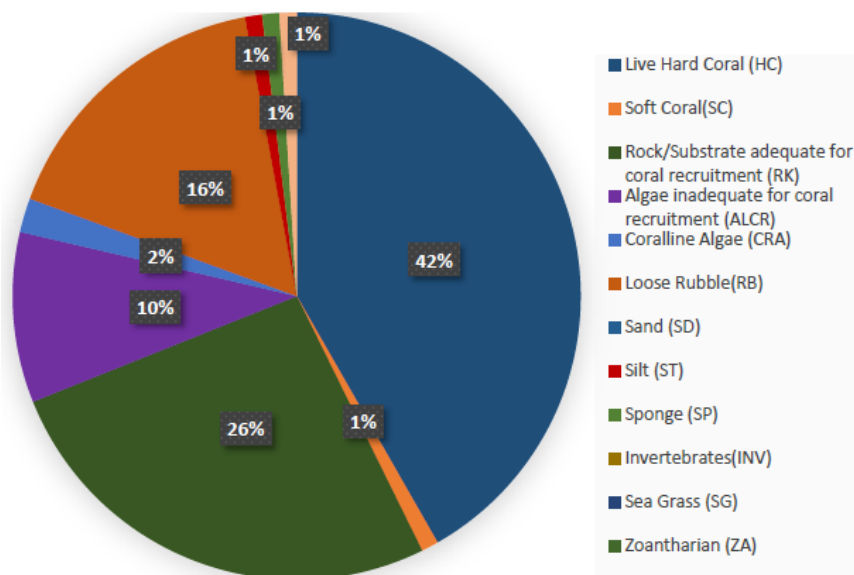
### 3.2.3.3 Transect 3

**Reef flat:** Live corals make up 44% of the survey area. The variability is high with a uniform coverage of turf algae and bare rock (19%) and the loose rubble (10%) seems to be more consolidated than in koatthey gondi, having a cover of Crustose coralline algae (*Mesophyllum sp.*) and easy attachment of recruits. Few soft corals (1%) were observed in this area.



*Figure 4.32: Percentage benthic cover of the Reef flat at Transect 3*

**Reef crest:** Live coral cover on the slope is high with 42%. The Crustose coralline algae (*Mesophyllum sp.*) (10%) work as a cement binding together areas with loose rubble (16%) and allowing the area to flourish with recruits of branching corals and encrusting growth forms, the turf algae cover is also not so high.



*Figure 4.33: Percentage benthic cover of the Reef slope at Transect 3*

### 3.2.4 Wetland Environment

There are two areas of wetland on the island. At the extreme north end of the island is the Eidhigali Kilhi which is separated into two by a narrow causeway. The central part of the causeway is occasionally partially submerged providing partial surface water flow between the two bodies. The conductivity of the water is discussed in detail in Section 6 of this report but here it is sufficient to say that during the fieldwork the water was found to be brackish with conductivities in the range 16-19,000  $\mu\text{S}/\text{cm}$ , equivalent to 24%-38% seawater. At the north east corner of the island there is also a mangrove fringed lagoon, Koatthey, which has a direct connection to the sea.

The Eidhigali Kilhi wetland and the surrounding coastal and marine area of Corete have been declared a Protected Area under the Environment Act in 2004. The ecological significance of the area had been investigated under the Marine Areas Protected Scheme (MPAS) Project, which concluded that Eidhigali Kilhi should be gazetted (see report<sup>ix</sup> published in 2006).

The southern wetland has been divided into two by a road which connects the west and east sides of the island. The two areas are unequal in size, the smaller area to the north of the road is Fehele Kilhi and the larger area to the south is Maa Kilhi.

The areas of the open water and associated wetland for the two areas are summarised in Table 4.28 below.

**Table 4.28 Areas of open water and marginal wetland on Hithadhoo**

System	Component	Component Area (ha)	Total Area (ha)
Eidhigali	Open water	13.6	27.7
	Marginal wetland	14.1	
Fehele	Open water	0.3	13.5
	Marginal wetland	13.2	
Maa pre development	Open water	1.3	81.2
	Marginal wetland	79.9	
Maa post development (see section 10.2)	Open water	1.3	22.4
	Associated wetland	21.1	

### 3.2.4.1 The wetland drainage system

#### 3.2.4.1.1 The Edhigali Kilhi

The Edhigali Kilhi has no engineered drainage system by which the water level in the Kilhi can be managed. The width of the coastal ridge between the ocean and the kilhi varies along the whole of the north shoreline of the island. At its widest it is approximately 50 wide but there are several narrow points where it thins to less than 10m. The process of mining sand from the beach ridge has been conducted by removing the surface layer of coral debris, taking out the sand core and filling the resulting hole with coral debris. This not only results in a lowering of the upper level of the ridge, which can then be overtopped by waves, but also results in a more permeable core.

#### 3.2.4.1.2 The Maa Kilhi/Fehele Kilhi System

Maa Kilhi drains into Fehele Kilhi by means of a culvert under the Medhe-aari Magu consisting of two 300m diameter plastic pipes which act as a restriction to the free flow of water from the Maa Kilhi.

From the Fehele Kilhi the water drains across open ground guided at some points by training/boundary demarcation walls. The shallow overland flow collects in an open channel the Aari Kilhi. The inland part of this is walled on the northern side but has a sloping earth bank on the southern side on which coconut trees are growing. Two bridges cross the channel but present no obstruction to flow towards the sea. A single pipe takes the flow under the unpaved Sharafudhdeenu Magu which discharges into a trapezoidal channel formed from hessian bags containing a sand /cement mix. On the downstream side of the crossing a small pipe discharges road run off into the channel. The channel continues in a straight line to the Link Road where it

enters two pipes which pass under the road, across the narrow foreshore before discharging into the coastal lagoon.

### 3.2.4.2 Flora of the Wetlands

The flora of the Eidhigali wetland was surveyed during the assessment of the Eidhigali-Koatthey study<sup>x</sup>. The report includes a detailed description of the habitat types within the proposed protected area. Plant species named in the report are listed below in Table 4.29.

**Table 4.29: Non-cultivated flora of the Eidhigalli Kilhi and surrounding area**

	Scientific Name	Common Name	Local Name	
Tree Species	<i>Hamadhia peltata</i>	Jack in the Box	Kandhu	
	<i>Barringtonia asiatica</i>	Barringtonia	Kibi	
	<i>Cocos nucifera</i>	Coconut	Ruh	
	<i>Pandanus tectoris</i>	Wild Screw Pine	Boa-kashikeyo	
Shrub Species	<i>Scaevola taccada</i>	Sea Lettuce	Magoo	
	<i>Hibiscus tilaceus</i>	Beach Hibiscus	Funa	
	<i>Guettarda speciosa</i>	Nit pitcha	Uni	
	<i>Pemphis acidula</i>	Pemphis	Kuredhi	
	<i>Calophyllum inophyllum</i>	Alexander laurelwood tree	Funa	
	<i>Terminalia catappa</i>	Country almond	Medhilli	
Ground Species	Cover	<i>Stachytarpheta indica</i>	Vervain	Rakima
		<i>Ipomea pes-caprae</i>	Cats foot creeper	Bodu veli veyya
		<i>Wedelia calandulaceae</i>	Mexican sunflower	Mirihi
			Grass	Vina
		<i>Passiflora suberosa</i>	Corky stemmed passion flower	Rangu
Mangrove	<i>Cerops tagal</i> <sup>see Note 1</sup>	Mangrove	Karamana	
	<i>Lumnitzera racemosa</i>	Mangrove	Burevi	
	<i>Rhizophora mucronata</i>	Mangrove	Ran'doo	

Note 1. At the time of preparation of the FAO publication Trees and shrubs of the Maldives<sup>xi</sup> *C. tagal* had only been recorded in the Maldives on Farukolhu Funadhoo island in the northern group of islands. The reporting of this species in the Airport EIA is therefore the first record of the species in the south of the Maldives.

There are a number of medium size agricultural plots under cultivation. The range of crops grown on the plots are listed in Table 4.30 below.

**Table 4.30: Crop plants of the Eidhigalli Kilhi and surrounding area**

Scientific Name	Common Name	Local Name
<i>Zea mais</i>	Sweet corn	Zuvaari
<i>Lycopersicon lycopersicon</i>	Tomato	Villaathu bashi
<i>Capsicum frutescens</i>	Chilli	Mirus
<i>Musa sp</i>	Banana	Dhonkeyo

<i>Carica papaya</i>	Papaya	Falho
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No endangered species of plant have been reported for the two wetlands.

### 3.2.4.3 Fauna of the Wetlands

Hithadhoo lies towards the extreme southern end of the Central Asia-Indian Flyway (CAF) which extends northwards to northern Siberia.

The Eidhigali Kulhi and Koathey Area report<sup>xii</sup> states that the area is of high ecological significance, and that the area is used by a number of bird species as a feeding and resting ground. The Eastern Grey Heron (*Ardea cinerea rectrostris*) and the endemic Maldivian Pond Heron (*Ardeola grayii phillipsi*) can be found there, and the area is perhaps the largest breeding, feeding, nesting and roosting area for these two species in the country. The Garganey and Whimbrel are winter visitors to the wetland from north Asia and Siberia. The apparent absence of the Little Egret from the wetland is unusual, as it would normally be resident in the wetland.

A list of the birds of the Eidhigali Kulhi was included in the IEE for the Convention Centre<sup>xiii</sup> and is reproduced as Table 4.31 below.

**Table 4.31: Birds Found at Eidhigali Kulhi during the Two Monsoon Seasons (P = Season when Present)**

Scientific Name	Common Name	Dry Monsoon (January-March)	Wet Monsoon (May-November)
<i>Anas querquedula</i>	Garganey	P	
<i>Amaurornis phenicurus</i>	White Breasted Water Fowl	P	P
<i>Numenius phaeopus</i>	Whimbrel	P	
<i>Gygis alba</i>	White Tern	P	P
<i>Egretta garzetta</i>	Little Egret		P
<i>Acridotheres tristis</i>	Common Myna	P	P
<i>Butorides striatus</i>	Little Heron	P	P
<i>Ardea cinerea</i>	Grey Heron	P	P
<i>Ardeola grayii phillipsi</i>	Pond Heron	P	P

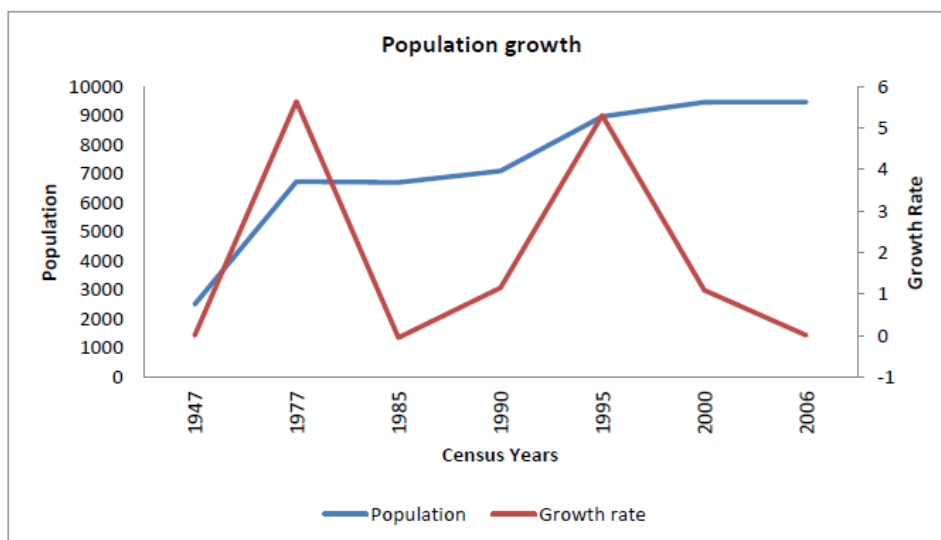
The Mammalia are represented by the Fruit Bats which are commonly found in trees around the margin of the wetland and in the developed area.

During the walkover of Maa Kilhi area a dead shrew was found. Cesarini *et al*<sup>xiv</sup> describe observing shrews on three occasions and consider the individual which they saw to be *Crocidura nanilla*, the only shrew to have been previously recorded in the Maldives.

### 3.2.5 Socio-economic Environment

#### 3.2.5.1 Demography

The total registered population of Hithadhoo in December 2008 is 14,102. The total enumerated population from Maldives population and housing census of 2006 is reported as 9,465 (Ministry of Planning and National Development, 2008). There are 4,365 males and 5,100 females (MPND, 2008) with a male-female sex ratio of 0.85.



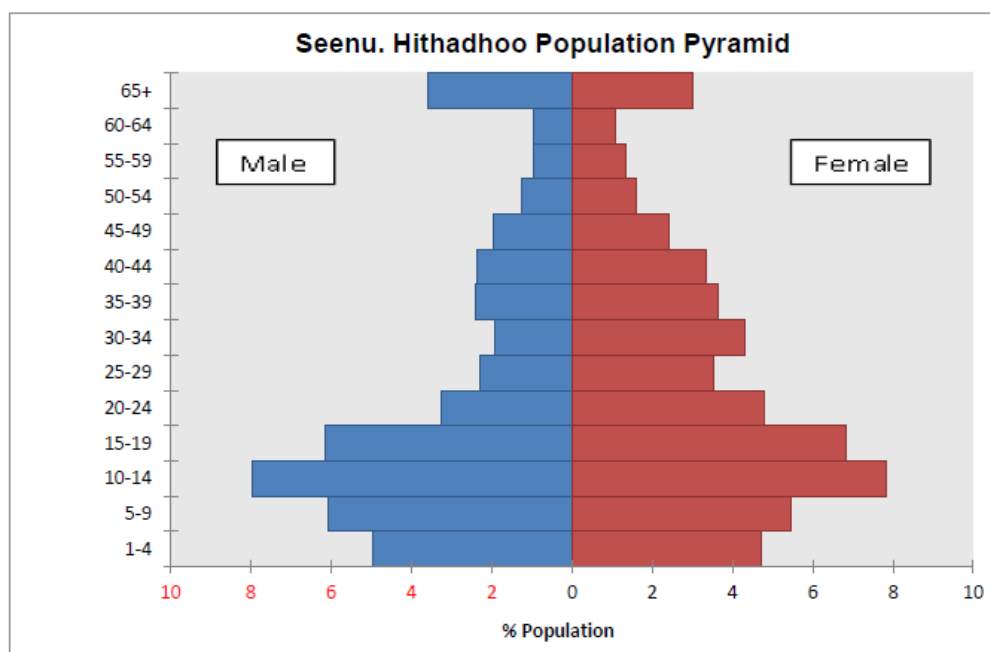
Source: (Ministry of Planning and National Development, 2002, Ministry of Planning and National Development, 2006)

**Figure 4.34: Hithadhoo population and growth rates between 1947 and 2006**

The annual population growth rate at present is estimated at 0.01 and shows a controlled growth. However, over the last 80 years population growth has varied dramatically peaking at 5.7 between 1947 and 1977, and at 5.4 between 1990 and 1995 (see Figure 4.34). The first event was related to the presence of the British Royal Air force base and associated economic activity. The second growth is linked to the development of the secondary school (Muhibudhdheen School) in Addu Atoll and the return of number of migrants to Male'. The period between 1977 and 1985, and 2000 and 2006 showed the lowest growth rates. The first instance was related to the closure of the British Base and the rapid emigration to Male'. The second instance is both associated with emigration to Male' and lower birth rate.

##### 3.2.5.1.1 Population Structure

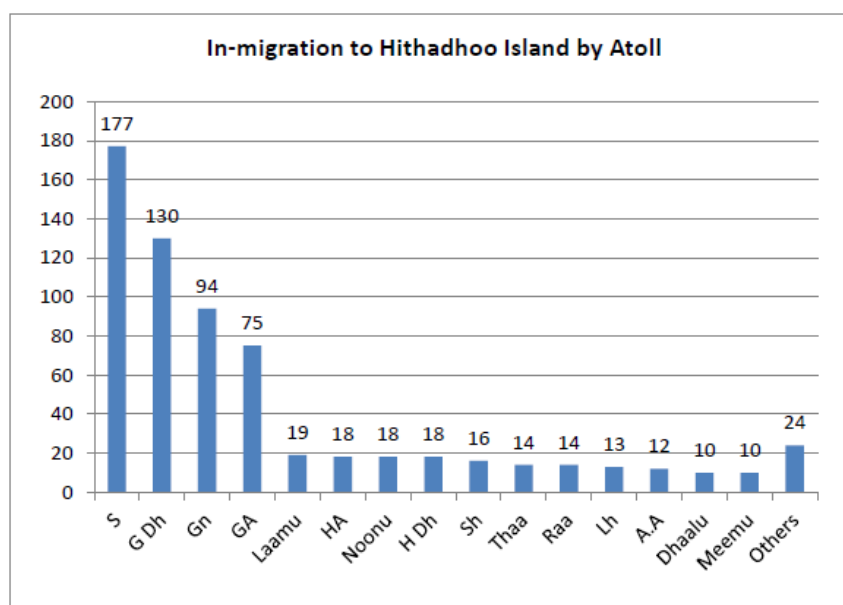
The general structure of the population is shown in Figure 4.35 below. The dependent population is at 43% of the population, which comprises of 37% children and 6% elderly. The working age population (between 16 and 45) comprise of nearly half the island population with 44%. The sex ratio of working age population is 0.7 compared to the 1.1 and 1.2 for children and the elderly. As noted above, this reflects the temporary out migration of men for employment outside the island.



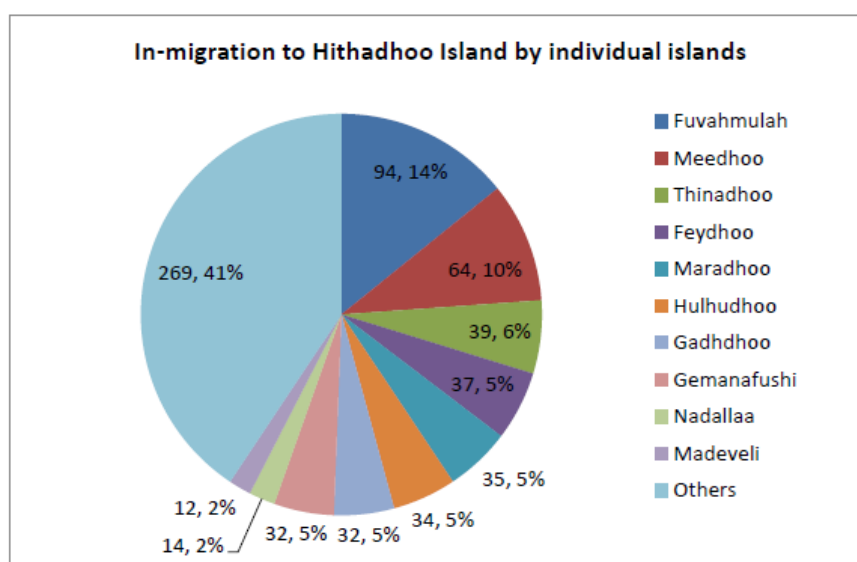
*Figure 4.35: Age structure of Hithadhoo population*

### 3.2.5.1.2 Migration

The Census 2006 estimates the population born outside Hithadhoo in 2006 at 686 persons (7 % of total population). It shows that most migrants are from the southern atolls - Seenu, Fuvahmulah, Gaafu Alifu and Gaafu Dhaalu Atoll (see figure 4.36 below). In terms of individual islands most migrants appear to come from Fuvahmulah, S. Meedhoo, G.Dh. Thinadhoo and other islands of Seenu Atoll (see figure 4.37). It is also noteworthy that Hithadhoo currently has population born in a number of other islands across the Maldives.



*Figure 4.36: In-migration to Hithadhoo – Nationwide migration*



*Figure 4.37: In-migration to Hithadhoo– Island level migration*

### 3.2.5.1.3 Community Structure

In the Maldives, households are generally based on the extended family system. It is quite common to find the extended family living under one roof. The family authority often rests on the patriarch of the family, usually the eldest son in the family. He carries the responsibility of overseeing the affairs of the entire family when enough experience and maturity has been shown in family duties. A key feature of the island society is that it respects family and communal values. Significant amount of caring is shown towards each other by members of the family and strong bond exists between large family groups. At times of difficulty, they almost always seem to support each other.

### 3.2.5.2 *Organizations and Networks*

Hithadhoo has a number of Governmental and Non-Governmental organizations. The Government level organization is now comprised mainly of the Addu City Council, which is an elected body tasked with undertaking the role of a local government. According to UNDP (2009), there are about 16 NGOs covering a wide range of development and recreational activities at present (see Table 4.32).

*Table 4.32: List of Community Organizations, NGOs and their main activities (Source UNDP, 2009)*

Organization	Founder	Aim/ Objectives
Addu City Council	Government / elected council	To perform the functions of a local government
Southern Lights Society	Non-governmental	Film and drama production. Music and entertainment. Develop cultural and Dhivehi literary activities.
United Friends Club	Non-governmental	Serve the country in religious and sports related activities.
Hithadhoo Illuminated Stars Club	Non-governmental	Assist in island development activities. Promote and develop sports among youth Create awareness on development and environmental issues.

Organization	Founder	Aim/ Objectives
Dhivehi Ekuveri Zuvaanunnge Jamiyya	Non- governmental	Revival and Enhancement of sports amongst youth. Youth empowerment and assist in projects related to youth health. Environment protection.
Seenu Teenagers Recreation Society	Non- governmental	Promoting sports and sports values amongst youth. Organize sports and recreational activities. Work for protection of environment.
Maavahi		Environmental awareness and protection.
Society of Voluntary Impartment for Education and Women		Work with less disadvantaged children in assisting with education. Work for women's development.
Addu Sports Club		Development of sports. Identifying and addressing youth related issues.
Youth Association of Seenu Hithadhoo Initiative		Youth empowerment and development.
Addu Women's Development Initiative		Enhance the economic and social well being of women
Parents Association of Addu		Working for promoting good values amongst students. Student development and youth empowerment. Train
Hithadhoo Youth Association		Promoting good social and religious values amongst youth. Youth empowerment Assist in island development activities.
Medhuvalu City United		Promote and enhance sports amongst children and youth Identifying youth issues and social issues and
Take Care		Promote and enhance social, cultural issues Revival and protection of culture. Work for Youth development. Work for children's development.
Eedhigali Ornithological Society		Research and study about the birds in Eedhigali area and other protected birds. Study of migratory patterns of birds migrating to
Concept Earth		Environmental awareness and protection.

### 3.2.5.3 Housing

The Census 2006 reports the number of households in Hithadhoo as 1486. Some of the existing buildings are vacant, however. The number of inhabited households has grown rapidly following the recent returning populations. The average household size in Hithadhoo is 6.4 persons. The plot size varies and the average size is estimated around 5000 ft<sup>2</sup>. The demand for housing plots is increasing rapidly and there is a rapid decline in available land. At present, according to the locals, there is a shortage of land for housing.

### 3.2.5.4 Economic Base and System

According to UNDP (2009), Hithadhoo should be considered the largest island economy in the south Maldives. It has the largest population outside Male' and enjoys the infrastructure privileges afforded to regionally strategic islands, such as the Regional hospital, secondary schools and commercial port.

Hithadhoo's economy is based four basic sectors: fishing, manufacturing, wholesale and retail trade, and tourism (UNDP, 2009). Fishing is the dominant industry and involves fishing and fish processing activities. Manufacturing activities mainly involve food processing, tailoring and carpentry. Whole sale and retail trade has been considered a basic sector since Hithadhoo is a major re-exporter of various products to nearby islands (UNDP, 2009). Tourism plays a leading role in household income through remittances from temporary migrants in resort islands.

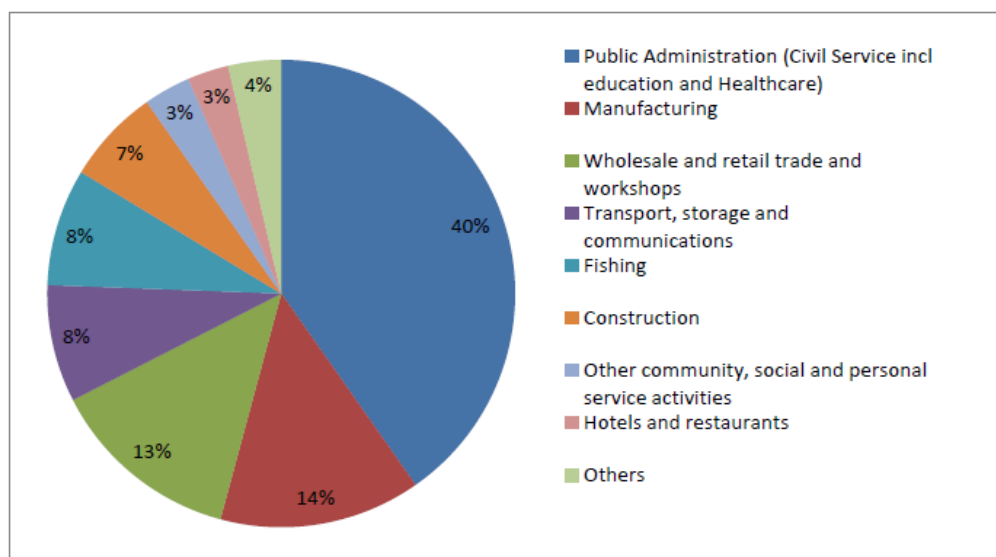
There is no dominant employer on the island, since there no major manufacturing investments on the island. The key employers are the Government (civil service), fishing vessel owners, construction companies and traders.

Hithadhoo's economy is strongly linked to Male', Fuvahmulah and the islands of Seenu Atoll. The presence of the regional hospital and secondary school seems to provide opportunities to expand trade activities targeting temporary visitors from nearby islands. The Addu Link Road plays a significant role in linking the local economy to other islands along the link road (UNDP, 2009).

### 3.2.5.5 *Employment and Occupational Structure*

The total number of economically active population is 3300 (MPND, 2006). Amongst these, 2367 are employed and 933 are unemployed. The economically not active population is reported as 2550 and the labour force participation rate is 55%. The unemployment rate is reported as 28%, indicating the large number of voluntarily unemployed persons on the island. Much of the voluntary unemployment is amongst the female population and students aged 19 and under.

In terms of the employment structure, much of the employment is in public administration (40%), manufacturing (14%) and wholesale and retail trade (13%) - see Figure 4.38 below. Together, these three sectors account for 67% of the employed population. The fishing sector comprises 8% of the working population. Other non-basic service sectors comprise 18% of the working population.



*Figure 4.38: Proportion of employment by economic activity*

### 3.2.5.6 Key Sectors

The following assessments have been derived from UNDP (2009).

#### 3.2.5.6.1 Basic Sectors

**Fishing:** Fishing is the dominant sector with an estimated monthly income of Rf 9-10 million. There are 13 mechanized fishing vessels involved in fishing activities. The main types of fishery are yellow fin tuna and skipjack tuna fishery. A large proportion of the catch is sold to collector vessels operating in the south and to Koodoo fish processing centre. Most large vessels spend between 7-14 days out in the sea. Smaller vessels may return daily with their catch. A small proportion of skipjack tuna is processed on the island. Processed fish are directly exported overseas and Male'. Main investments in the fishery sector are in fishing vessels. Most of the vessels are currently repaying loans, primarily for the purchase of the engines. Investment on land include an ice plant, a commercial fish processing centre and small scale fish processing activities.

**Manufacturing:** Manufacturing sector mainly comprise of food processing, carpentry and tailoring. Most of the products are exported to other islands and Male'. This sector is dominated by women who undertake the activities as part-time work along with their basic household activities.

**Trade:** There about 89 wholesale and retail trade businesses established on Hithadhoo. The volume of trade is estimated between 4-5 million Rufiyaa per month. Wholesalers stock their items monthly and are stored in warehouses. Local and atoll wide retails shops may purchase stock from the wholesalers. There are significant investments on stock. It was observed that the stock was not insured and that their storage method was highly vulnerable to flooding. There are about 8 major wholesalers on the island. This sector is strongly linked to the transportation sector.

**Agriculture:** Agriculture is practiced only at a small scale. Much of the produce is either sold to the island or exported to Male'. Investments are small and comprise mainly of water pumps and recurrent costs such as fertiliser and seeds. Backyard subsistence agriculture is practiced in 80% of the households. Large fruit trees such mango and breadfruit are present on the island, but is sparsely distributed.

#### 3.2.5.6.2 Non-basic Sectors

**Public Administration:** The largest non-basic sector is the civil service and the largest single employer is the Government. The present governance system makes them somewhat independent of the local economy as their salaries are paid by the national government. Employment is primarily in education (326 persons), general island administration (425 persons) and health care (143 persons). The health and education sector is dominated by females and the general administration sector is dominated by males. This is the main source of income for much of the population of Hithadhoo. The dependence of this sector on Government finance makes them somewhat immune from personal income losses from a disaster.

**Construction:** This is a newly emerging sector with demand both locally and within other islands of the atoll. Significant investments have been made in construction equipment and the workforce primarily involves foreign workers.

**Transport Sector:** The transport sector is well developed. The marine transport sector investments comprise of 3 cargo boats, 12 speed boats and two 'safari' vessels. The speed boats cater for inter-island transport, particularly between Fuvahmulah and Hulhu-meedhoo Island.

**Other service sectors:** A number of small businesses have been established with the service sectors. The exact numbers are difficult to determine and some business establishments do not function on a regular basis, and thus, does not have a fixed location.

### 3.2.5.7 Historical and Cultural sites

The following cultural and historical sites within Hithadhoo Island and the protected area are shown in the map in Appendix H. There are a few ruins and of cultural and historical significance within the protected area but they are not properly documented or researched. Only anecdotal information is available and differs between people interviewed. The main sites of cultural and historical significance within the protected area are:

- **Ruins of a fort:** located on the northern end of the Protected Area, it has been identified by the British archaeologist H.C.P. Bell in 1922 and reported in his monograph from 1940 (see Figure 4.39).
- **Gravesite next to fort:** No research is available on these graves but locals indicate that Koathey area was once inhabited and the gravesites belong to an ancient cemetery for the inhabitants of the area.
- **Ranin Hanaa Fengandu or the Queen's Pond:** While the formation of this large pond is natural, the placename attached to it indicates that the area was of importance in the past.
- **Light house at Koathey end:** The light house has been linked to the presence of the British in Gan island during World War II.



*Figure 4.39: The ruins of the fort and marked grave within the protected area (Source: Hidria/Aquatica)*

### 3.2.5.8 Agricultural Practices

Agriculture is practiced in a stretch of 8 Ha in the middle of the protected area. Records from the Atoll Council indicate that about 32 plots have been allocated to various individuals on a lease- hold basis. Field surveys were conducted in the area but some plots were not accessible. At least six plots could be readily identified. It was difficult to undertake the field surveys and consultations with farmers working in the area for the following reasons.

- The requests for public meetings were not attended by the farmers.
- The existing farmers are in some cases reported to be not the head lease holder. Tracking the sublease holders has been difficult, as there is no official documentation.
- Some plot owners often do not work or visit the farm, and in some cases do not live on Hithadhoo Island. Only foreign workers were found on some of these farms and they either do not have information about the farming activities or have been told not to communicate with authorities regarding farming activities.

The following sections summarize the findings of a questionnaire survey and interviews carried out with the willing farmers, nearby households, City Council and individual members of the public. Given the

sensitivity of the subject matter (farm related issues were identified as sensitive by Addu City Council), no names were recorded. A total of 37 participant's views were recorded.

**Land tenure:** As noted above, 32 plots have been officially leased for agriculture in this area. Records show that the 32 plots were leased to individuals from 21 houses (i.e. some houses have multiple plots under individual names). Among these four were lease in 2006, six on 2007, two in 2008 and the rest in 2009. No plots have been leased since 2009 and the first City Council ceased leasing land as this is a protected area. The City Council estimates that a total of 77,850 sq m have been allocated under this process. However only a very few plots have an official handover letter and most plots do not have any documentation.

**Crop types:** A wide variety of fruits, vegetables and ornamental plants are grown. An inventory of all the trees was not possible as some plots were not accessible. In general the vegetable varieties included, cucumber, tomato, chilli, egg plants, lime, etc.. Fruits included water melon, honey melon, papaya, rock melon etc.

**Existing practices:** The current practices were observed to be unsustainable in the protected area. Farmers use numerous agrochemicals products (fertilizers, pesticides) that are likely to cause chemical pollution to the groundwater, the soil and the surrounding aquatic and marine ecosystems. In most cases they are not aware of the products they are using and were being used based on word- of-mouth recommendation. None of the products has local language labels and in some cases, lacked English language instructions as well. Usually, the local supplier scribbles some instructions on the side of the bottle with a marker when farmers first buy a product. Water quality results presented earlier in this chapter clearly shows the effects of these chemicals on the groundwater and subsequently on the plants grown here.

Planting and harvesting is adhoc and is based on demand. The most active period is just before Ramazan period where demand for vegetables and fruits increase in Addu City as well as the rest of the country. Almost all produce is sold within Addu City. Composting is not practiced. Farms are separated by fences (made from steel, coconut thatch or tarpaulin) towards the roads. Separation between farms are often based on green fences or lining of plants. The main fertilizer used in "cow dung" imported in packs of 10-20 kg. There are wide variety of pesticides including pyrazoles and organophosphates. There is no safety equipment on the farms. No safety gear is used in handling pesticides and fertilizers. There was evidence that they do not fully comprehend the dangers of these chemicals. Equipment, fertilizers and pesticides are stored in a small shed in most farms. The conditions of these sheds are poor in those surveyed. Waste management methods are poor. All green waste is stored on the side of the farms and are rarely transported out to the waste management centre. The farmers claim that all empty pesticide cartons are disposed to the waste management centre, but empty cans and bottles can be seen littered around the area.

### **3.2.5.9 Recreation**

The protected area is regularly used for recreational purposes. Nature, landscape and outdoors enjoyment seem to be the most common recreational activities carried out by local people at any time. The most common form of recreation is riding motorbikes up and down Koatney tip. The footpaths around the wetland are also frequently used for walking as well as bike rides. Picnicking is very common during the weekends particularly on the weekends and public holidays. It is generally a family or a group activity. Koatney tip is one of the preferred locations. Recreational fishing is also a common activity on the Koatney tip. The main impacts from these activities the increased waste problem and lack of system to collect and transport waste to the waste site. Most people leave their rubbish behind. In Hithadhoo, there are a few people who are very keen on birds and they regularly visit the kilhi for bird watching and nature photography. There is also an NGO called Hithadhoo Ornithological Society.

### **3.2.5.10 Infrastructure Development**

A number of major infrastructure projects have been recently completed, are underway or are about to be undertaken. The impacts of such projects on the integrity of the wetlands and their potential effects on flooding have largely received only cursory attention in their respective EIAs. However, some of these

projects have been the subject of Environmental Impact Assessments which contain sections relating to effects of the project on surface water run-off management, flooding and effects on the wetlands.

#### **3.2.5.10.1 Addu Link Road**

The Addu Link Road is a 14-kilometre section of island road and causeway which links Hithadhoo, Maradhoo, Maradhoo-feydhoo, Feydhoo, and Gan which was constructed in 2001. On Hithadhoo the road passes along the eastern, the inner, shoreline of the island. Informal interviews with residents in the vicinity of the Link Road have commented that the higher level of the road is acting as a barrier to free drainage of surface water during heavy rains. A risk assessment study carried out by UNDP<sup>xv</sup> concluded that the main impacts from human induced activities have come from improper land reclamation on the eastern side of the island. These include lack of consideration for island topography and the capacity of the artificial drainage system established for the Addu Link Road, which has been unable to function properly.

#### **3.2.5.10.2 Convention Centre**

A Convention Centre is being constructed in the southern part of the Maa Kilhi, within the area shown on the land use plan as 'future institutional'. It is planned that the Centre will be completed in time for the SAARC Summit to be held towards the end of 2011. An Initial Environmental Examination (IEE) of the Convention Centre was carried out in January 2011<sup>xvi</sup>. As part of the Examination a groundwater assessment was conducted to assess the ambient conditions of groundwater at the proposed project location. Long term available weather data was obtained from the weather station at Gan International Airport. The data sets were used to develop a regional model in ArcGIS to assess the vulnerable areas of the island during both monsoons, thus helping the IEE team to assess the vulnerable areas of the island for flooding. No details of the results of the modelling are presented in the IEE. The landscape design of the Centre calls for it to be surrounded by water, but no details of how this will be achieved or maintained are given in the IEE. The land use plan indicates a future road to the immediate south of the Convention Centre which forms the boundary between it and the wetland.

#### **3.2.5.10.3 Paving of Roads on Hithadhoo, Addu City**

The paving and improving the condition of the Ghazee Magu has always been a priority of the Government. As Addu City is preparing to host the SAARC Summit end of year 2011, it was decided to pave the Ghazee Magu and Medhe-aari Magu. The two roads had been identified for development for many years by the community of Hithadhoo and other stakeholders. An Environmental Impact Assessment for the proposed paving of the two roads<sup>xvii</sup> has been carried out.

The design consultant submitted and presented to the Ministry two options of asphalt paving vs concrete paving blocks for the driving surface at two stakeholder meetings held in August 2010. On both occasions, having considered the pros and cons presented, the Ministry and the stakeholders decided on the option of using asphalt paved surface as the driving surface. An asphalt surface, when compared with a concrete surface, generates relatively low noise, is relatively low cost compared with other paving methods, and has perceived ease of repair. The disadvantages are that it has less durability than other paving methods, less tensile strength than concrete, the tendency to become soft in hot weather and give rise to pollution, in the form of polycyclic aromatic hydrocarbons (PAH), of soil, surface water and groundwater.

The EIA indicates that the surface runoff from the road will be recharged to the aquifer through the use of soakaway pits. The design of the pits has been such as to ensure easy maintenance and to ensure recharge rates match normal rainfall intensities. The design includes an additional system to address the issue of flooding in the event of unprecedented rainfall. This feature, a dry main, would be used in the event of extended rainfall where the ground has become saturated and cannot absorb any more water. The emergency services would connect relief pumps to valve points on the main and discharge the excess water directly into the Eidhigali Kuli and Maa Kuli at either end of the Ghazee Magu. While the scheme proposed for managing runoff and preventing flooding would appear to be feasible, the fine clays generated on the side roads which would be carried onto the main road would be unlikely to be removed by standard filter media in the infiltration pots and would lead to blinding of the aquifer being recharged.

### 3.2.5.10.4 Road Development Adjacent to Maa Kulhi

A road development project to construct two roads which will link the Convention Centre area to Medhe-aari Magu (see Section 10.2.4 for details of plans for improvements to Medhe-aari Magu) is on-going. This will entail constructing two roads within the Maa Wetland thereby creating a 'box' around the wetland. This project and the two previous projects will create a road system which will extend almost the whole length of the island and, at the time of writing, contain no structures to allow the free flow of water from the west side of the road into either the Maa Kilhi or Fehele Kilhi. It will thereby increase the risk of flooding in the area to the west of the road system.

### 3.2.5.10.5 Sewerage Project.

It is understood that Southern Utilities are investigating the possibility of laying a sewer system on the island. The details of the type of sewer system, whether gravity or vacuum, the level of treatment and route for disposal of the final treated effluent have not been determined. The latter issue is important with regard to the impact of the process on the extent of recharge of the aquifer and hence thickness and quality of the freshwater lens.

## 3.2.6 *Hazard Vulnerability of the Site*

The primary sources of natural hazard risks in Maldives are strong winds during monsoons or freak storms, earthquakes, island interior flooding caused by heavy rain, coastal flooding caused by high surf, storm surge, prolonged strong monsoonal wind, high astronomical tides or tsunamis, and sea level rise (Pernetta and Sestini, 1989, RMSI, 2005, Severe weather events in 2002 2003 and 2004, (2005), Woodroffe, 1989). Coastal flooding related flooding and wind damage can be considered as the most frequent natural hazards that occur in Maldives (see Maniku (1990), Luthfy (1994)). Most of these risk factors (apart from earthquake, wind damage and rainfall flooding), stems from the extremely low elevation of all Maldivian islands: the average elevation is 1.5 meters above sea level. In spite of the occasional natural hazards, Maldives in general is relatively from high risk natural disasters.

Spatial variations in hazards are evident across Maldives (Maniku, 1990, RMSI, 2005, Shaig, 2005). Northern atolls are more exposed to intense storm systems, increasing the risk of wind damage in these atolls. In comparison, southern atolls experience less storms systems, but are more exposed to flooding events, probably as a result of exposure to intense South Indian Ocean storm surges and wind-waves during south west monsoons. Southern atolls are also more likely to experience earthquakes.

The disaster risk assessment report of Hithadhoo (UNDP, 2009) has undertaken a detail analysis of the natural hazard risks in Hithadhoo Island. Key findings of the report are summarized below.

### 3.2.6.1 *Event Scenarios*

**Table 4.33: Event scenarios for rapid onset flooding hazards**

Hazard	Max Prediction	Impact thresholds			Probability of Occurrence		
		Low	Moderate	Severe	Low Impact	Moderate Impact	Severe Impact
Swell Waves – western side (wave heights on reef flat – Average Island ridge height +3.6m above reef flat)	NA	< 4.0m	2 > 4.0m 1F1F1 F1F	> 5.0m	Moderate	Low	Very Low
Tsunami (wave heights on reef flat)	3.0m	< 2.0m	3 > 2.0m 2F2F2	> 3.0m	Moderate	Low	Very low

SW monsoon high seas (wave heights on reef flat)	2.0m	< 3.0m	> 3.0m	> 4.0m	Very High	Very low	Unlikely
Heavy Rainfall (For a 24 hour period)	284mm	<75mm	>75mm		High	Moderate	Low

*Table 4.33: Slow onset flooding hazards (medium term scenario – year 2050)*

Hazard	Impact thresholds			Probability of Occurrence		
	Low	Moderate	Severe	Low	Moderate	Severe
SLR: Tidal Flooding	< 2.5.0m	> 2.5m	> 3.0m	Moderate	Very Low	Very Low
SLR: Swell Waves – western side	< 4.0m	> 4.0m	> 5.0m	Very high	Moderate	Low
SLR: Heavy Rainfall	<75mm	>75mm	>175mm	Very High	Moderate	Low

### 3.2.6.2 Hazard Zones

#### 3.2.6.2.1 Swell Waves, Udha and Storm Surges

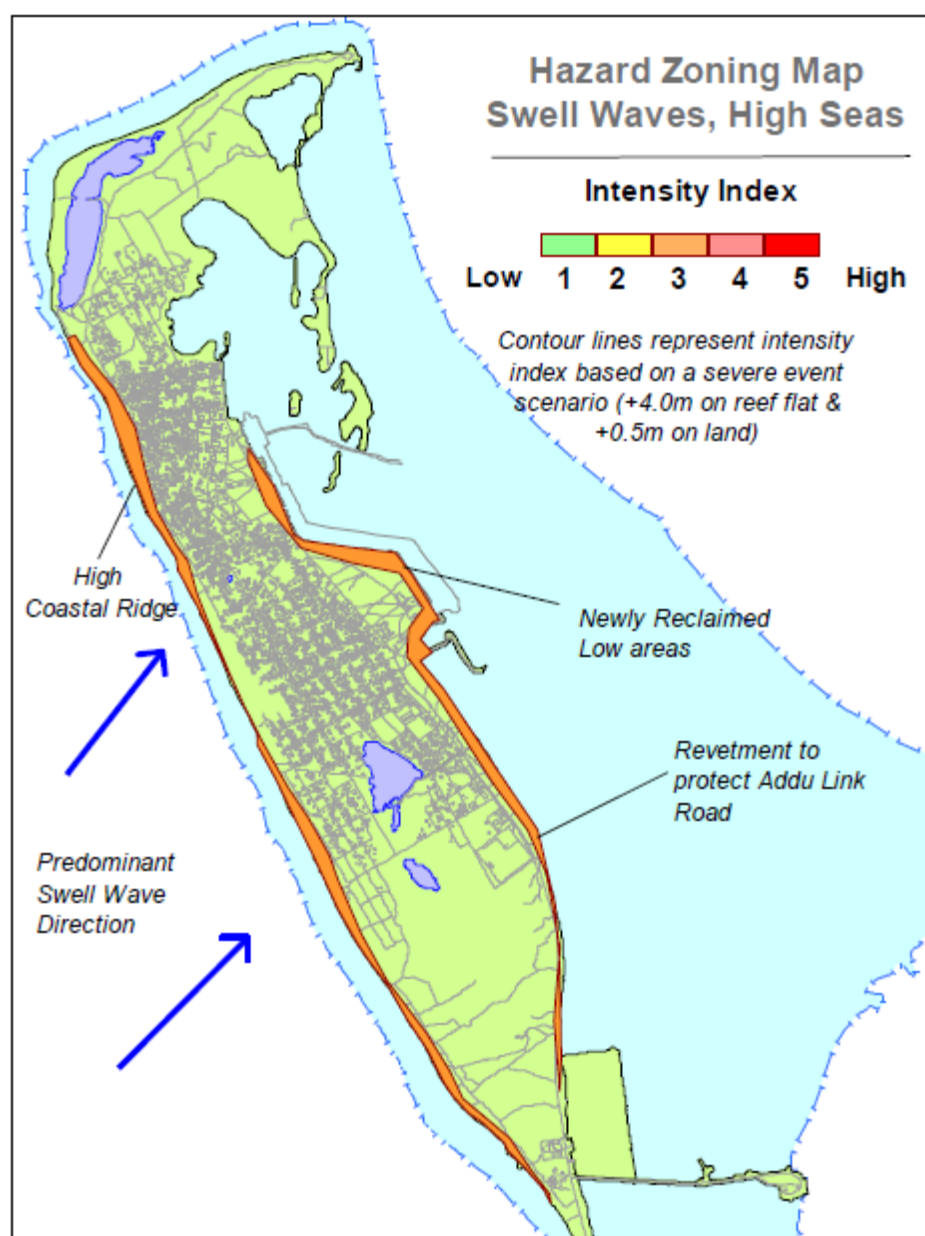
The intensity of SW monsoon udha is predicted to be highest 50m from the eastern coastline (see Figure 4.30). It is unlikely that the western beach ridge will be overtopped by udha events unless accompanied by swell waves. The eastern side however remains exposed during high tide and udha period due to low elevation. Intensity of swell waves is expected to be highest 50m from the western coastline and 150m from the eastern side. Swell waves higher than 4.0m on reef flat are predicted to overtop the oceanward ridge and penetrate 50-100m from coastline. There may also be a tendency for flood waters to flow rapidly eastward due to gradual sloping of the ridge eastward. This is most likely if the duration of swell incident is longer or if the waves are higher than 5.0m on reef flat.

*Figure 4.30: Hazard zone map for swell waves and southwest monsoon high seas (Source: UNDP 2009)*

There is a small probability of swell waves propagating through the south eastern reef pass of the atoll, if waves are oriented parallel to the pass. Such waves could affect the southern half of Hithadhoo up to 50m.

#### 3.2.6.2.2 Tsunamis

When a severe threshold of tsunami hazard (>3.0m on reef flat) is considered, the north eastern side of the island is predicted to receive the highest intensity (Figure 4.40). This is due to the low elevation of coastline and its possible direct exposure to tsunami waves. The small islands on the northeast are expected to absorb much of the wave energy but the southern half is expected to receive full energy. Wave height around the island will vary based on the original tsunami wave height, but the areas marked as low intensity is predicted to have proportionally lower heights compared to the coastline.



*Figure 4.40: Hazard zoning map for tsunami flooding (Source: UNDP 2009)*

### 3.2.6.2.3 Heavy Rainfall

Heavy rainfall above the severe threshold is expected to flood low lying areas of the island especially near wetland areas, reclaimed wetland areas and reclaimed reef areas (Figure 6-9). The reclaimed wetland in the northern and southern halves of the island have experienced the worst floods, while the reclaimed areas on the east are also very likely to be flooded in the future due to the runoff patterns and low elevation in the region. The area around the Addu Link Road is also reported to be particularly susceptible due the blockage of surface runoff towards the sea. At present the drainage system is reported to function poorly due to high levels of sedimentation and lack of arrangement between the community and authorities to regularly clean them. The inner areas of the islands are likely to experience low levels of flooding due to remnants of taro pits and improper road maintenance activities. The rainfall hazard zones are approximate and based on the extrapolation of topographic data collected during field visits. A comprehensive topographic survey is required before these hazard zones could be accurately established.

## 4 IMPACT IDENTIFICATION AND PROPOSED MITIGATION MEASURES

At this stage of the project preparation detailed activities are yet to be designed. Within this context and based on the experience implementing CCTF phase I, it has been assessed that activities potential impacts of drainage and community-based wetland management including ecotourism development will be associated with construction and operation stages, while the proposed physical activities and technical assistance on integrated solid waste management will be associated with construction and operation stages as well as legacy issues particularly in reference to Addu City existing waste disposal site. The following sections provide details of the evaluation of impacts and proposed mitigation measures.

### 4.1 Preliminary Assessment of Impacts Associated with Wetland Management and Proposed Mitigation Measures

#### 4.1.1 Fuvahmulah

##### 4.1.1.1 *Development and Implementation of Community-based Wetland Management Plans Dhadimaghi-Kilhi and Bandaara-Kilhi – Environmental Impacts*

###### (i) **Demarcation of wetland areas and mapping of existing resource use in the wetland areas.**

This will entail a detailed survey of the wetland area to define habitat types and the beneficial uses which the different parts of the wetland support. The information would ideally be managed by use of a Geographic Information System (GIS) within EPA. The result of the intervention would be **Positive** since it would provide a quantitative baseline against which to monitor the effectiveness of implementation of management and conservation measures.

###### (ii) **Sensitization and awareness building activities to engage the key stakeholders in the participatory process.**

While the activity will increase the awareness of the stakeholders of the need for a participatory process the impact of the intervention on the environment will be **Neutral** unless the awareness has a vehicle, the CBWMP, through which to act and turn awareness into action.

###### (iii) **Development and approval of CBWMPs based on the approved land use plans through a participatory process involving consultation with relevant stakeholders.**

This is the development of an institutional instrument which defines the objectives of the Management Plan, defines the roles and responsibilities of the principal actors in the process and provides the regulatory mechanisms to enable the Management Plan to be implemented. Again the direct impact on the environment of the intervention will be **Neutral**. However the implementation of the individual parts of the Plan will result in impacts and these are discussed below.

###### (iv) **Prevention of unplanned reclamation, illegal waste dumping, contamination of surface water, unsustainable harvesting of mangroves and other activities which are detrimental to the wetlands.**

These are the tools by which the wetland area will be managed. Each one is designed to manage the external pressures on the wetland which are leading to a deterioration of the ecological quality of the wetlands themselves and enabling the prescribed beneficial uses of the wetland to be improved and maintained. The net impact of the intervention will therefore be **Positive**.

###### (v) **Implementation of the management plan**

There are two wetland areas on Fuvahmulah, Dhanimagu-Kilhi and Bandaara-Kilhi. Separate Management Plans with their own objectives and indicators of success will need to be developed during the project. Key elements of the plans should include:

- **Controlling solid waste:** Waste management can only be effective if tackled on an island wide basis. There is no mandatory system for the collection and disposal of all form of solid waste on Fuvahmulah and collection, treatment and disposal processes are rudimentary or absent. The achievement of a functioning solid waste management collection system which results in the waste being collected and at least stored at a restricted area will result in a **Positive** environmental impact. Pollution of surface and groundwater will be controlled, the termination of *ad hoc* burning of waste will bring about a reduction of air pollution, and the hazard to wildlife due to discarded bottles, cans and plastic bags will be eliminated. The implementation of routine waste collection will need to have a parallel programme for the collection of historic waste which has been dumped in both the urban and non-urban environments. The two programmes will result in a cleaner island which will be more visually attractive to tourists. The presence of solid waste is frequently cited by tourists as one of the factors which would deter them from visiting places.
- **Fencing of the protected area:** This is a practicable option for controlling access to protected terrestrial, dry ground, protected areas. In an area of wetland where there is, at times, a shallow layer of surface water, and a layer of mud which may be greater than 6m in depth<sup>xviii</sup> which also has a dense flora, the erection of a boundary fence is impracticable. The alternative would be to plant a “green fence” of a clearly identifiable native species along the boundary which would serve as a reminder to the community of the location of the boundary of the protected area. The impact on the environment of this intervention would be **Positive** since it would identify the physical boundary of the protected area and the surrounding taro fields and would act as an enforceable demarcation between land allocated for development and the protected area.
- **Zoning:** The zoning of the wetlands, in terms of their characteristics within the IUCN Protected Areas classification scheme, has been carried out by EPA in preparation for the formalisation of the protected area status of the two wetlands. The core area of each of the wetland has been classified as Category Ia and the surrounding area as Category IV. The approximate locations of the areas are shown in Figure 6.2. The drawing shows there to be an area of wetland, which is between the edge Cat IV boundary and the existing roads around the wetland. This area contains developments and roads and is clearly under pressure. The clear delineation of the zones and the activities permitted within each zone would be defined in the Management Plan endorsed by the community resulting in the **Positive** benefit of maintaining the value of each of the zones. The establishment of a buffer zone around the formal boundary of the protected area is addressed in the following section, ‘green-belt’.
- **Green belts:** A green belt is a policy and land use designation used in land to retain areas of largely undeveloped, wild, or agricultural land at the interface between areas of development and, in this case a protected area. It provides a soft interface and acts as a buffer between the two adjacent land uses. In the green belt further development of housing and extension of agricultural activity would be managed within guidelines defined by the Management Plan and endorsed by the community. There would be a **Positive** benefit to the environment since it would provide gradation in the transition from developed to protected area thereby reducing pressure on the protected area ecosystem while maintaining community function up to the formal boundary.
- **Regulating cropping:** The regulation of the type of crops to be grown and in which locations within the proposed Protected Area of the wetland is one component of the zoning process (see above). The Protected Area on Fuvahmulah consists of two wetland areas and the Thundi marine/coastal area. The Management Plan will define whether crops can be grown within the protected area and control the expansion of areas within the Green Belt. The range of crops which can be grown in the two areas is limited and to a large extent pre-selected by the current growers to taro based on their local knowledge of the conditions. The regulation of the crop type and total area under cultivation will result in a **Positive** impact on the environment. Regulated cropping may also proscribe/prohibit the use of herbicides and pesticides within the regulated cropping zone. Observation of store sheds on farmed areas on Hithadhoo revealed that herbicide and pesticide concentrates were stored haphazardly, labels were frequently not in Divehi script or in English and parts of the labels were illegible. Empty pesticide concentrate containers, without tops, were seen discarded in the undergrowth. There is clearly the need for the introduction of improved agrochemical awareness within the farming community, and this could form part of a regulated cropping plan.

#### 4.1.1.2 Eco-tourism development

- **Development of basic infrastructure for ecotourism** (nature trails, observation hides, interpretation centre, visitor convenience services). This specific outcome from the Component is only applicable should the business model for ecotourism be one based on nature tourism where the product being sold to the tourist is the ability to see wildlife in its natural setting within an environmentally sustainable framework. In terms of a nature tourism product, the two wetland areas on Fuvahmulah have little to offer to the dedicated bird-watcher. The wetlands are of scientific interest to the specialist. During the visit by the team, a German specialist in moths and butterflies stayed on the island for three days and observed two species of moth which had not previously been recorded for the Maldives<sup>‡</sup>.
- However, should a marketable product be identified, **Positive** benefits for the environment in general would be forthcoming in the form of greater awareness among the population of the function of wetlands and if information regarding species observed and their numbers are recorded there will be a greater understanding of the value of the wetlands as a habitat. The inappropriate development of the wetland area to accommodate tourists could result in **Negative** impacts on the wetland as an ecosystem through visual and noise disturbance of birds, discarding of tourism related waste, drinks bottles, food wrappers etc. The tourist support facilities in terms of toilets and restaurants would increase the demand for water taken from the freshwater lens for toilet flushing, etc, which in turn would increase return flows from large septic tanks. Demand for water of potable quality for food preparation would increase demand from the harvested rain water.
- **Training of local community nature guides.** The training community nature guides will improve the knowledge of the community with regard to the functioning of the wetlands and the adverse impacts of some activities on them. This will be a **Positive** benefit to the ecology of the wetlands since the consequences of activities not conducive to the maintenance of the ecosystem will be understood. The presence of nature guides/wardens within the protected area if nature trails are opened for visitors will be a **Positive** benefit for the environment since they will deter people from littering, creating a disturbance or taking away plants.

#### 4.1.1.3 Current Impacts on Natural Resources

Following Table provides existing natural resource management practices, issues and recommendations

**Table 5.1: Natural Resource Management Practice, Issues and Recommendations, Fuvahmulah**

Existing Practice	Issues	Recommendations
<b>Wetlands</b>		
The island has two wetland systems. Very few households use the wetlands and surrounding areas for generating a cash income; however, many households have taro fields on the edges of the wetlands, and these are important for domestic food supply.	<ul style="list-style-type: none"> <li>• Waste dumping and firewood extraction continue but appear to be declining.</li> <li>• Pollution and invasive species are ongoing risks.</li> <li>• The biggest threat is conversion to urban use, including roads and land reclamation, as shown in the approved Land Use</li> </ul>	<ul style="list-style-type: none"> <li>• Stop all plans for new roads in the wetlands and initiate an urgent review of the official Land Use Plan, giving appropriate consideration to wetland conservation.</li> <li>• Survey, locate and destroy invasive plants such as Nile Cabbage (also known as Water Lettuce: <i>Pistia stratiotes</i>).</li> <li>• Develop and implement wetland</li> </ul>

<sup>‡</sup> The specialist was reluctant to provide the team with his name, the two unrecorded specie, or species seen since the information would pre-empt a monograph on the Butterflies and Moths of the Maldives which he was writing.

Existing Practice	Issues	Recommendations
The wetlands are important for recreational purposes, especially swimming.	<p>Plan.</p> <ul style="list-style-type: none"> <li>There are no wetland management plans or active management.</li> <li>Declaration as protected areas will be meaningless unless accompanied by practical management actions based on a feasible management plan.</li> <li>Low to zero opportunities for income generation from wetland tourism on Fuvahmulah.</li> </ul>	<p>management plan for both wetlands focused on (i) conservation of ecosystem functions, (ii) continuation of current sustainable livelihood uses (taro cultivation), (iii) enhancement of local recreational values (swimming, picnicking), and (iv) education and awareness as part of a wider package of environmental education.</p> <ul style="list-style-type: none"> <li>Review and improve the solid waste management system.</li> </ul>

### Water Resources

<p>In some locations the shallow freshwater aquifer is contaminated by cess pits, sea water and possibly pesticides and is not suitable for drinking; it is used for other domestic purposes and for irrigation. Rainwater is collected from roofs and stored in tanks for drinking and cooking; there are 73 community tanks (&gt;3 m<sup>3</sup> per tank) and 2,048 recently installed household tanks (2.5 m<sup>3</sup> each)<sup>2</sup>.</p>	<ul style="list-style-type: none"> <li>Increasing demand for fresh water may cause salt water intrusion.</li> <li>Reducing and eventually preventing contamination of the freshwater aquifer by sewage will require a major investment and ongoing cost of piped sewerage; any such system will have its own effluent and sludge disposal issues.</li> <li>Pesticide use is not controlled; prevention of groundwater contamination by pesticides will require major and ongoing investment in regulations, training and enforcement.</li> <li>Domestic use of untreated rainwater is associated with diseases such as toxoplasmosis, which is widespread.</li> <li>Demand for fresh water is increasing.</li> </ul>	<ul style="list-style-type: none"> <li>Determine safe groundwater extraction volumes and establish a groundwater abstraction licensing system.</li> <li>Implement a centralised sewerage system, subject to thorough environmental, technical and economic sustainability analysis.</li> <li>Work with central government to initiate a system to control pesticides, manage pesticide use, and train operators, as part of a national move towards integrated pest management (IPM) (FAO is assisting government with drafting of a Pesticides Act).</li> <li>Investigate and popularise effective home treatment systems for household rainwater (e.g. filtration, UV light, chlorination tablets, sunlight sterilisation, boiling).</li> <li>Minimise demand increases by demand management techniques including pricing, building codes (e.g. requiring high-efficiency shower heads), and awareness.</li> </ul>
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<sup>2</sup> This is nearly double the number of households understood to be on the island as reported by the Atoll Council (1,191), and also exceeds the number of allocated household plots (1,849). The discrepancy is not explained.

Existing Practice	Issues	Recommendations
<b>Agriculture</b>		
<p>Agriculture employs 236 people, some 11% of the island's workforce; both men and women are involved in agriculture.</p> <p>Crops are grown commercially on very small plots of land allocated to farmers by the island government on a year-to-year basis; no tree crops can be grown on these plots, although bananas are now permitted.</p> <p>Crops grown for sale include water melons, chillies, tomatoes and other vegetables, and bananas.</p> <p>Additional produce is grown in household gardens.</p> <p>Coconuts and mango trees are widespread throughout the island.</p> <p>Taro is cultivated wherever households have access to freshwater, i.e. around the entire perimeter of both wetlands.</p> <p>There is some use of international (Bangladeshi) migrant labour in agriculture but a detailed analysis of numbers and conditions remains to be made.</p>	<ul style="list-style-type: none"> <li>Recently some 50% of the island's agricultural land has been lost to the airport development (~20 ha) (<b>Error! Reference source not found.</b>), and a further 20% is allocated for a city hotel.</li> <li>Soil quality is low and manure is not available (unless imported) due to the lack of domestic livestock.</li> <li>Farmers complain of inadequate plot sizes, new diseases, difficulties obtaining inputs, challenges marketing produce, flood damage and lack of knowledge including of such basic techniques as composting.</li> <li>Pesticide use is common and uncontrolled, with attendant health hazards to both farmers and the public and risks to groundwater.</li> <li>Farmers have little or no knowledge of crop processing or adding value; for example, mangoes are often wasted due to lack of storage or processing techniques.</li> <li>Farmers have inadequate marketing tools, ranging from access to market data to physical access to markets: produce sent to Male' often rots <i>en route</i>; there is no bulk cargo ferry service to Addu Atoll which is much closer than Male'.</li> <li>Diversification into higher value crops requires additional investment, skills and labour.</li> </ul>	<ul style="list-style-type: none"> <li>Review the need for a City Hotel, bearing in mind the long-term need for agricultural land.</li> <li>Work with central government to initiate a system to control pesticides, manage pesticide use, and train operators, as part of a national move towards integrated pest management (IPM) (FAO is assisting government with drafting of a Pesticides Act).</li> <li>Consider branding Fuvahmulah as "the Organic Island" or "the Green Island" as the basis for converting all agricultural production on the island to intensive organic methods, and adding value.</li> <li>Support diversification initiatives such as the SEA-UNDP honey melon autopot enterprise.</li> <li>Promote the establishment of a regular bulk cargo ferry service to Addu Atoll.</li> <li>Encourage home gardening and food processing to enhance diets and contribute to food security, perhaps as part of a cultural revival.</li> <li>Research and promote techniques to add value to mainstream island crops such as taro and mango.</li> <li>Work with national government to regularise the working conditions and rights of migrant agricultural labour.</li> <li>Improve road drainage on micro-scale to avoid sedimentation of taro fields by crushed coral.</li> </ul>

Existing Practice	Issues	Recommendations
	<ul style="list-style-type: none"> <li>Commercial agriculture is associated with the creation of a marginalised social underclass of foreign labour with few rights.</li> <li>Some taro fields are affected by sediment washed off the recently-raised roads.</li> </ul>	
<b>Fishing</b>		
<p>Fishing employs some 7% of the working population on the island (~145 people).</p> <p>There were 19 fishing boats in 2006, and 25 in 2011; 5 boats are longer than 30 m.</p> <p>The crew of the larger boats are mostly from Huvadhu Atoll.</p> <p>145 fishermen predominantly fish for skipjack tuna using poles and lines near the Fish Aggregating Devices (FADs) close to the island.</p> <p>Yellowfin tuna fishing is increasing.</p> <p>Some fishing is carried out on Fuvahmulah's house reef (the reef immediately around the island).</p>	<ul style="list-style-type: none"> <li>Bait fish for skipjack tuna are scarce on the house reef, although yellowfin tuna bait is plentiful.</li> <li>There is no ice plant; an ice plant is essential to keep fish fresh and obtain higher sale prices.</li> <li>There is very low recruitment to the industry since young people do not want to become fishermen; many of the smaller vessels are sitting idle in the harbour due to lack of crew.</li> <li>The harbour is too small to accommodate many more fishing boats.</li> </ul>	<ul style="list-style-type: none"> <li>Review bait fishing practices and institute management to conserve baitfish stocks.</li> <li>Install an ice plant at the harbour.</li> <li>Research better markets for Fuvahmulah fish and the feasibility of fish processing on the island for added value.</li> <li>Explore ways to improve working conditions, profitability and status of fishing to improve its attractiveness as an employment or career option for youth.</li> </ul>
<b>Sand and Coral Mining</b>		
<p>Sand mining has been banned from the beaches of Fuvahmulah since September 2009 but still continues to some degree.</p> <p>One estimate places use of the island's sand resource (on and off-shore) as 150,000 m<sup>3</sup> out of a total of 200,000 m<sup>3</sup> (CDE Consulting, 2010).</p>	<ul style="list-style-type: none"> <li>Lack of access to affordable sources of construction material.</li> <li>Direct contribution to beach erosion and interruption of sand supply to beaches.</li> </ul>	<ul style="list-style-type: none"> <li>Work with national government to explore options for affordable alternative sources of construction material.</li> <li>Encourage the use of cement blocks for construction.</li> </ul>

#### ***4.1.1.4 Potential social impacts***

The potential social impacts of implementation of CBWMP are presented in Table 5.2.

**Table 5.2: Preliminary Assessment of Potential Social Impacts and Issues and Recommendations for Mitigation**

Project Component and Intervention	Anticipated Social Issue and/or Potential Impact of Intervention	Preliminary Recommendation for Mitigation or Other Comment
<b>Component 1: Wetland Conservation</b>		
<b>1.1 Community-based wetland management</b>		
<i>(a) Development and Implementation of Community-based Wetland Management Plans (CBWMPs)</i>	<ul style="list-style-type: none"> <li>Wetland management is both legally and in terms of residents' perceptions a government responsibility. A project focus on "community-based" planning risks diverting attention away from the government stakeholders who are critical to any form of practical management plan.</li> </ul>	<ul style="list-style-type: none"> <li>Re-focus this Sub-component on Wetland Management Planning and Implementation rather than Community-Based Planning and Implementation.</li> </ul>
(i) Demarcation of wetland areas and mapping of existing resource use in the wetland areas.	<ul style="list-style-type: none"> <li>On Fuvahmulah a participatory demarcation exercise has just been completed by the EPA in cooperation with councillors and residents, in connection with identification and adjustment of the boundaries of the two wetlands, which have been declared as protected areas. This exercise has raised awareness and provided information.</li> <li>Adjustment of the declared boundaries may be necessary if the approved Land Use Plan is adjusted to remove the current proposal for perimeter roads to be built within and re-define the existing wetland areas.</li> <li>Demarcation provides certainty to local residents and users, provided they have full information.</li> <li>Existing resource use is almost entirely (a) recreational, and (b) agricultural (taro): see Section</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that mapping and demarcation are fully coordinated with the EPA and the protected area gazette process.</li> <li>Review the Land Use Plan to consider deleting the proposal to build roads within and around the wetlands.</li> <li>Ensure that any future protected area zonation and management plan allows continued use of wetland edges for taro.</li> </ul>

Project Component and Anticipated Intervention	Social Issue and/or Potential Impact of Intervention	Preliminary Recommendation for Mitigation or Other Comment
(ii) Sensitization and awareness building activities to engage the key stakeholders in the participatory process.	<ul style="list-style-type: none"> <li>These activities are essential to ensure an effective planning process and local "ownership" of the results (necessary for institutional sustainability).</li> </ul>	<ul style="list-style-type: none"> <li>Use inclusive techniques to engage the stakeholders in the planning process, including operating through active NGOs such as SEA and within the educational system.</li> </ul>
(iii) Prevention of unplanned reclamation, illegal waste dumping, contamination of surface water, unsustainable harvesting of mangroves and other activities which are detrimental to the wetlands.	<ul style="list-style-type: none"> <li>See comments under (v) below.</li> </ul>	<ul style="list-style-type: none"> <li>See comments under (v) below.</li> </ul>
(iv) Implementation of one CBWMP, for example:		
<ul style="list-style-type: none"> <li>Controlling solid waste disposal</li> </ul>	<ul style="list-style-type: none"> <li>At present there is relatively little use of the wetlands for dumping solid waste, but construction of the roads shown on the approved Land Use Plan would dramatically change access and probably result in significant pollution.</li> <li>Waste management can only be effective if tackled on an island-wide basis, which cannot be done within the scope of this project. There is no mandatory system for the collection and disposal of any form of solid waste. Collection, treatment and disposal processes are rudimentary.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure the wetland management plan includes a strategy to limit new road access to the wetlands.</li> <li>Include waste dumping in the plan's information, education and communication campaign.</li> </ul>
<ul style="list-style-type: none"> <li>Creation of green belts</li> </ul>	<ul style="list-style-type: none"> <li>Assuming that this means the creation of a special use zone around the wetlands and/or the planting of trees, no negative impacts are foreseen - unless taro growers are displaced.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that any wetland zonation allows for continued use by householders of established taro field.</li> </ul>

Project Component and Anticipated Intervention	Social Issue and/or Potential Impact of Intervention	Preliminary Recommendation for Mitigation or Other Comment
<ul style="list-style-type: none"> <li>Zoning</li> </ul>	<ul style="list-style-type: none"> <li>The EPA's current protected area demarcation and declaration exercise assigns both wetlands to two IUCN protected area categories<sup>xix</sup>, mostly IV (Habitat/species management area) but with core areas of 1a (Strict nature reserve). Management of Category IV areas aims to protect identified habitats and species, generally with active management and without sustainable resource use. If the protected area boundaries include some taro fields, then there will be a theoretical possibility of loss of use if zoning does not permit continuing agricultural use.</li> <li>Discussion with concerned EPA staff indicates that the formal protected area boundaries will <i>exclude</i> the taro fields which ring the wetlands.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that the wetland management plan allows for continued agricultural use existing taro fields.</li> <li>As a hydraulic and biological system, the wetlands include the taro fields. Management plans should encompass these perimeter areas as well as the inner areas of the wetlands. If formal protected area status is extended to cover the whole of each wetland system, an appropriate IUCN category would be VI (Protected area with sustainable use of natural resources).</li> </ul>
<ul style="list-style-type: none"> <li>Fencing</li> </ul>	<ul style="list-style-type: none"> <li>Fencing is intended to exclude the public from access to certain areas (or under certain circumstances, as a water safety feature). It would have no negative social impact if it is installed and maintained as a result of a transparent and participatory planning process.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that fencing is only installed after transparent and participatory planning, is intended to control an identified behavioural issue, and is regularly inspected and maintained.</li> </ul>
<ul style="list-style-type: none"> <li>Regulating cropping</li> </ul>	<ul style="list-style-type: none"> <li>See comments under "zoning" above.</li> </ul>	<ul style="list-style-type: none"> <li>See comments under "zoning" above.</li> </ul>
<ul style="list-style-type: none"> <li>Regulating sand mining</li> </ul>	<ul style="list-style-type: none"> <li>Not relevant to this project on Fuvahmulah since there is no sand mining from the wetlands.</li> </ul>	-

Project Component and Anticipated Intervention	Social Issue and/or Potential Impact of Intervention	Preliminary Recommendation for Mitigation or Other Comment
<ul style="list-style-type: none"> <li>Preventing contamination of surface water</li> </ul>	<ul style="list-style-type: none"> <li>It is assumed that this refers to (a) contamination from cess pits and septic tanks, and (b) contamination from agrochemicals.</li> <li>Prevention of contamination from sewage is a very large task, outside the scope of this project (it is understood that a centralised sewerage system for the whole island has been designed and will soon be installed).</li> <li>Few if any chemicals (either fertilisers or pesticides) are used on subsistence taro and there are no data on water contamination from the taro fields on Fuvahmulah. Pesticides are used (and misused) by farmers in areas away from the wetlands. Any controls would have social benefits through reducing hazards to both users and consumers, but the scientific resources to follow up on this topic are unlikely to be available within the scope of the project.</li> </ul>	<ul style="list-style-type: none"> <li>In the wetland management plan(s), include as a medium term activity research on water quality and cooperation with MoFA on improving pesticide use and safety.</li> </ul>
<ul style="list-style-type: none"> <li>Preventing unsustainable harvesting of mangroves</li> </ul>	<ul style="list-style-type: none"> <li>Not relevant to Fuvahmulah since there are no mangroves in the interior freshwater wetlands.</li> </ul>	-
<ul style="list-style-type: none"> <li>Other</li> </ul>	<ul style="list-style-type: none"> <li>Dhandimaghi Kilhi is an important, safe freshwater swimming resource for residents. Improvement of the existing access point would bring many benefits, especially but not only to children learning to swim.</li> </ul>	<ul style="list-style-type: none"> <li>Include, as a priority, design and implementation of minor works to improve the attractiveness and safety of the existing access point to Dhandimaghi Kilhi (e.g. parking area, picnic tables, safe steps into water, hard bottom underwater for, say, 20 m from access point)</li> </ul>

Project Component and Anticipated Intervention	Social Issue and/or Potential Impact of Intervention	Preliminary Recommendation for Mitigation or Other Comment
(b) Pilot on eco-tourism on Fuvahmulah	<ul style="list-style-type: none"> <li>"Ecotourism" is defined by The International Ecotourism Society (TIES) as "<i>Responsible travel to natural areas that conserves the environment and improves the well-being of local people</i>". It has a high social content and is not the same as nature-based tourism.</li> <li>There is <i>no</i> current potential for off-island wetland based tourism on Fuvahmulah, even when the airport is completed.</li> <li>Any tourism development on Fuvahmulah would be dependent on branding the island and marketing the new brand, which would have to be significantly different from other tourism options in the Maldives (for example, home-stays to experience "the real Maldives").</li> <li>Both Councils on Fuvahmulah have requested the development of a tourism vision or concept.</li> </ul>	<ul style="list-style-type: none"> <li>Revise this activity to focus on development of a tourism concept for the island based on a realistic assessment of the domestic and international tourist markets in relation to existing and possible attractions on the island.</li> </ul>
(i) Development of basic infrastructure for eco-tourism (nature trails, observation hides, interpretation centre, visitor convenience services).	<ul style="list-style-type: none"> <li>Disappointment if facilities are built but economic benefits from tourism do not materialise (see comments above). This scenario is considered likely in the absence of an identified tourist market and business plan - and a full clean up of the island to remove all solid waste.</li> </ul>	<ul style="list-style-type: none"> <li>See comment above.</li> </ul>
(ii) Training of local community nature guides.	<ul style="list-style-type: none"> <li>This should only be done as part of a comprehensive tourism development package, otherwise the training will be wasted and false expectations raised.</li> </ul>	<ul style="list-style-type: none"> <li>See comment above.</li> </ul>
(iii) Supportive communications (IEC programmes and materials).	<ul style="list-style-type: none"> <li>See comments above.</li> </ul>	<ul style="list-style-type: none"> <li>See comment above.</li> </ul>

Project Component and Anticipated Intervention	Social Issue and/or Potential Impact of Intervention	Preliminary Recommendation for Mitigation or Other Comment
<i>(c) Documentation of Best Practices on Community-based Wetland Management</i>		
(i) Development of best practice notes on community based wetland management based on experience and lessons from this project and others in the Maldives.	<ul style="list-style-type: none"> <li>• See comments at 1.1 (a) above on the validity of the community-based wetland management concept.</li> <li>• Best practice research from other locations is necessary as an input to the management planning exercise.</li> </ul>	<ul style="list-style-type: none"> <li>• Consider study tours to other wetland and/or protected area management sites and projects in the Maldives for key individuals from Fuvahmulah, as part of the planning exercise.</li> </ul>
(ii) Review of existing policy documents through a stakeholder consultation process to identify scope for strengthening them from the perspective of community involvement in wetland management.	<ul style="list-style-type: none"> <li>• This sub-activity refers to the National Wetland Management Strategy and Action Plan (NWMSAP), 2003 (draft). Carrying out a stakeholder consultation process merely to identify a scope for strengthening the document, but not to actually improve the document itself, is a very low target.</li> </ul>	<ul style="list-style-type: none"> <li>• Consider revising this sub-activity to include an actual revision of the 2003 draft.</li> </ul>
(iii) Dissemination workshops.	<ul style="list-style-type: none"> <li>• Dissemination workshops are useful if the product is practical and the target audience able to use the knowledge gained. The project timescale is very short, and it may not be possible to draw significant lessons drawn from project implementation before the end of 2012.</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure that resources are available for independent, objective, review of the project at least six months before it terminates (i.e. June 2012), so that lessons can be documented and a dissemination process designed and implemented.</li> </ul>

Project Component and Anticipated Intervention	Social Issue and/or Potential Impact of Intervention	Preliminary Recommendation for Mitigation or Other Comment
<b>1.3 Strengthen Local Government Capacity on Mainstreaming Climate Change Considerations.</b>		
<i>(a) Capacity building on climate change adaptation.</i>		
Develop and deliver a training module for local councils on climate change adaptation through a training of trainers approach.	Local government is going through a period of rapid change as a result of decentralisation and democratisation. Climate change adaptation is an important strategic topic with implications for all aspects of planning, design, construction and operation of urban and municipal infrastructure and housing. Councils are overwhelmed with responsibilities and have low technical and implementation capacity.	The training modules must be practical and fit directly into local government processes.

#### **4.1.2 Hithadhoo**

##### **4.1.2.1 Development and Implementation of Community-based Wetland Management Plan (CBWMP) for the Maa-Fehele wetland system including updating of existing Eidighali and Koattee Management Plan.**

There was no formal Management Plan for the Eidighali and Kottee protected area at the time the CCTF I was prepared. During the CCTF I implementation, CBWMP was prepared and Environmental and Social Impact Assessment (ESIA) was conducted. Findings and recommendations of the ESIA are presented below: The overall impacts

##### **4.1.2.1.1 Potential Adverse Impacts during Construction Phase and Suggested Mitigation Measures**

**Air Quality Degradation:** Air quality may be deteriorated due to:

- Operation of machinery such as small excavators, trucks and concrete machines during construction, excavation and dewatering (if required).
- Transportation to and from the work site.
- Open burning of waste cleared from the protected area at the Waste Management Centre.

Dust and emissions from vehicle and machinery exhausts may degrade the air quality leading to short term health risks to the community. Due to relatively small size of islands that allow rapid turnover and flushing of harmful emissions, impacts from air pollution due to operation of machinery and construction works is considered negligible. However, burning of waste at the Waste Management Centre could have effects on the health and safety of workers there.

##### ***Mitigation Measures***

- Vehicles and machinery must be tuned and well maintained to minimize air emissions.
- Ground/soil must be kept damp to minimize dust from construction works.
- Use vehicles that have passed the Road Worthiness Tests
- Open burning should not be carried out when the wind is blowing from the south or the north to avoid smoke coming into the settlement area.

**Noise and Vibrations:** Noise pollution and vibrations are likely to be caused by:

- Operation of machinery such as small excavators, trucks and concrete machines during construction, excavation and waste removal.
- Construction works related to installation of viewpoints, fence, boardwalk and ranger huts.

Increased noise levels from operation of machinery, demolition and construction works will cause some nuisance to the nearby households. In particular, the construction work related to the view points and boardwalk is expected to have short-term impacts on fauna due to their proximity to the wetland. In addition, higher noise levels when constructing the visitor centre could affect nocturnal fauna that use auditory communication such as bats. Nonetheless, any unfavourable disturbance would be short term and limited to duration of construction.

##### ***Mitigation Measures***

In addition to the mitigation measures for air quality degradation, following actions will be taken.

- All construction work, except at the visitor centre must be carried out during day time to minimise nuisance to the local community and disturbances caused to nocturnal fauna that uses auditory communication.

***Groundwater and Wetland Surface Water Pollution:*** Project activities that may lead to contamination of water sources are:

- Operating machinery
- Concreting works
- Excavation and dewatering works
- Waste management and disposal.

During construction, any accidental spill of oil and toxic substances has the potential to contaminate groundwater, marine water and the wetlands. Likewise, during construction waste will be generated where any mishandling of solid and hazardous waste could also pollute the terrestrial water sources. Waste disposal also has the potential to cause contamination of groundwater from leachate while waste is stockpiled

Groundwater may be at risk during excavation to prepare the foundations. While fauna is expected to generally stay away from the work site, mishandling of concrete may affect the surround water.

The wetland water quality may also be briefly affected due to the sediments during the creation of small manual openings in the dyke that separate the eastern and western side of the wetland. However, this impact is expected to be very short-term and not significant.

Any contamination of groundwater or wetland surface water will affect the island aquifer.

In the Maldives, groundwater contamination is an irreversible impact due to the absence of impermeable layers to separate the freshwater lens in independent reservoirs. Accordingly, any point sources of pollution would cause the contamination of the entire island groundwater resources. If humans consume such contaminated groundwater, it may lead to serious health risks leading to increased public and private health costs.

It is anticipated that only small quantities of fuel and chemicals will be used during construction. Power will be sourced from existing power supply therefore fuel for power will not be handled at the site.

#### *Mitigation Measures*

- If dewatering is required, water must be released back into the ground water system. It should be released on to a street or surface waters in wetland.
- Oil, solid waste and hazardous waste should be handled carefully and transported in sealed containers. No oil or hazardous chemicals should be used or stored within the wetland boundary. All mechanical repairs and refuelling must be done outside the protected area boundary.
- All paints, lubricants, and other chemicals used on the prefabrication site should be stored in secure and bunded location.
- No waste shall be disposed or left behind at the wetland site.
- Littering and accidental disposal of construction wastes should be avoided at all sites.
- General waste should be stockpiled in one central area of the development site for easier management and monitoring.

- Construction activities should be carried out under the supervision of an experienced person.

**Loss of Vegetation:** Removal of vegetation will be required at the visitor centre site. The Council will determine the locations to relocate the coconut palms. If the council does not have a specific site the trees can be moved out of the footprint and planted in the surrounding areas which have some open space. There will also be bush vegetation and some medium sized trees which may need to be relocated. Working within the protected area will require pruning some trees including mangrove vegetation.

*Mitigation measures*

- All coconut palms must be replanted.
- This project shall not remove any tree within the protected area boundary.
- When removing bush, grass and ferns care must be taken only to remove the required footprint.
- All plants that can be replanted must be replanted.
- All remaining vegetation must be transported to the Addu City Waste Management Centre. No green waste generated from this project shall left or disposed within the protected area boundary.
- Installation of the visitor facilities such as boardwalk, footpaths, fence and viewpoints should avoid removing vegetation where possible and readjust the structures to move around vegetation, especially medium to large trees.

**Pollution due to waste:** Waste generated from the removal of all existing waste will be substantial. Mishandling of this waste during removal, transportation and disposal could lead to serious health hazards and impacts on terrestrial environment.

*Mitigation Measures*

- Workers should use protective gear when removing waste
- All trucks used in the transportation must ensure that waste do not fall out of the truck during transportation.
- Waste must be segregated before transporting to the waste site. Segregation should consider separating, plastics, metal, construction waste and general domestic waste.
- All waste must be taken to the Addu City Waste Management Centre.

**Risks to health and safety of construction workers:** Health and safety risks associated with project include noise exposure, accidents and fatigue. Given the World Bank requirements of health and safety under its OPs the following mitigation measures are required.

*Mitigation Measures*

- Follow the health and safety plan provided in the EMP of this report.

**Loss of lagoon bottom habitats:** The installation of marine buoys may lead to direct damage to live coral cover if installed in locations with high coral cover. The activities of workers and well as the anchor block footprint will be permanently damaged.

*Mitigation Measures*

- The anchor blocks must be placed on a dead coral bed. If there is no dead coral zone around the area, live colony must be moved to a separate location before installing the anchor blocks. Removing

and transporting must be undertaken by experienced (former) coral miners or under the supervision of a marine biologist.

- Carry out the activities in as short a time period as possible to allow normal conditions to re-establish in the area as soon as possible.
- Ensure all project activities are restricted to necessary areas only.
- Undertake work during calm weather.

**Impacts on Sand miners:** As noted in the previous chapter, there may be some loss or reduction of income for sand miners, who use the protected area beaches for sand mining. This activity is already illegal and is one of the prime concerns of the local population regarding the misuse of the protected area. The fence and gate planned under this project is being installed under this project is specifically being installed at the request of the locals to prevent illegal sand mining and waste dumping. Nonetheless, the closure of the protected area will have some short-term loss of livelihood for sand miners. However, all miners will have access to all other legal sites in Addu City.

#### *Mitigation Measures*

- It is recommended to undertake alternative skills development training for those miners willing to participate. This activity can be conducted as a series of workshops or single extended workshop based on demand.
- It is also recommended to consider employing the affected sand miners during construction stage and possible extension during operation.

#### **4.1.2.1.2 Potential Adverse Impacts during Operational Phase and Suggested Mitigation Measures**

**Damage to vegetation and disturbance to fauna:** The increased visitors to the site may lead to unintended damages to the vegetation along the footpaths and trails due to visitor activities. Visitors straying away from the main trails could trample and damage vegetation as well.

There may also be damage and disturbance to sensitive flora and fauna by those straying out of the established trails.

Disturbance to fauna during the use of proposed boardwalk and viewpoints is possible especially on birds and crustaceans. The boardwalk is constructed in an area where crab activity may be high seasonally.

Improper waste disposal at the protected area has always been a problem and the proposed low and green fencing may not solve the problem. These are waste dumped from the nearby houses. Waste thrown by visitors may also be a problem in the short-term.

#### *Mitigation Measures*

- Development of rules and regulations for the use of the protected area.
- Application of rules through better enforcement capacity and monitoring.
- Conducting mandatory guided activity for tourists.
- Installation of signs and awareness posters.
- Information sessions at the visitor centre.
- Regular clean-up of the trails and other parts by rangers and Visitor Centre staff.

**Damage to ground water and soil due to improper farming methods:** The current farming activities do not form part of this project but their presence and activities do have impacts on the protected area

environment. Activities such as extensive use of fertilizers and pesticides have polluted the groundwater which subsequently seeps into the surrounding wetland and marine waters. The degrading soil conditions also affect the plants.

Demand for groundwater may also increase for the visitor centre with increasing arrivals and around the protected area during restoration activities. Ground water is used for flushing and general use in the Visitor Centre, when rain water tanks dry out. These effects may become negligible over time as desalinated water is piped to the Visitor Centre.

#### *Mitigation Measures*

- Awareness and training programmes for the farmers on the effects of fertilizers and pesticides and how to do effective organic farming.

**Waste management impacts:** Increased waste and lack of proper waste handling facility in Addu City is likely to increase the pressure on the current waste management site. Waste such as sewage sludge from the septic tank may pose a health risk at the waste site without the necessary facilities to handle them. Establishing the municipal waste site is beyond this component. However, the proposed project will provide technical assistance to assess the SWM challenges and develop a proposal for investment to ensure a proper system is in place for SWM. Please refer to section on SWM for details.

#### *Mitigation Measures*

- Agree on schedule of waste transfer, estimated quantities and methods of disposal with the Waste Management Centre, so that they are informed of the quantities and requirements for disposal methods.
- Inspection of the waste handling process by the Waste Management Centre to determine if it is undertaken with all safety precautions and agreed standards.

**Social impacts:** The project mainly has beneficial public impacts (see next section), and has been formulated with the participation and input of a large number of stakeholders and community members (see Chapter on stakeholder consultations). In general the public would like to see that vehicle access is controlled to prevent dumping waste and illegal sand mining. Their preference is for a strong fence. Some also had reservations about activities in the farming area that can be considered beyond farming such as construction of buildings. They wanted such activities to be restricted. However, there are groups in the community which may have grievances against some of the measures proposed under the project. They are:

- Sand mining will be ceased in the area. This has positive and negative affects; the sand miners will have grievances due to the lack of access. However, since sand mining is already illegal in the protected area, there may not be any official complaints.
- Poaching will be ceased. Some youth groups may have grievances to this aspect indirectly through expressing frustrations at other aspects of the project such as controlled access.
- Access control to the site, particularly vehicle access control, may have grievances from some sections of the community in the short-term. In particular, the farmers will require the use of vehicles to transport the produce. Access to certain parties may lead some individual to claim unfairness. Use of motorcycles is very common by youth to visit the Koatney area during free time and late afternoons. Control of motorcycles may attract a substantial number of grievances towards the project
- Limits to farming practices such as the conversion to organic farming may be met with resistance from farmers.

#### *Mitigation Measures*

- Public workshops and awareness programmes to inform as much of the public as possible about the management regimes implemented in the Protected Area.

- Post the rules and regulations of using the protected area outside the visitor centre for public to view.

#### ***4.1.2.1.3 Potential Significant Positive Impacts during Operational Phase***

The project mainly has beneficial impacts on the community. The most significant of these positive impacts are:

- Increase in direct and indirect employment opportunities. Direct employment opportunities in the form of Visitor Centre staff, rangers and guides will be available. Indirect opportunities for craftsmen, women (crafting, food processing and cleaning), traditional artists and small retail businesses will be available, once the ecotourism activities attract foreign tourists.
- Better management of natural resources and prevention of illegal activities within the protected area.
- Preservation of the protected area for future generations.
- Indirect benefits of tourism activities on the island.
- A better recreational area.

**Table 5.10: Impact identification matrix**

Activity	Noise Level	Air Quality	GHG emissions	Groundwater	Terrestrial Flora	Terrestrial Fauna	Soil condition	Marine water	Marine flora and fauna	Protected species	Natural hazard risk & safety	Health and safety	Employment	Traffic condition	Community cohesion	Land and livelihood
<b>Construction Stage</b>																
<b>Mobilizing and Site Setup</b>																
Storage and work site setup	-	-	X	-	-	X	-	X	X	X	X	-/+	+	X	+	X
<b>Constructing Visitor Centre</b>																
Vegetation clearing and palm relocating	-	-	-	-	-	-	-	X	X	X	X	-	+	-	+	X
Excavation and dewatering (if required)	-	X	-	-	-	-	+/-	X	X	X	X	-	+	X	+	X
General construction works	-	-	-	-	X	-	+/-	X	X	X	X	-	+	-	+	X
<b>Constructing visitor facilities</b>																
Vegetation clearing and creating trails	-	-	X	-	-	-	-	X	X	X	X	-	+	X	+	X
Installing gates and fencing	-	-	X	-	-	-	-	X	X	X	X	+	+/-	-/+	+	+/-
Constructing boardwalk and view points	-	-	X	-	-	-	-	X	X	-	X	+	+	-/+	+	X
Installing marine buoys	-	X	X	X	X	X	X	-	-	X	X	+	+	X	+	X
<b>Removing waste</b>	-	-	-	+/-	+/-	+/-	+	X	X	+	+	+	+	-/+	+	X
<b>Demobilizing</b>	-	-	-	X	X	-	X	X	X	X	X	X	-	X	X	X
<b>Operation Stage</b>																
Operation of visitor centre	X	X	-	-	+	+	X	+/-	+/-	+	+	+	+	X	+	+/-
Operation of visitor facilities	X	X	X	X	+	+	X	X	X	+	X	+	+	X	+	X
Farming	X	X	X	-	-	-	-	-	-	-	X	-	+	-	+/-	+

X (no impact), - (negative impact) + (positive impact)

**Table 5.11: Evaluation of key impacts on the natural environment during construction and operation stage**

Impact area	Potential impacts	Nature/Distribution/Duration/Magnitude	Reversibility	Significance
<b>Construction stage</b>				
<b>Ambient noise level</b>	<b>Noise pollution:</b> Operation of vehicles, machineries during site preparation and construction. However, these will not be operated continuously for a long period of time.	Direct/negative; 50-100 m radius; Visitor Centre and visitor facilities sites; Project duration; Minor negative change Non-cumulative	Easily reversible	Insignificant - Limited hours of operation
<b>Ambient air quality</b>	<b>Air quality degradation:</b> negligible level of air emissions during transport of labour force and equipment's to the project site. In addition small amounts of emission are anticipated during operation of machineries and vehicles. Excavation work and vehicle use are expected to create dust particles. Waste disposal will degrade air quality temporarily due to open burning in the Waste Management Centre.	Direct/negative; 200 m radius; Short term; No change; Cumulative	Easily reversible, negligible effects	Insignificant - Negligible level of dust over a short time period.
<b>GHG emissions</b>	<b>Increase in GHG gas in atmosphere;</b> operation of vehicles that emit GHGs will results in negligible increase in GHG in the atmosphere; disposal of waste removed as part of the project will increase emissions for a short-period as they are usually burnt in the Waste Management Centre.	Direct/negative; Island level; Short term; No change; Cumulative	Easily reversible	Insignificant - negligible amount of GHGs is anticipated to be released.
<b>Ground water &amp; wetland and surface water</b>	<b>Contamination;</b> During excavation and construction there is the potential of spillage of fuels/chemicals/concrete etc. to the groundwater of the island and to the surface	Direct/negative; Project site 100 m radius; Short term;	Reversible – adjustment through natural processes	Moderately significant – groundwater is the main source of water for non-potable purposes

Impact area	Potential impacts	Nature/Distribution/Duration/Magnitude	Reversibility	Significance
	water of wetland. <b>Water Demand</b> will increase during construction and extraction of ground water required for concreting and general construction works.	Negative change. Cumulative		
<b>Terrestrial Flora</b>	<b>Loss of vegetation:</b> Some young trees are expected to be removed from the project foot print. These trees are not within the protected area. Some coconut palms will have to be moved and may not survive in the long-term; trees and undergrowth may be damaged during waste removal and fencing; pruning wetland vegetation may be required for boardwalk and view point construction.	Direct/negative; Project site; Short term; Moderate negative change	Reversible through tree relocation or replanting	Moderately insignificant – as all palms are replanted, all other trees likely to survive will be replanted and only bush varieties are discarded; no vegetation removed from protected area, except for trees pruned.
<b>Terrestrial Fauna</b>	<b>Disturbance to wetland fauna:</b> During construction works the noise levels may effect bird behavior; crabs and other crustaceans may be affected during construction of the board walk and viewpoints; waste removal activities will also create disturbances to fauna.	Direct/negative; Project site; Short term; Moderate negative change	Reversible through tree relocation or replanting	Moderately insignificant – as these tree are occasionally removed regardless of the presence of this project. Moderately significant damage to ferns.
<b>Health and safety</b>	<b>Risks to health and safety;</b> During the construction risks to workers health and safety is increased, as chances of accidents are high; waste disposal methods may harm the community, particularly open burning of waste.	Direct/negative; Project site; Short term; Moderate negative change.	Reversible	Significant - Risks to health and safety especially during construction stage is high
<b>Employment</b>	<b>Increase in employment opportunities</b>	Direct/positive;	NA	Moderately Significant

Impact area	Potential impacts	Nature/Distribution/Duration/Magnitude	Reversibility	Significance
		Island level; Short term; Moderate positive change		- Short term employment opportunity, opportunities for craftsmen
<b>Land and livelihood</b>	There is no acquisition of land or resettlement due to project activities. There may be a loss of economic opportunity for sand miners who mine from the protected area. However, it has to be noted that mining is already illegal from any island beach or protected area in the Maldives. The miners may also continue to mine from other legal locations. The farmers will continue to operate their farms.	Direct/positive and Direct/positive; Island level; Short term; Moderate positive change	Reversible by identifying alternative mining sites	Moderately Insignificant

Impact area	Potential impacts	Nature/Distribution/Duration/Magnitude	Reversibility	Significance
<b>Operation</b>				
<b>Terrestrial flora and fauna</b>	<b>Damage to flora:</b> The increased visitors to the site may leads to unintended damages to the vegetation along the footpaths and trails. <b>Disturbance to fauna</b> during the use of proposed boardwalk and viewpoints is possible especially on birds and crustaceans. <b>Improper waste disposal:</b> waste disposal at the protected area has always been a problem and the proposed low and green fencing may not solve the problem. Waste thrown by visitors may also be a problem in the short-term.	Direct/Negative; Protected area; Long term; Moderate negative change	Reversible with proper monitoring and awareness	Moderately Significant

<b>Ground wetland marine water, and water quality</b>	<p><b>Current farming practices</b> are likely to continue to degrade the water quality.</p> <p><b>Demand for groundwater</b> may increase for the visitor centre with increasing arrivals and around the protected area during restoration activities.</p>	<p>Direct/Negative; Protected area; Long term; Moderate negative change</p>	<p>Reversible with a desalination plant and changed farming practices</p>	Moderately Significant
<b>Health and safety</b>	<p><b>Increased waste</b> and lack of proper waste handling facility in the city is likely to increase the pressure on the current waste management site. Waste such as sewage sludge from the septic tank may pose a health risk at the waste site without the necessary facilities to handle them.</p>	<p>Indirect/Negative; Hithadhoo Island; Long term; Moderate negative change</p>	<p>Reversible with a proper waste management equipment and facility</p>	Moderately Significant
<b>Social</b>	<p><b>Sand mining</b> will be ceased in the area. This has positive and negative affects; the sand miners will have grievances but the public in general will support the measure and be better-off.</p> <p><b>Poaching</b> will be ceased. General approval from the community.</p> <p><b>Access control</b> to the site, particularly vehicle access control, may have grievances from some sections of the community in the short-term but is necessary and was a key demand during public consultations.</p> <p><b>Limits to farming practices</b> such as the conversion to organic farming may be met with resistance from farmers.</p>	<p>Direct/negative; Hithadhoo Island; Short term; Negative change. Cumulative</p>	<p>Reversible – through public awareness</p>	Moderately Significant in the short-term
<b>Employment</b>	<p><b>Increase in employment opportunities</b> for direct and indirect employment.</p>	<p>Direct and indirect City Level; Long-term Positive change</p>	NA	Significant

## **4.2 Preliminary Assessment of Impacts Associated with Solid Waste Management and Proposed Mitigation Measures**

### **4.2.1 Introduction**

Solid waste remains the most visible environmental threat to the tourism industry. The management of solid waste is especially challenging in the Maldives, where waste generation due to high incomes and more than 100 tourist resorts much exceeds that of many other small island states. With a highly dispersed population spread across numerous islands, there is little scope for harnessing scale economies and the costs of delivering services are high. A high population growth rate, a large influx of foreign workers and the execution of extensive infrastructure projects has meant that land space available for the disposal of waste is now extremely limited, and that accordingly there is an urgent need for the waste stream to be minimized through incentives for resource recovery such as recycling and composting. Finally, the fragile marine atoll ecosystem requires that special attention should be given to the choice of waste management technology and system design to mitigate adverse impacts, which adds to cost implications. To address these risks and challenges, stringent criteria need to be applied for evaluating the potential impacts of the selected site(s) for SWM, the choice of engineering, technological and management solutions for minimizing the environmental and social impacts in the Maldives. This meant prior to site-specific ESIA is conducted, it will be necessary to seek the willingness of inhabited island communities to participate, selection of technologies and site through Best Practicable Environmental Option exercise and establishment of technical and feasibility of proposed options.

It is emphasized that options available in other South Asian countries for example will not be applicable due to the country's geographical setting and other social-economic and environmental factors unique to the country.

There are two main options to the project, either a development or a no-development alternative. The development option is highly justified since it is a high priority in the Government's policy to develop a regional facilities due to serious environmental impacts associated with the present waste disposal in the small island communities. Consequently, a no-development option of the no SWM can be disregarded due to government policy, demonstrated impacts of not managing solid waste and its link to the sustainability of Maldives' key economic sectors, particularly tourism and fisheries. Assuming there has been no government policy; the no-development option means severe health hazards to island communities, rapid degradation of ecosystem integrity and significant negative impact on the economy of the Maldives.

### **4.2.2 Alternative Analysis**

The proposed project is intended to provide technical assistance to an environmentally sound and economically feasible regional solid waste management system in Addu City and Fuvahmulah, which is currently underserved by proper waste management facilities. Taking account of the Maldives' dispersed geography and fragile ecology, the project would be implemented at multiple levels. A policy decision is already in place that it is necessary to process the waste to some extent at the island level to reduce the residual to be disposed and a regional facility will be necessary with appropriate technology options for final processing or disposal depending on the conditions of the site selected for the facility. Final disposal at the currently existing centralized facility in Thilafushi is not considered to be viable due to cost of transportation. Within this context, the following processing steps have been identified for the proposed interventions of the project;

First, the upgrading of Island Waste Management Centers (IWMCs) will provide adequate facilities for the island communities to reduce the volume of waste requiring final disposal by sorting, recycling, and composting. The residual waste will be temporarily stored in a safe and environmentally responsible manner in the IWMC. Second, a technical assistance will be provided to undertake a strategic options study for integrated SWM specifically focused on building and managing Regional Waste Management Facility (RWMF) in a site with compatible land use that will serve as the destination for residual waste from the IWMCs and participating resorts. Detailed

assessment of current and future needs and technology choices for waste management will be carried out as part of the study. Alternate sites and technologies will be weighed, keeping in mind cost and sustainability. Recognizing the significance of the country's natural capital and reputation as an unspoiled tourist destination, environmental factors will be given high priority over economic considerations in determining both the location and design of the system. Community consultation, communication and involvement are for this component and are essential to the successful operation of IWMCs.

On the long-term (beyond the project period), all the above will be supported by allied services such as community programs, waste transfer and transportation facilities, technical assistance and financial systems, all of which will be subject to government regulations and guided by stringent environmental criteria. The facilities will be designed and built in accordance with the national standards set by EPA to reduce the risk of contamination from solid waste. Special attention will be paid to healthcare waste and toxic waste that will require special handling and management. Detailed assessment of environmental and social impact assessment will be carried out. Polluter Pays Principle and fee for services are the main government policies for ensuring a sustainable waste management system. Recognizing that waste management is a municipal service, government will ensure incentives and subsidies are provided where necessary.

**Waste Management Options.** Based on previous experience on developing integrated SWM through MEMP has demonstrated the importance of following elements when selecting waste management options:

- Collection and transportation
- Processing (overall):
  - Energy recovery (incineration, bio-methanation, refuse derived fuel, gasification and pyrolysis);
  - Recycling;
  - Composting (Windrow, in-vessel).
  - Disposal:
  - Landfill;
  - Land reclamation.
- Processing (site-related):
  - Island level processing
  - Processing at a regional facility
  - Recyclable Management
- Management of the facility(ies) including institutional mechanism and cost recovery

#### **4.2.3 Island Waste Management Centres**

The Island Waste Management Centres will serve as a focal point for island waste management activities. The successful completion of island based management plans, and activity based environmental assessment screening and/or scoping processes will be the trigger to move onto the construction of the Island Waste Management Centres, provision of equipment and implementing island based waste management activities.

A generic design of an IWMC consists of a concrete pad, covered waste storage bays, guttering, a rainwater harvesting tank, a chain link fenced enclosure with lockable gates. The solid waste generated by the island communities is brought to the IWMCs where it will be separated into recyclables, hazardous wastes, and residual waste requiring final disposal. The separated wastes will be stored in respective waste storage bays for regular collection and transport to the RWMF. The footprint of the individual IWMCs are based on the population size on

the island and land area available as described in Table 5.X. However, for islands where specific activities are identified, the final footprint for the IWMCs will be determined by the scale and extent of the activity proposed. Adverse environmental impacts arising from the construction and operation of IWMCs are not likely to be significant.

**Table 5.16: IWMC Footprint**

Population	Footprint m <sup>2</sup>
<=500	204
>500<=1000	280
>1000<=1500	360
>1500<=2500	532

This Framework describes processes to engage the community in constructing, operating and maintaining IWMCs. In accordance with the agreements reached within the Government island offices are required to form an Island Waste Management Committee, consisting of one participant for the Island Development Committee, one participant from the Women's Development Committee, one participant from the island office and two community participants. The Island Waste Management Committee, with support from the island office, is responsible for informing the community, advertising and evaluating bids submitted by community enterprises, NGO's or private sector contractors, and providing construction oversight for IWMC construction. Standard equipment lists and specifications have been prepared for islands based on population size. However, equipment will be provided based on specific community expectations as detailed in the Island Waste Management Plans (IWMPs). Additional equipment may be made available to support specific activities proposed in the IWMPs.

#### **4.2.3.1 Preliminary Assessment of Potential Impacts Associated with IWMCs**

The Table 5.17 below identifies the likely impacts due to construction and operating IWMCs and proposed mitigation measures. Issues leading to poor siting will not be applicable, as the project will only support existing IWMCs.

**Table 5.17: Impacts of construction and operation of IWMCs**

Impact	Significance	Mitigation Measures
<b>Poor design leading to:</b>		
Negative impacts on ecologically significant wetland and marine habitats	Low	Ensure IWMC's are not designed with a wetland or marine outfall
Contamination of groundwater	Low	Ensure (i) waste storage areas are covered to prevent contaminated stormwater run off, and (ii) hazardous waste storage area is bunded.
<b>Construction activities leading to:</b>		
Negative impact due to noise	Not significant	Civil works will only involves putting up a concrete pad for composting – concrete mixing at the scale required will not emit significant level of noise. Ensure construction activities occur between 8 am and 4 pm
Negative impact on air quality	Low	Sumilar to above (relate to noise), there will not be significant impact on the air quality. Stockpiled material for long period will be

Impact	Significance	Mitigation Measures
		covered to manage dust generation due to windy conditions screens or wetting of source materials
Stockpiles of construction and demolition waste		Ensure waste materials are either reused by community or removed from island at the end of construction phased activities
Damage to reef during materials unloading	Not significant	Ensure adequate arrangements are available on all islands for unloading construction materials using only existing harbor areas
Negative impact on ground water quantity due to over extraction and quality	Low	Ensure fresh groundwater supplies are available in sufficient quantities The proposed small scale civil works will not impact the quality of groundwater significantly <i>Note:</i> Many of the island's ground water quality is poor for portable uses
Positive impact on island economy	Moderate	Continue to encourage the use of labor and material from the island
<b><i>Operational activities leading to:</i></b>		
Positive impact on island economy	Moderate	If a market for composted material and recyclables can be found, the IWMC either can self sustain by cost recovery which will be positive for the island economy
Positive impact on island waste management	Moderate	A managed IWMC as opposed to a dump site, as well as the reduction of amount of waste that requires to be disposed will bring about positive impacts
Negative impact on nearest adjacent households or establishments from waste management activities undertaken	Low	Ensure (i) training is available to support good operational practice, and (ii) facilitate waste management planning process to address issues raised by the community.
Negative impact on groundwater	Low	A good design will ensure there will be no impact or existing impacts is minimized
Negative impact on marine environment	Low	A good design will ensure there will be no impact or existing impacts is minimized
Litter, odour, vector/ raptor nuisance to nearby residences	Moderate	Ensure (i) waste is collected at least daily; (ii) Adequate bins with closures are provided at the drop off; (iii) Regular checks for pests to be undertaken.
Work place health and safety issues	Moderate	Ensure (i) employees are equipped with boots, gloves and coveralls (ii) adequate training in use of equipment (iii) adequate training in workplace health issues relating to handling of compost etc
Noise nuisance to nearby residences.	Low	Ensure IWMC activities occur between 8 am and 4 pm
Vector breeding, raptor, litter, public health	Moderate	Ensure (i) organic wastes are stored in covered bins if composting process does not

Impact	Significance	Mitigation Measures
		takes place immediately, (ii) cans are crushed and stored in closed facility or in covered bins
Odour nuisance to nearby residences.	Moderate	Ensure (i) organic waste is stored in covered bins or composted immediately and composting process managed to ensure no odor is emitted; (ii) Provide composting training to all laborers and management staff of the facility; (iii) Daily monitoring by the management staff on the composting process. Note: The two participating councils representatives have been already provided initial training though the AASWMP in Sri Lanka
Environment, health and safety impacts of residual waste (waste that cannot be recycled or composted) due to absence of a final sanitary disposal facility	Moderate	(i) All non-organic residual waste that cannot be recycled will be baled and stored in the IWMCs; (ii) Arrangements will be made to transport the baled residual waste to Thilafushi or Vandhoo RWMFs <sup>3</sup> at a frequency that is economically viable (and until a sanitary facility is established in the southern region); (iii) All organic residual waste that cannot be composted which will include mainly coconut husks, tree trunks and branches, etc. will be left in the periphery of the facilities for natural degeneration. Care will be taken to ensure coconut shells and husks in particular are disposed in a manner that will not become vector breeding sites.

### 4.3 Preliminary Assessment of Impacts Associated with Coral Reef Monitoring and Proposed Mitigation Measures

#### 4.3.1 Introduction

The Marine Research Centre (MRC) is already doing some coral reef monitoring in Addu Atoll under the National Coral Reef Monitoring Framework (NCRMF). The coral component under the CCA project will include the following sub-components in addu atoll and other selected sites elsewhere:

- Training and capacity building of the relevant stakeholders

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<sup>3</sup> IDA financed Vandhoo RWMF is expected to be commencing its operations around second quarter of the calendar year 2015. Thilafushi rehabilitation and management of waste reaching the facility are expected to commence soon with the signing of the rehabilitation work to the Indian Company Tatva that was facilitated by the IFC.

- Setting up baselines at the new sites (in addition to the existing 5 sites) monitoring of coral reefs
- Refining and improving performance of the web-enabled technology platform (referred to as ‘the Coral Reef Monitoring Framework’)
- Experience exchange workshops targeting national and international stakeholders (selected small island nations)
- Dissemination and policy inputs (recommendations) on coral reef resources management.

It is that implementation of this component will have relatively little adverse impact on the environment, and no social safeguards issues are anticipated. However, some physical impacts on corals could occur if insufficient care is taken during the monitoring work, so the component was included within the ESAMF study. It should be noted that no grievances were raised by partnering resorts during the WCCM Project under CCTFI.

As practiced during CCTF I, the field monitoring will be undertaken by qualified professional resort divers, which greatly simplifies the project work, in that it reduced the need for diver training and largely eliminate safety concerns since the divers will already be trained in good environmental diving practices.

During CCTF I appropriate environmental, social and safety guidelines to be followed during the coral monitoring activities, including measures to mitigate any likely adverse impacts were developed based on existing internationally accepted guidelines from respected institutions. CCTF II will also follow the same measures and principles.

#### **4.3.2 Identification of Potential Adverse Environmental Impacts**

The reef monitoring involves activities include travelling to the shoreline, travelling between the shore and the monitoring site by boat, travelling between the shore and the near-shore monitoring sites by swimming, and the standard underwater survey activities directly associated with identification and quantification of coral and other marine organisms. Where new sites are to be set up these will have to be permanently marked.

As mentioned previously, the impacts of the coral monitoring work are expected to be very limited. Nevertheless, an environmental review has been made of the fieldwork that can be expected, and a preliminary assessment has been made of the potential impacts, along with their proposed mitigation. The results are presented in Table 5.18.

**Table 5.18: Impacts of coral reef monitoring**

Activity	Potential Impact	Mitigation Measure	Guidance Reference
Vehicular access to shoreline	Damage to structure or vegetation of coast.	Vehicles banned from driving on the foreshore.	MG
	Pollution of shoreline with oil or fuel.	- Check all fuel lines for leaks. - Park vehicles in off the beach.	MG
Use of boats/ outboard engines	Pollution of sea with oil or fuel.	- Use of 2-stroke outboards banned. - Outboards fuelled and fuel lines checked for leaks in advance. - Use of approved fuel containers and drip trays. - Refuelling carried out onshore.	MG
	Physical damage to coral	- Use of short-shaft engines with	MG

Activity	Potential Impact	Mitigation Measure	Guidance Reference
	reef	propeller guards. - Anchoring on reef banned - Permanent mooring buoys laid.	MG, ED
	Risks to boat and dive personnel	- Carry spares, tools, etc - Wear lifejackets (boatmen)	MG
Monitoring of reefs	Damage to coral by physical contact	- Precise buoyancy control - Minimisation of quantification methods requiring direct contact <sup>6</sup> with the reef. - Use of photographic methods and lightweight equipment.	RC, ED MG
	Upsetting balance of reef ecosystem	- No feeding of fish. - No food to be taken aboard (other than emergency food supply).	MG ED
	Pollution of reef	- Equipment count before and after the dive. - All waste brought ashore.	MG MG, RC
	Risks to dive personnel	- Appointment of an Environment & Safety Officer for the dive. - Use of properly certified divers.	MG MG, RC

RC = ReefCheck Best Diving Practices

ED = Earthdive Code of Responsible Diving

MG = Mitigation Guidelines – developed within the ESAMF process.

### **4.3.3 Review of Published Mitigation Measures**

#### **4.3.3.1 ReefCheck: Best Diving Practices**

The guidance material produced by the ReefCheck Foundation was considered to be appropriate, because of the widespread use of ReefCheck for monitoring and its recognition under the Biodiversity Convention. The relevant document is ‘Reef Check Instruction Manual – A Guide to Reef Check Coral Reef Monitoring’ 2006 Edition ISBN 0-9723051-1-4. (This is also cited as the ‘ReefCheck Eco-Monitoring Manual’.)

The most important part of this is the instructions in training for buoyancy control, so that divers can undertake the monitoring without touching corals, without touching or disturbing the seabed, and without breaking surface.

Another valuable part of this document is the Liability Release Form, which would be signed by each participant. This essentially confirms that divers involved in the coral monitoring accept all risks as their own, and will not hold the organising institution liable for any injury or loss. It would be important for the component to use an adapted version of this form in order to protect the MRC, MEE and the World Bank (as sponsors and organisers of the monitoring missions) from any future claims by participating divers. Use of the form will also avoid the need to take out life insurance for those involved in the monitoring (unless the project sponsors feel a moral obligation to

provide such protection). A copy of the form can be found in Appendix K as an example to be tailored to the Project.

The Best Diving Practices advocated by ReefCheck are listed below.

**A. Respect the Reef**

- Observe but don't handle marine life.
- Avoid feeding reef creatures.
- Use waterproof sun block.
- Leave no trash behind.

**B. Bring home memories, not reef scrapes**

- Master neutral buoyancy.
- Keep dive gear from dragging on the reef.
- Stand and walk on sand, not on corals.
- Keep fins away from the reef.

**C. Know and Follow Local Regulations**

- Respect no-fishing and no-collecting areas.
- Stay within catch and size limits.
- If collecting shells, make sure they are empty.

**D. Go Blue**

- Patronize reef-friendly dive shops, hotels and tourist operators especially Reef Check Certified Facilities.
- Ask what operators are doing to monitor and protect their reefs.

**4.3.3.2 Earthdive Code of Responsible Diving**

The Code of Responsible Diving published by the organisation 'earthdive' essentially carries similar messages to the ReefCheck Best Diving Practices, but it provides more detail to explain why care is needed in relation to coral conservation and safety. The Code is summarised below.

**A. Know your limits.**

Every dive is different and every diver is different. Always ensure that you dive within the limits of your training and experience, whilst taking due account of the prevailing conditions. Take the opportunity to advance and extend your skills whenever that opportunity arises. In particular, buoyancy skills can become a little rusty after any prolonged absence from the water. If you can't get pool or confined water practice before your trip, get your buoyancy control checked out by a qualified instructor on your first dive. There are many national and international dive training organisations which offer a comprehensive range of courses and instructional material beyond basic skills level. Take advantage of them.

**B. Be aware of the marine environment and dive with care.**

Not surprisingly, many dive sites are located where the reefs and walls play host to the most beautiful corals, sponges and fish - fragile aquatic ecosystems. Starting with your point of entry, be aware of your

surroundings: never enter the water where there are living corals, water plants or reeds. Once underwater, it only takes one unguarded moment - a careless kick with a fin, an outstretched hand, a dragging gauge or octopus - to destroy part of this fragile ecosystem. Even fin kicks too close to the reef or sand can have an adverse effect - so dive with the utmost care. Photographers in particular need to take greater care as they strive for that best-yet shot. Don't let your dive become an adverse anthropogenic impact. And remember that these rules apply just as much to 'hard' dive sites - such as wrecks, which have become the home of diverse marine life - as well as fresh-water and other sites.

### **C. Understand and respect marine flora and fauna.**

A large part of the joy of diving is in learning more about the plants and animals who live in this unique underwater environment. In order to survive and thrive, many living creatures disguise themselves to look like plants and inanimate objects, or develop defence mechanisms such as stings. Some even do both. The earthdive information sheets which are attached to the earthdive Global Dive Log, provide information about indicator species for the region in which you are planning to dive. In addition, dive training organisations run marine naturalist and identification courses. The more that you learn, the more that you will see, the more that you will derive pleasure from your underwater experience - and the safer you will be for yourself, other divers and the marine environment.

### **D. Don't interfere.**

First and foremost, be an observer in the underwater environment. As a general rule, look don't touch. Remember that polyps can be destroyed by even the gentlest contact. Never stand on coral even if it looks solid and robust. Always resist the temptation to feed fish and discourage others from doing so. You may interfere with their normal feeding habits, damage their health and encourage aggressive behaviour. Leave only your bubbles.

### **E. Take only what you need.**

The marine environment is a valuable source of food for mankind and it is important that it remains so into the future. If you are among those divers who enjoy taking food from the sea, observe some simple rules.

- Obtain any necessary permits or licences.
- Comply with all relevant fish and game regulations. These are designed to protect and preserve fish stocks, the environment and other users.
- Only take what you can eat. If you catch it and can't eat it, put it back.
- Never kill for the sake of 'sport'.
- Avoid spear fishing in areas populated by other divers or visitors to the area, or where you might cause collateral damage

### **F. Observe and report.**

As an earthdive contributor, you will be in a unique position to monitor and report on the health, biodiversity and any obvious damage to dive sites using the earthdive Global Dive Log. In addition, we would encourage you to report anything unusual to the appropriate local marine and environmental authorities, or if this is difficult, get your dive centre to do it for you. They have a vested interest in a healthy marine environment, and will normally be more than willing to help. Always be on the lookout for physical damage, fish stock depletion, pollution and other environmental disturbances. If the dive

operation itself is causing damage -say by anchoring to the reef - then let them know how you feel in no uncertain terms.

#### **4.3.3.3 ESAMF Mitigation Guidelines**

Whilst the ReefCheck and ‘earthdive’ materials are relevant and have value for the proposed project, they do not address broader environmental protection and safety issues. In the circumstances, the ESAMF has developed the following Environmental Guidelines for Coral Reef Monitoring:

##### **A. Vehicles**

Vehicles will not be available in most resorts. However, if they are, the following guidance should be followed:

- Before use for a monitoring assignment, vehicles must be checked for potential leaks of lubrication oil or fuel.
- Vehicles must not be driven onto the foreshore and must not be driven over any sand berm at the top of a beach. The reason for this is to both prevent pollution of the coastal environment, and to prevent any damage to the physical and biological elements of the shore which stabilise the sand and therefore minimise erosion and flooding.
- During monitoring activities, vehicles must be parked well away from the shoreline, preferably on the nearest road or layby.

##### **B. Boats / Inflatables and Outboard Motors**

- Only 4-stroke outboard motors may be used (i.e. the use of 2-stroke motors is banned as a condition of participating in the monitoring). The use of electric outboard motors is encouraged.
- Outboard motors must be filled with fuel before transport to the monitoring site, and must be checked for potential leaks of lubrication oil or fuel before reaching the shore.
- Spare fuel must only be carried in metal or plastic screw-top containers approved for fuel use (and marked as such by the manufacturer), which themselves must stand in a drip-tray to prevent the loss of small leaks or spillages.
- Where practicable, craft should return to the shore for refuelling, which must be done with the use of a detachable spout or a funnel to avoid spillage.
- The propellers of outboard motors must be within a wire or metal cage, in order to both protect divers from injury, and protect corals in the event of contact with the reef.
- Boats must be equipped with drinking water, VHF, GPS, flares, torch, first-aid kit, tools, spare spark-plugs and shear-pins.
- Food should normally not be taken aboard the dive boat. If food is taken for longer monitoring missions, care must be taken not to drop or discard any food or wrappers, and all unused food must be taken ashore at the end of the trip.

##### **C. Monitoring**

- ReefCheck and ‘earthdive’ guidelines must be observed at all times.

- Anchoring on reefs is forbidden. Boats must either hold station, or moor to a permanent mooring. Moorings should be established on a sandy seabed away from the reef, or on a part of the reef where risers will not affect live coral.
- Permanent transects should preferably be identified only by GPS positions and photographs of notable features at start and end. If transects are to be marked, stainless steel bolts or nails should be installed in existing blocks of dead coral.
- Transect lines should be deployed with extreme care. Calibrated string is preferable to steel tape measures. Likewise, if quadrats are to be used, they should be of very light construction. Alternatively, the corners of permanent quadrats can be marked.
- One member of the team should be allocated the role of Environmental & Safety Officer.
- The Environmental & Safety Officer should log all equipment and material taken to the dive site, and check that it has all been recovered after the monitoring assignment.
- To minimise impact at the shore, the Environmental & Safety Officer should make a final check of the shore before leaving to ensure that all wastes, consumables and other materials arising from the monitoring assignment have been removed from the shore. (Time and dated photographs of the shore before and after the assignment would be good evidence that care had been taken.)

#### ***4.3.3.4 Maldives Recreational Diving Regulations***

In addition to the guidelines described above, which focus to a large extent on the protection of the marine environment, there are strict local regulations which relate to recreational diving in the Maldives. These broadly constitute the Health and Safety requirements that should be applied to any diving conducted as part of the coral reef monitoring component. Some of the provisos concerning the depth of diving will not be applicable to the relatively shallow diving required for coral reef monitoring, but they are all reproduced below for completeness, as they are the official regulations.

##### ***4.3.3.4.1 Diver Qualifications***

#### **Section 1: Recognized Diver Training Agencies: Minimum Certification Requirements**

- The minimum certification level for divers wishing to participate in diving in the Maldives is an entry level certification from a Recreational scuba Training Council ( RSTC ) associated Diver training agency or a 1 -star Confederation Mondiale Des Activités Subaquatiques (CMAS) certification from a CMAS-affiliated diver training agency.
- Other diver training agency's entry level certificates must have as performance requirements for open water training Dives encompassing the knowledge and skills as outlined in the RSTC entry level performance requirements.
- A diver is required to submit proof of his/her training by means of a diving experience by means of a logbook.
- A diver who cannot submit an entry level or higher certification must be considered a trainee and may only participate in training dives according to the standard of the training programs a sponsored by the aforementioned driver training agencies, until certified as an entry level diver.
- A diver who cannot submit proof of his/her dive experience by means of a log book must demonstrate to the dive instructor that he/she has mastered the skill as outlined in Section 11: Orientation Dive.

#### **Section 2: Supervision of Diving Activities**

- All diving activities, both land and boat based, must be supervised by Dive Centre Staff either directly or indirectly. If a Dive Centre Staff is found to be negligent in supervision, the Dive Centre Staff and the Dive Centre will be subject to appropriate action as deemed fit by the government authorities.
- In order to function as a Dive Centre Staff, a person must meet all the prerequisites as mentioned under Section 10: Recognised Qualification of Dive Centre Staff.
- “Direct Supervision” is defined as Dive Centre staff being physically present and in control of the diving activities and being able to personally value the behaviour of the divers and being capable to prevent or correct problems when they occur.
- “Indirect Supervision” is Dive Centre Staff Organizing the diving activity and being available to respond correctly and timely to problems when they occur.
- Prior to a dive, a dive briefing has to be given to the divers by the Dive Centre Staff.
- For all diving activities a dive roster must be kept starting the divers’ dive time, maximum depth and remaining tank pressure after the dive.
- For independent land based dive activities, a Dive Centre Staff member is required to note the time the divers enter and exit the water.
- Dive rosters are to be kept the Dive Centre Staff for reference by the Maldivian Authorities for a period of not less than one year.
- Certified divers may dive with another certified diver without the immediate supervision of a Dive Master when environmental conditions are similar to the conditions in which the diver has been trained, or proof of experience of diving in more demanding conditions can be demonstrated by entries in their logbooks.
- Certified divers, who do not have the skill or experience necessary to safely and comfortably dive in give environmental conditions, must dive under the immediate supervision of Dive Centre Staff.

### **Section 3: Maximum Depth Limitations**

- The Maximum depth for all recreational diving in the Maldives is 30 metres.
- This applies to divers training in deep diving Techniques who participate in recreational diving activities within the Maldives, tourists, Dive Centre Staff, Instructors on or off duty and all instructors and students involved in Advanced and Deep Diving Training.
- The maximum depth limitation also applies without exception to diving activities on live aboard and safari boats.
- Any person repeatedly and deliberately violating this regulation may be excluded from further diving. Furthermore, any Dive Centre Staff repeatedly and deliberately violating this regulation will be subjected to disciplinary measures as deemed fit the concerned Maldivian Authority.
- Entry level Divers may dive to a depth of 20 metres or within the limits as set forth by standards of their certification agency, but not exceeding 20 meters.
- Not until entry level divers have received training in Deep Diving techniques may they go deeper than 20 metres.
- Instruction in Deep Diving techniques must be provided in compliance with the standards of the Diver Training Agencies as mentioned in Section 1: Recognised Diver Training Agencies.
- The fact that an entry level diver is diving under the supervision of an instructor shall not be grounds to dive deeper than 20 metres unless the diver is trained or is receiving in Deep Diving Techniques as per standards.

#### **Section 4: Decompression Dive Limitations**

- Only non-decompression diving is allowed in the Maldives. This applies to everybody who participates in diving activities within the Maldives, tourists and dive Centre Staff, instructors on and off duty, also instructors and Students involved in Advanced and Deep Diving Training. This no stage decompression limitation also applies to live aboard or safari boats. No exception what ever is allowed.
- Any person repeatedly and deliberately violating this regulation may be excluded from further diving. Furthermore, and Dive Centre Staff repeatedly and deliberately violating this regulation shall be subjected to disciplinary measures as deemed fit the concerned.

#### **Section 5: Dive Centre Requirements**

- All Dive Centre's must register with the Ministry of Tourism and obtain an operating license.
- All Dive Centre's must be equipped with pure Oxygen and have an emergency plan ready in case of diving related accidents. The emergency plan ready in case of diving related accident. The emergency plan must include mechanisms for:
  - a) Searching methods in case of missing divers
  - b) Providing First Aid Care
  - c) Transport method to the next appropriate medical facility.
  - d) Reporting to the appropriate Authorities (Police, Coast Guard. Ministry of Tourism, etc.)
- All Dive Centre Staff must familiar with his/her Emergency Plan and be able to act appropriately.
- A Dive Centre must have an employed Base Leader who is responsible for the Dive Centre and who is present at the Dive Centre on a daily basis. In case the Base Leader is absent, an Assistant Base Leader must assume responsibility for the Dive Centre.
- A dive centre must have adequate equipment spare parts, equipment and course material for all course conducted.
- A dive Centre must have a list of all dive services and course conducted and their rates available in writing.

#### **Section 6: Dive Centre Equipment**

- Dive centre's must provide well maintained dive equipment.
- Dive cylinders must be hydrostatically tested by a facility authorized to do so by the Ministry of Tourism.
- Buoyancy compensators Device (BCD's) must be approved for recreational diving by the manufacturer and must have a Low Pressure inflator. The BCD must be maintained according to the Manufacturer's instructions.
- Regulators must be approved for recreational diving by the manufacturer and must be maintained according to the manufacturer's instructions.
- Dive Centre's must provide Alternative Air Sources, depth and timing devices as standards rental equipment.

#### **Section 7: Standard Equipment for Divers and Instructors**

- During all recreation diving activities divers must be equipped with:

- a) Mask, Snorkel, Fins
- b) Regulators with submersible pressure gauge and Alternative Air Source or redundant air supply.
- c) Buoyancy Compensator Device (BCD) vests with oral and low pressure inflator.
- d) Time and depth measuring device
- e) The use of dive computers are highly recommended for all divers
- f) Emergency signalling device comprising inflatable surface balloon and whistle
  - o During all night diving activities divers must be equipped with:
    - a) Underwater torch and night signalling device
    - b) Reflective surface marker buoy (SMB), and
      - o In addition, all the dive instructors supervising diving activities must be equipped with; knife and emergency signalling device

## **Section 8: Dive Boats**

- o Dive Boats are the responsibility of the Dive Centre and the crew.
- o Dive Boats must have at least a crew of three, and must be dedicated to the safety of the divers and supports the divers in any way they can.
- o The Dive boats operated by dive centre's must be able to communicate to the Dive Centre's must be able to communicate to the Dive Centre at all times during the dive through a functioning walkie-talkie or hand phone and radio telephone or CB set.
- o The Dive boats must have sufficient fuel to make the prearranged dive trips and any changes there to.
- o In case weather conditions deteriorate while divers are under water, the crew must be proficient in recalling methods.
- o The Dive centre staff is responsible for the provision of a spare tank, spare diving equipment, First Aid, Oxygen Kit, Dive flag and a boat ladder that allows for comfortable exit from the water.
- o The Dive flag shall be clearly visible when the divers are in the water and must be lowered when the last driver has exited the water.
- o An operational Search Light must be onboard, in all night dives involving dive boats.

## **Section 9: Safety Considerations**

- o All Dive Centre's must have an Emergency Plan as mentioned under Section 5: Dive Centre Requirements.
- o The dive Centre Staff must brief the drivers prior to every dive. The Brief must include information about safety regulations, depth limits, dive site characteristics, currents, entry and exit techniques, environmental considerations and potential hazards.
- o After all dives, a safety stop must be made for at least 3 minutes at 5 metres. Divers must commence their safety stop with a tank pressure not less than 50 bars. A safety stop at 5 meters is recommended for all dives deeper than 9 meters.
- o The use of Buoyancy Compensator Device (BCD) is absolutely mandatory for all diving activities.
- o Solitary Diving is NOT allowed under any circumstances.

- For Practical reasons the term “Diving” is used to describe recreational diving only. Commercial and military divers and other occupational divers must adhere to these regulations when participating in recreational diving activities.
- Familiarization sessions with the oxygen equipment must be provided on the dive centre for all dive staff and this training session must be held at least annually.
- No exception to the Maldives recreational diving regulations are allowed unless expressly permitted in writing by the Ministry of Tourism.

#### **Section 10: Recognized Qualification of Dive Centre Staff.**

- In order to supervise diving activities exercise leadership in diving activities, a person must: be a Dive master (RTSC) or 4-star divers (CMAS) or equivalent as per RSTC standards, have a work permit and a Resident Permit Visa if not a Maldivian national, carry professional liability insurance and Personal accident insurance covering diving accidents and chamber treatment.
- All training and certification of divers is to be done exclusively by instructor, who may be assisted by Assistant Instructors and / or Dive Masters as per standards.
- In order to function as an Instructor an individual must, in addition to the above: be certified as an Instructor (RTSC) or 2 star monitor (CMAS) or equivalent as per RSTC standard; be in teaching status with the diver-training agency whose diver training program he / she chooses to teach. Strictly adhere to all the standards that apply to the diver-training program he chooses to all the standards that apply to the diver-training program he chooses to teach.
- In order to function as a Base Leader or Assistant Base Leader, an individual must be a Dive Instructor.

#### **Section 11: Orientation Dive**

- If a diver is certified as an entry level diver or above, but cannot show proof of at least 30 dives and/or has not been diving in the last 3 months, the diver is required to make an Orientation Dive.
- An Orientation Dive is NOT a test, but is dive shallow water under quiet, controlled circumstances, where the diver is given the opportunity to regain confidence in his/her skills, including but not limited to: mask clearing, regulator recovery, neutral buoyancy, ascents, descents and alternate air source breathing.

#### **Section 12: Definitions**

In this regulation, unless the context otherwise requires:

- “diving “ means underwater recreation scuba diving
- Dive Centre” means dive schools, dive bases and all other parties that provide diving services for tourists.

The following are some of the abbreviations used by International Diving Associations referred to in this regulation

- PADI Professional Association of Diving Instructors
- NAUI National Association of Under Water Instructors
- RSTC Recreational Scuba Training Council
- CMAS Confederation Mondiale Des Activities Subaquatiques
- SCUBA Self Contained Underwater Breathing Apparatus

- BARACUDA Baracuda International Aquanautic Club
- VIT Verband Internationaler Tauchschulen (Association of International Diving Schools)
- POSEIDON Poseidon Nemrond International Diving Club

#### **4.3.3.4.2 Diving Guidelines**

The execution of a reef monitoring programme must be carried out in a organised and safe way to minimise the risk to the divers themselves and also the environment in which the boat access to and from the dive site, boat handling at the dive site, and the diving will take place. Planning and management of the whole activity must be thorough and in accordance with national regulations and guidelines as set out below. While the guidelines are primarily intended for the use by tourist divers staying on resorts, they provide the basis for a code of good practice for all diving. Of specific significance are Sections 13 and 14 which relate to the protection of the environment.

Section 16 refers to diving for Marine Research, reef monitoring would be classified in this category. Since the activity will be carried out under the auspices of the MRC, it is assumed that permissions for diving will be provided by MRC.

#### **Section 1: Planning the Dive**

- It is essential to 'dive the dive you plan'. Any changes to the plan must be notified to the Dive centre who must be aware of any changes to the dive plan of the dive boat and divers.

#### **Section 2: Weather Checks**

- It is recommended that dive centre's keep aware of local weather conditions and inform divers of any special conditions at each dive site prior to the dive.

#### **Section 3: Low-Risk Conditions**

- Maximum depth of dive site not exceed 20m
- Swell and / or wave height does not exceed 0.5m
- Current is nil to slight (diver can swim against it with minimum exertion)
- Underwater Visibility is greater than 4m
- Dive starts and ends in full daylight

#### **Section 4: Prohibited Dives**

- Decompression dives
- Dives deeper than 30m
- Dives less than 24 hours before flying (a pressured aircraft)
- Dives in restricted/no dive areas (see Section 10: Diving In Restricted Areas)

#### **Section 5: Dive Qualifications**

- A diver must present the following documents to the dive centre:
  - a) Dive certification card from a recognized agency that allows the person to dive without supervision in open water.
  - b) Log book validating open water diving experience of at 900 minutes, excluding training dives.

- c) Medical certificate dated within 12 months of diving or self-declaration stating that the person is fit to scuba dive.
- d) Completed diver registration form at the dive centre.
- e) An orientation dive may be required for persons who have not dived within the last 3 months. The dive centre may impose restrictions on a diver's activities on the basis of his / her logged experience.

#### **Section 6: Dive Tables and computers**

- Use of dive tables and dive computers are highly recommended for all divers.
- Dive tables must be available at the dive base for divers to workout their dives manually.

#### **Section 7: Dive Flag**

- The wide transport activities around the island in the Maldives make it essential that divers mark their presence clearly. Therefore, any boat with divers operating from it must always display signals by day or night to inform other boat users. In the Maldives the daytime Signal for divers is the International Code Flag "A" (White and blue split flag) approved by the Ministry of Tourism as an indication of a submerged diver. The flag must be at least 750mm in length and 600mm in width.
- Dive flag can be used anywhere where divers are diving and should always be displayed by dive boats when it has divers in the water. The use of dive is to signal any boat, jet-ski or anybody else in the vicinity that diver is underneath and hence should keep distance, or take care when approaching.

#### **Section 8: Diving from Boats**

- For all dives away from the dive centre, it is recommended that a person with the following qualifications and experience remains on the surface during diving operations:
  - a. A boat driving / captains license from Ministry of Transport and Civil Aviation and with significant experience.
  - b. Dive Centre staff with adequate knowledge of the dive location or other persons approved by the Base Leader.
  - c. First aid Certificate.
  - d. Oxygen resuscitation and therapy certificate or PADI / DAN Oxygen Provider Course.

#### **Section 9: Cylinder Pressure Testing**

- Those who are professionally engaged in the filling of compressed air are forbidden to fill cylinders that have not been hydrostatic pressure tested within the last two year. Persons employed by dive centres to fill cylinders, such as compressor boys, must be made aware of these regulations.

#### **Section 10: Diving in Restricted Areas**

- Generally diving is fairly free in Maldives, but in the vicinity of closed national security installations diving is not permitted. These areas are not always marked on maps; hence it is recommended that divers consult the Coast Guard/Ministry of Defence & National Security or the Ministry of Tourism in advance, to find out about possible restrictions.
- All the above stated are valid for the whole of Maldives. Other restricted areas are:
  - a) Ports, traffic route accesses, passages and alike. Permission has to be obtained from the Maldives Ports Authority / Harbour authorities before attempting to dive in dive in designated commercial harbours and ports.

- b) Vicinity of areas under the Ministry of Defence & National Security and near maritime vessels.
- c) In the atolls where tourism is undeveloped (outside the tourism zone), except in designated dive sites.

### **Section 11: Diving Wrecks and Underwater Artefacts**

- Maldives being a seafaring nation, it is expected that there will be many wrecks among the atolls. The imperative rule for wreck diving is: “Look but don’t touch!” Those who do not observe this rule are not only damaging the underwater wrecks, but are also obstructing future wreck diving in the Maldives. This rule applies not only to wreck diving in the Maldives. This rule applies not only to whole wrecks, but also to any separate objects found under water.
- Should you discover an underwater object the correct procedure is to mark the spot and then report to the National Centre for Linguistics and Historical Research and the Ministry of Finance and Treasury. A list of wrecks is available from the Ministry of tourism.

### **Section 12: Protection of Underwater cultural Monuments**

- Nothing should be taken out from the sea, and particularly this prohibition refers to cultural monuments. Please contact the National Centre for Linguistics & Historical Research and the Ministry of Finance & Treasury should you find any.
- Damaging and extracting cultural monuments is prohibited, as well as taking the same abroad. Underwater archaeological researches may be performed only with permits issued by the Maldivian government authorities, and the procedure is NOT covered under these regulations.

### **Section 13: Environment Protection**

- As responsible divers, reasonable care should be taken to protect the marine environment, its associated living organisms and their habitats. Divers should be briefed by the dive instructor on responsible behaviour whilst diving, such as buoyancy control, avoiding damage to corals and physical contact with marine animals. Shark feeding is NOT permitted for the divers and the dive centre staff alike.
- Activities that are detrimental to marine protected areas and protected species and their habitats are prohibited under the Environment Protection & Preservation Act (Act No. 4/93) of Maldives. Marine Protected Areas are living marine aquariums. Look but don’t touch is the message in these areas, and only permitted activities can take place. Protected areas, as their name suggests, are there to protect typical areas of the coral reef system, and its resident fish and other animals, in as near to a pristine condition as possible.
- Permit to dive in marine protected areas may be required. Please check before you venture.

### **Section 14: Damage Due to Anchoring**

- Dive boats are not allowed to anchor on dive sites. Drift boat diving is the norm in Maldives. Boat anchors destroy fish habitats especially corals and even sea-grass beds. If anchoring is required for any reason prevents reef damage by anchoring in sandy areas or using mooring buoys.

### **Section 15: Diving in Bait Fishery Areas**

- Bait fishing is an important activity for the traditional pole and line tuna fishery in the Maldives. Hence, occasionally divers may encounter fisherman collecting bait. In order to reduce conflict between local fishermen, diving should be avoided in the same area whilst fishermen are engaged in bait fishing. Any such conflicts should be reported to the Ministry of tourism through the responsible

dive centre as soon as possible. Dive centres should also keep divers informed of these traditional economic activities in the country.

#### **Section 16: Diving for Commercial Fishing & Marine Research**

- Diving for marine resources and marine research are not covered under these regulations. Permission should be obtained from the concerned government authorities before engaging in such activities.

#### **Section 17: Confiscation of Equipment**

- The Maldivian legislation provides the Police the right to confiscate objects unlawfully taken up as well as equipment in case where a diver has applied his or her equipment illegally.

environmental and social management framework

#### **4.4 Due Diligence Principles**

This Environmental and Social Management Framework (ESAMF) considers and incorporates principles of due diligence that will be applied during project preparation and implementation in managing potential environmental and social risks that may be encountered. The key due diligence principles are as follows:

***Principle 1: Review and Categorisation.*** All physical interventions will be subject to a social and environmental review and shall be categorized based on the magnitude of potential impacts and risks in accordance with environmental and social screening criteria.

***Principle 2: Social and Environmental Assessment.*** As per the GoM regulatory requirements, where necessary Initial Environmental Evaluations (IEEs) or Environmental and Social Impact Assessments (ESIAs) will be undertaken to address, as appropriate, the relevant social and environmental impacts and risks. The Assessment will also propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project as described earlier.

***Principle 3: Applicable Social and Environmental Standards.*** The Social and Environmental Assessment will refer to the applicable World Bank Operational Policies and Environmental Health and Safety (EHS) Guidelines, as well as policies and standards of the GoM. The Assessment will establish the project's overall compliance with, or justified deviation from, the respective World Bank Operational Policies, Performance Standards and EHS Guidelines where applicable. The Assessment will address compliance with relevant Maldivian laws, regulations and permits that pertain to social and environmental matters.

***Principle 4: Environmental and Social Management System.*** For all physical activities, an Environmental and Social Management Plans (ESMPs) and monitoring indicators will be developed which addresses the relevant findings, and draws on the conclusions of the assessments. The ESMPs will describe and prioritize the actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks identified in the assessments. These actions will be costed and reflected as part of the contractual documents of the civil works contracts.

***Principle 5: Consultation and Disclosure.*** For all activities affected communities will be consulted within a structured and culturally appropriate manner. If principle project activities or subproject activities are assessed to have significant adverse impacts on affected communities, the process will ensure their free, prior and informed consultation as a means to establish whether those activities have adequately incorporated affected communities' concerns. In order to accomplish this, this framework as well as all other safeguard instruments will be made available to the public by the borrower for a reasonable minimum period. The process will be documented and account will be taken of the results of the consultation, including any

actions agreed resulting from the consultation. For projects with adverse social or environmental impacts, disclosure will occur early in the Assessment process, and on an ongoing basis.

***Principle 6: Grievance Redressal Mechanism.*** To ensure that consultation, disclosure and community engagement continues throughout project implementation, a grievance redressal mechanism will be established, scaled to the risks and adverse impacts of the project or subproject, as part of the management system. The grievance redressal mechanism will allow for concerns and grievances about the project's social and environmental performance raised by individuals or groups from among project-affected communities to be received and to facilitate resolution of those concerns and grievances.

***Principle 7: Monitoring and Reporting.*** All ESMPs will be monitored based on the monitoring schedule identified in the ESMP by the relevant responsible party. The Environmental and Social Coordinator will be responsible to ensure the monitoring activities have taken place including his/her monitoring and consolidate monitoring report is prepared bi-annually.

***Principle 8: Training.*** Training to ensure project staff, staff of civil contracts and other parties who would play a role in managing environmental and social impacts will be necessary to ensure successful implementation of this ESMF. Necessary budget should be allocated to carry out the training plan.

## **4.5 Framework Structure**

### ***4.5.1 Screening***

At the national level, screening is the process by which proposed developments are reviewed to determine the level of environmental assessment to which they should be subjected, which could range from none at all up to a full Environmental & Social Impact Assessment (ESIA). At the project level, screening is the process of reviewing a proposed activity against a checklist of factors to determine whether it is likely to have adverse environmental effects, and if so, what mitigation measures should be applied. The present ESMF is largely concerned with the project level, but some notes are provided on national screening for completeness.

#### ***4.5.1.1 National Level Screening***

The Maldives national requirements for environmental assessment are set out in the Environmental Impact Assessment (EIA) Regulations, 2007. Part III of those regulations includes a description of the Screening Process applied to development proposals. Schedule D of the Regulations is a screening list of all development types for which full EIA is mandatory. It is not expected that any of the interventions proposed under the Wetlands Conservation Component will fall within Schedule D.

Proposed developments that do not fall within Schedule D are subject to manual screening by the EPA, for which a Screening Form must be submitted providing relevant development details. Within 10 days, the EPA will decide whether the proposed development is approved, or needs further study, which may be required in the form of an Initial Environmental Examination (IEE) or a more detailed EIA.

Unfortunately, the EIA Regulations do not specify a threshold of development size below which even screening will not be required. This means that, in theory, every development, however small, needs to be screened by the EPA. In practice, small developments are submitted to the Local Council for approval and, if appropriate, the Council may require the proposed development to be submitted to the EPA for screening. However, EPA should be consulted at the outset, to determine whether the formal national screening process should be applied

#### ***4.5.1.2 Project Level Screening***

At the project (component) level, proposed sub-component activities need to be subjected to screening to determine whether they should be subject to an Environmental / Social Review. (This is a simple review, by the component team, of the likely implications of the activity, to determine whether it is acceptable, and if so, whether

any particular mitigation measures should be applied.). The objective here is to provide a level of environmental / social review that is appropriate to the small scale of the sub-component activities, i.e. without the need to conduct an ESIA.

All island waste management activities proposed in the IWMP will be the subject of an environment and social screening as the key management tool for identifying and assessing risk of environmental and social impact. An outcome of the above environmental and/or social reviews will, in most cases, be the development of Environmental and Social Management Plans (ESMPs). Where there are little or no environmental or social issues the proposed activities may move to implementation.

#### ***4.5.1.3 Screening elements***

##### ***4.5.1.3.1 What Type of Development?***

The following types of proposed sub-component activity will require Environmental / Social Review within the component:

- Drainage construction or improvement (excluding maintenance)
- Construction of bund walls, berms or embankments
- Road, track or footpath construction
- Public toilets
- Effluent treatment facility
- Waste clean-up activities
- Waste management facility
- Construction of permanent ecotourism buildings (restaurant, education/info centre, shop, etc).
- Construction of waterside facilities (filled or piled landing stage, etc)

##### ***4.5.1.3.2 What Kind of Area?***

Sub-component activities to be conducted within the following areas will require Environmental / Social Review within the component:

- Open water bodies (fresh, brackish or marine)
- Wetland margins
- Mangroves
- Shores
- Coconut plantations

##### ***4.5.1.3.3 How Could it Affect the Environment?***

Proposed sub-component activities that could potentially cause the following adverse impacts, either directly or indirectly, will require Environmental / Social Review within the component:

- Negative social effects
- Negative economic effects
- Degradation of land
- Pollution of surface or ground water
- Interruption of the hydrological cycle
- Air pollution
- Reduction of, or damage to, wildlife and habitat

- Reduction of, or damage to, agriculture
- Reduction of, or damage to, critical natural resources
- Loss of, or damage to, cultural, religious, historic or archaeological property

#### ***4.5.1.3.4 How Serious Could the Impact Be?***

Proposed sub-component activities that could potentially cause adverse / negative / harmful effects having the following characteristics, will require Environmental / Social Review within the component:

- Impacts that will be of a significant extent (area)
- Impacts that will be of a significant intensity (degree)
- Impacts that will be of long duration
- Impacts that will be irreversible
- Impacts that may have cumulative or synergistic effects
- Activities that will be of uncertain effect
- Impacts that may be locally or nationally controversial
- Potential for the contravention of laws, conventions or regulations.
- Activities that will have unequal effects on the genders or on vulnerable groups

## **4.6 Negative List**

The screening checklist mentioned above are intended to assist those responsible for the component and related activities to determine the acceptability of physical activities that may be proposed as sub-components during implementation of the project. However, there are some particularly damaging activities that should not even be considered within the component, as follows:

- Construction of permanent buildings within the wetlands (excluding hides, etc., made of biodegradable materials).
- Construction of paved roads within the wetlands (excluding boardwalks)
- Construction of walls in or around wetlands which will interrupt water flow
- The ‘tidying’ of wetlands or mangroves by the removal of dead wood
- The introduction of any species of fish or water plant to the wetlands
- The use of non-native species for the formation of boundary hedges
- The burning of any material (including previously dumped wastes) in the wetlands
- Any sub-component that would require the demolition of a permanent house

## **4.7 Environmental and Social Standards and Guidelines**

Screening will identify proposed sub-component activities that may have adverse environmental and/or social consequences, and which therefore need careful review and identification of mitigation measures. In addition, the Negative List above identifies activities which should not be considered at all. The third step of environmental management is the application of Environmental and Social Standards and Guidelines to those sub-components that screening finds to be applicable. They include both management guidance and possible mitigation measures, as outlined in the paragraphs below.

The application of these guidelines will require appropriate judgement and balance by the component implementation team. For tasks that are relatively small and simple, it may appear to be ‘overkill’ to introduce lengthy guidelines and formal training. The danger is that if such arrangements are perceived to be unnecessarily complex, the workers concerned will simply ignore them. A balance will therefore be needed that ensures protection of the environment by providing an appropriate level of engagement with the workforce.

#### ***4.7.1.1 Management of Environmental Issues***

It is recommended that the project / component should adopt over-arching principles of engagement. This should be developed in consultation with stakeholders at the start of the project and be disseminated to all people working on the project and to project partners. This can be as simple as ‘Do no harm to the environment and natural resources’, but it will be a reminder to all that even an obviously beneficial sub-project could have some harmful consequences.

The component team should always include the Environmental and Social Coordinator and Officer who will take responsibility to ensure Environmental Management. They would be responsible for undertaking the initial screening together with the relevant council and EPA, ensure appropriate assessment and/or preparation of ESMPs takes place in a timely manner and included in contract documents and monitoring environmental performance and reporting. Similarly, a member of the team should be allocated responsibility as Community Liaison Officer to deal with relations with people who may be affected by the development, construction or operation of sub-components.

The implementation of most of the mitigation measures will lie with the selected contractor during construction stage and implementation of mitigation measures during operations will be the responsibility of the site owner or operator. Facilities developed within the protected areas will be the responsibility of EPA unless the operations have been delegated to for example island/atoll/city council with adequate oversight and guidance by the EPA. Other facilities such as drainage outside protected areas, as well as the IWMCs will be managed by the respective island/atoll/city council with EPA monitoring as the EIA regulator.

#### ***4.7.1.1.1 Management of Construction Sites***

It is acknowledged that most of the physical sub-components will be small-scale activities undertaken by local communities or local contractors. Nevertheless, it is necessary to apply best practice management measures to ensure that the work will have a minimum effect on the natural environment.

- Vehicles must not be washed at construction sites.
- All liquid fuel and lubricant storage tanks must be ‘bunded’ to retain the entire contents of the tank in the event of leakage or rupture.
- Construction sites must be watered to suppress dust whenever appropriate during the dry season.
- All site drainage water must be passed through a sediment trap.
- Care must be taken to prevent cement laden drainage water from entering the wetlands.
- Temporary toilets must be provided for construction workers.
- All sewage must be treated before discharge, e.g. using septic tanks.
- All effluents must comply with any national environmental standards.
- All emissions (e.g. from engines, crushers, batching plants, etc) must comply with any local environmental standards.
- All motor-driven generators, compressors, pumps, etc., must be properly silenced.
- The running of machinery and lighting in the vicinity of housing must be limited to normal working hours.
- All solid wastes must be properly disposed of (see 6.4.1.1.2) Management of construction solid wastes and toxic wastes below).
- Proscribed toxic and hazardous substances must not be used or disposed of (see below).
- All plant, equipment and wastes must be removed at the end of construction, and each site must be restored to its original condition.

- A Code of Practice must be issued to all construction workers. This should specify required behaviour, e.g.:
  - No unauthorised cutting of trees or branches.
  - No lighting of fires.
  - No hunting or fishing.
  - No disposal of any kind of waste into water courses
  - Behaviour to comply with defined local cultural and religious sensitivities.
  - No unauthorised entry onto private property
  - Recommended health protection measures (see also 6.4.1.1.6 - Health and Safety below).

*Environmental Standards* – Contractors must comply with any national environmental standards. In the absence of relevant national standards, international standards should be applied, e.g. as published in the World Bank Pollution Prevention and Abatement Handbook, 1997.

*Toxic and Hazardous Materials* – Contractors must not use any substances which are internationally banned.

#### **4.7.1.1.2 Management of construction solid wastes and toxic wastes**

- Waste generation is to be minimised. The treatment of waste should follow the hierarchy: Avoid > Minimise > Reuse > Recycle > Treat > Dispose.
- All waste arising during construction is to be disposed of to the island's recognised waste disposal site. Recyclable materials (e.g. glass, cans, plastics, paper) should be separated and recovered. Organic waste should be composted.
- Any toxic or hazardous waste must be either returned to its source, or stored and disposed of separately in consultation with EPA; this includes oil filters, batteries, empty paint cans and the packaging of toxic construction materials.
- The empty containers of toxic or hazardous liquids must be punctured or crushed to avoid them being used subsequently for drinking water.
- Waste lubricating oil is to be stored prior to recycling.
- Vehicle batteries are to be stored prior to recycling.
- Vehicle tyres are to be stored prior to recycling.
- Construction generated wood, paper, glass bottles, cans, plastic and other recyclables are to be separated and recycled.
- No waste is to be burnt.

#### **4.7.1.1.3 Management of Land**

- Topsoil must be removed and stored for future use, before any further excavation work.
- In the case of temporary land take in agricultural areas, the positions of all walls, fences and hedges should be recorded, and they should be replaced at the end of construction.
- All land used temporarily during construction must be restored to its pre-construction condition.
- Cut and fill volumes must be planned to minimise the generation of spoil.
- Spoil from excavation must only be disposed of in planned spoil disposal sites that have been approved by the EPA; specifically, excavated spoil must not be dumped in wetlands or lagoons or on agricultural land. Completed spoil heaps must be profiled, covered in topsoil and grassed to maintain stability.
- All excavations below ground level should be bunded to prevent water inflow or outflow.
- Water pumped out of excavations should be passed through a settlement facility before disposal.
- The use of heavy machinery should be minimised to avoid soil compaction.
- Arrangements must be made for the halting of work and the consultation of specialists from the National Museum, in the event that any potential archaeological remains are uncovered during excavation.

#### **4.7.1.1.4 Management of Transport**

- All vehicles must be in a safe and legal condition with respect to all of their systems.
- All vehicles must comply with national regulations on emissions and noise.
- All drivers must be properly licensed for the class of vehicle they are driving.
- All vehicles must carry a fire extinguisher and first aid kit.
- All construction vehicles must have upward facing exhaust pipes.
- All vehicles must have audible indicators for reversing.
- Public roads must be promptly cleaned if affected by material loss.
- Truckloads of construction materials or spoil must be covered to prevent dust or losses.
- Where public roads are to be used, an official 'construction route' is to be defined, avoiding housing as much as possible, and this route should be marked with road signs.
- Unsurfaced haul roads must be watered to suppress dust whenever appropriate during the dry season.
- Vehicles must not be washed at construction sites.

#### **4.7.1.1.5 Community Facilities**

- Consultation is required with neighbouring communities before the start of construction, to identify any notable features or issues of local concern.
- Features that are to be protected during construction (cemeteries, mature trees, wells, etc) should be marked with brightly coloured tape.
- Excavation works below ground level in the vicinity of settlements should be marked with posts and tapes for safety.
- Temporary bridges or diversions must be provided wherever existing footpaths, tracks or roads are to be cut by construction works.
- Temporary water supplies are to be provided where either an existing water source is to be interrupted by construction, or access to the existing supply is severed.

#### **4.7.1.1.6 Health & Safety**

- All employed construction workers must be given a medical examination (including sight and hearing tests) before being accepted for employment. This must be repeated annually. The results of these medical examinations must be kept by the contracting company.
- All employees must be given printed information on the health implications of their work and how to avoid problems. This should incorporate advice in the field of sexually transmitted diseases (STDs), including HIV / AIDS.
- All construction workers must be given H & S training.
- All construction workers must be provided with a set of appropriate personal protective clothing and equipment (e.g. hard hat, hard boots, leather gloves, ear defenders and dust mask). Workers are required to wear appropriate protective equipment before being allowed on active construction sites.
- A 'permit to work' system is to be instituted for all work at hazardous locations, e.g. working over water or in boats.
- All excavations below ground level should be marked with posts and tape.
- Drinking water, toilet and washing facilities must be provided at each active site.
- Each active site must be equipped with a comprehensive First Aid kit and eyewash bottle.
- All construction vehicles must carry a fire extinguisher and first aid kit.
- All (legal) toxic or hazardous materials (e.g. water chlorination agents) must be stored in a locked, waterproof, ventilated enclosure.
- All compressed gas bottles must be stored, chained in the upright position, in a locked ventilated enclosure.

- International occupational health standards must be applied to all contractors' workplaces. Contractors should consult the World Bank Environment, Health and Safety Guidelines.

#### **4.7.1.2 Guidelines related to IWMCs**

The detailed guidelines in the planning, improvement and operationalizing IWMCs are provided in Appendix L which includes construction specifications, guide for creating an island waste management plan and community mobilization plan. An initial environmental evaluation as per the Maldives Environmental Impact Assessment Regulation 2007 will be conducted for each IWMC identified to be upgraded and site-specific environmental and social management plans will be developed.

### **4.8 Environmental and Social Assessment**

As discussed under 'Screening' above, the initial step in sub-component implementation will be consultation with the Atoll Council (Fuvahmulah) or Island Council (Hithadhoo). If the council decides that national level screening is required, a Screening Form will have to be completed and submitted to the EPA. The EPA will then decide whether the proposed sub-component can be simply approved, or needs further study in the form of an IEE or an EIA. Schedule E of the EIA Regulations, 2007, defines the required format and contents for an IEE and an EIA. These are the general ToRs to be applied to any IEE or EIA. The proponent (in this case, either the sub-component Project Coordinator or the appropriate local council or the relevant agency) is required to submit specific ToRs for the IEE or EIA to the EPA for approval. The details of that ToR will be governed by the nature of the physical project proposed.

#### **4.8.1 Initial Environmental Evaluations (IEEs)**

Initial Environmental Evaluation for island waste management activities is a requirement of the Maldives Environmental Impact Assessment Regulation 2007. The screening process is the first step in the EA process. The objective of the IEE screening process is to rapidly identify environmental and social aspects of the island environment which may be impacted upon by the proposed island waste management activities.

#### **4.8.2 Environmental and Social Impact Assessments (ESIAs)**

All ecotourism and drainage activities will require full-scale ESIAs carried out as per the national EIA regulation. Only new construction of IWMCs will require ESIAs. In the case of this project since only improvements to the existing IWMCs is necessary, only ESMPs will be adequate.

#### **4.8.3 Environmental and Social Management Plans (ESMPs)**

All physical sub-projects/activities will prepare ESMPs that will describe and prioritizes the actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks identified in the screening assessments, IEEs or ESIAs. A generic terms of reference for ESMP is provided in Appendix M.

Measures and actions that address identified impacts and risks will favor the avoidance and prevention of impacts over minimization, mitigation wherever technically and financially feasible. Where risks and impacts cannot be avoided or prevented, mitigation measures and actions will be identified so that the activities operates in compliance with applicable national laws and regulations etc., and meets the requirements of relevant World Bank standards.

#### ***4.8.4 Physical Cultural Resources – protection and chance find procedures***

If any person discovers a physical cultural resource, such as (but not limited to) archeological sites, historical sites, remains and objects, or a cemetery and/or individual graves during excavation or construction, the Contractor shall:

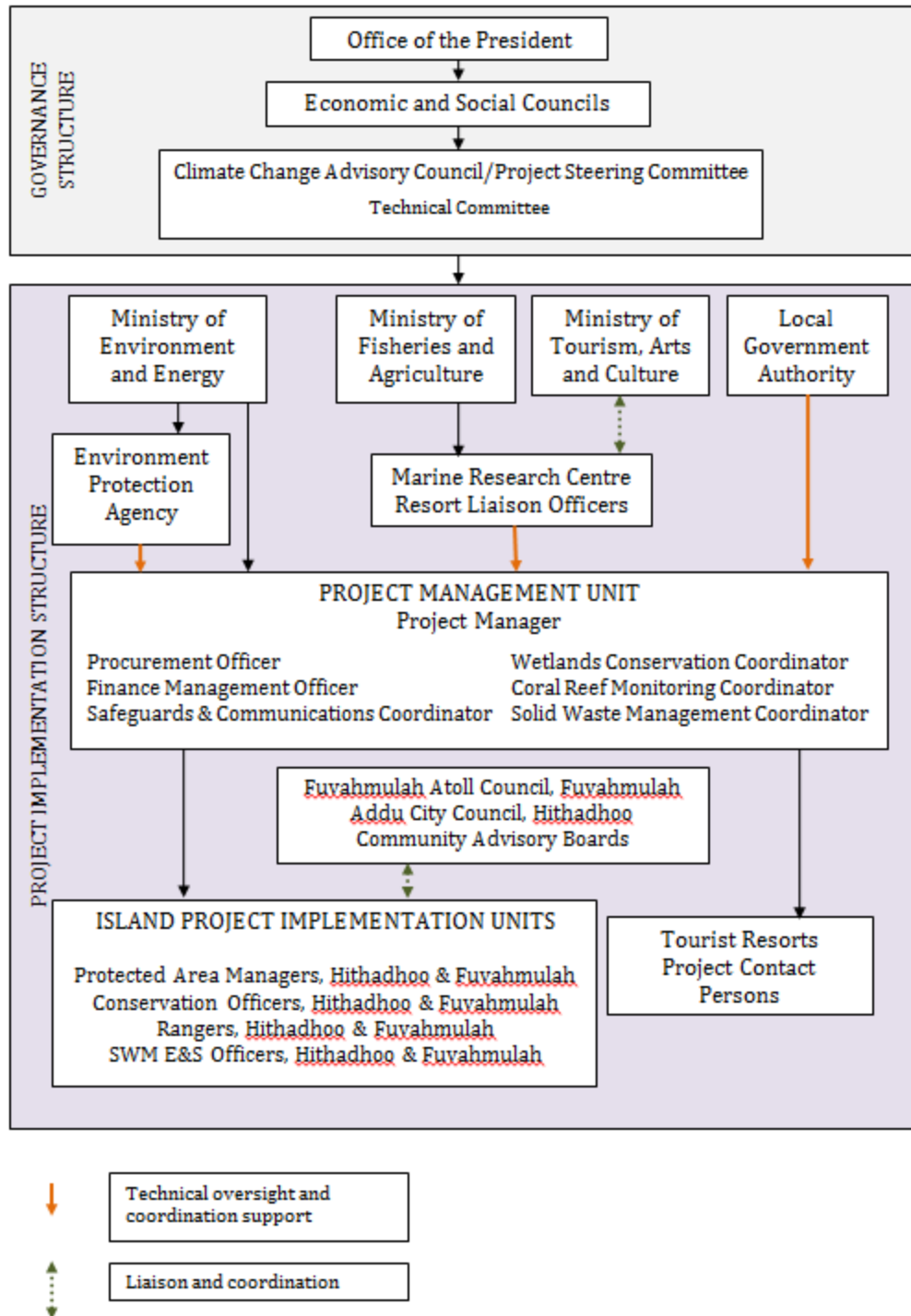
1. Stop the construction activities in the area of the chance find;
2. Delineate the discovered site or area;
3. Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible authorities take over;
4. Notify the Supervising Officer who in turn will notify the responsible authorities immediately (within 24 hours or less);
5. Responsible authorities are in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by archeologists. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values used by the GoM;
6. Decisions on how to handle the finding shall be taken by the responsible authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance) conservation, preservation, restoration and salvage;
7. Implementation for the authority decision concerning the management of the finding shall be communicated in writing by relevant local authorities; and
8. Construction works could resume only after permission is granted from the responsible local authorities concerning safeguard of the physical cultural resource.

Construction works could resume only after permission is granted from the responsible local authorities concerning safeguard of the physical cultural resource. The Supervising Officer must have capacity to manage the processes in the plan. At a minimum, expert opinion should be sought from government agencies or specialist consultants for the following:

- ☐ Issues with relocation / removal that cannot be resolved through the procedures in this plan.
- ☐ Restoration of damages to physical cultural resources or graves caused by construction

#### ***4.8.5 Institutional Arrangements***

The overall institutional arrangements for implementation of the project and its components are shown in Figure 10.1 below. Currently, the PMU has an Environmental and Social (E&S) Coordinator who will continue to play a central role of managing both CCTF phases I and II safeguards requirements. He/she will report to the Project Manager and will work closely with the Wetlands Coordinator; Solid Waste Management Coordinator and Coral Reef Monitoring Coordinator. The E&S Coordinator will be responsible for ensuring the overall implementation of environment and social plans and will also liaise with other agencies, contractors and engineering supervisors at the island level to implement safeguards mitigation measures, monitoring and evaluation of implementation and report on compliance and status of performance indicators. The field level responsibilities to monitor and report on safeguards will lie with the Conservation Officers that will be located in Fuvahmulah and Addu. The E&S Coordinator will take the leadership to orient staff and implementing partners of the ESAMF and how to operationalize it on the ground. The Conservation Officers at the island level will also be first level of contact for any grievance / feedback for the community.



*Figure 5.8: Project Institutional Arrangements*

Engineering staff or consultants that will be assigned will also ensure the necessary mitigations measures identified in the ESMPs are implemented by the contractors. In addition, contractors will be responsible for the

implementation of the respective ESMPs and will be required to prepare a method statement for approval by the E&S Coordinator to be submitted through the engineer to the activity.

Monitoring efforts should include the following:

- Regular inspection to determine compliance with the stated management measures with respect to excavation, spoil disposal, wetland protection, treatment and revegetation of land, etc.
- Regular inspection to determine compliance with mitigation measures with respect to community facilities, disturbance, land acquisition, etc.
- Regular inspection to determine compliance with defined truck routes.
- Sampling and analysis of any construction site drainage water discharges.
- Noise monitoring at active construction sites near to housing or noise sensitive receptors (e.g. school, hospital).

A final monitoring report should be prepared at the end of construction. This will be an environmental and social audit, which will report that the construction has been completed in full compliance with the respective ESMP. If necessary, it will identify any remaining environmental or social problems that need to be addressed before final payments are released to the contractors.

Simplified monitoring reports that use photographs to report on ESMP implementation will be adopted. These are to be prepared by the Conservation Officers and submitted to E&S Coordinator on a monthly basis. E&S Coordinator will use these reports to determine any significant issues he/she will need to check and correct. E&S Coordinator will also consolidate the reports submitted by Conservation Officers, as well as his/her own supervision reports and submit to Bank trimesterly.

The MRC will be responsible for arranging the training of divers and others who will participate in the monitoring programme under the Coral Reef Monitoring Component. The training by contracted instructors will need to be sensitive, i.e. it will need to take into consideration that all diver participants will be certified resort divers who already have an understanding of best practice. Nevertheless, all participants should be introduced to the best practices and environmental guidelines set out above, and certified as having completed the training provided.

The MRC will also be responsible for monitoring and supervision of the work of the participants to ensure that these best practices are properly applied. Again, this will need to be done in a sensitive manner, bearing in mind that the participants are all volunteers upon whom the project depends. The supervision will cover both the technical/scientific aspects of monitoring and also the health and safety aspects of putting divers into the water.

The project is not a social development project except in terms of capacity building for local government and, to the extent possible, in the community. The only social indicator identified in the project's results framework is "Participation of Local Councils and community stakeholder groups in decision making on wetland management". In this case participation can be measured by (i) minutes of meetings where decisions are taken concerning the wetlands, and (ii) the attitudes and perceptions of stakeholders towards the project and project activities and products, determined through interviews and focus groups.

No gender-specific negative impacts of project activities have been identified, and therefore it is not considered necessary to develop any specific gender-related indicators. This assumes that the project implementing staff apply normal best practice to the design of the participatory planning process, workshops etc. to ensure the inclusion of women as well as men and to target communication messages appropriately.

#### ***4.8.5.1 Assessment of Local Capacities***

##### ***4.8.5.1.1 Environment Protection Agency***

The EPA is a small organisation with major responsibilities. As with other arms of government it is being weakened by cuts in government spending and by loss of skilled staff through redundancy programmes. However, the EPA provided three of its staff on a part-time basis to coordinate the technical work on Wetland Component and roof water harvesting and to coordinate the environmental and social safeguards requirements in CCTFI. EPA is committed to providing two part-time staff under CCTFII. The challenge and risk is for the Agency to recognise the value of the CCA Project to delivering its mandate.

##### ***4.8.5.1.2 Marine Research Centre***

The MRC is also a small organisation with major responsibilities. As with other arms of government it is being weakened by cuts in government spending and by loss of skilled staff through redundancy programmes. However, the MRC has provided one of their staff, during CCTFI, on a part-time basis to provide liaison with resorts and to ensure that safeguards requirements are met. MRC is committed to providing three part-time staff under CCTFII. The challenge and risk is for the Center to recognise the value of the CCA Project to delivering its mandate.

##### ***4.8.5.1.3 Local Government Authority***

The LGA is tasked with supporting implementation of the Decentralisation Act and is heavily stretched. However, it views mainstreaming climate change as critical to its mandate and is accordingly supportive. It has already delivered training in mainstreaming climate change into island development planning in all Atolls in Maldives in CCTFI and has the practical experience and capability to support a similar, albeit more intensive, exercise under the CCA Project.

##### ***4.8.5.1.4 Maldives National University***

MNU already has a training programme to which CCA sponsored candidates will enrol.

##### ***4.8.5.1.5 Atoll Council of Fuvahmulah***

The council itself is small enough (six persons) to be able to hold effective and participatory meetings and currently has strong and dynamic leadership. The council's secretariat has a number of technical and administrative staff fully occupied with their respective duties, but, as with other islanders, interested in professional development and the acquisition of new skills and knowledge.

##### ***4.8.5.1.6 Addu City Council and Town Board***

The council itself is small but has a very heavy work load since it is responsible for the entire atoll. The council's secretariat has a number of technical and administrative staff fully occupied with their respective duties. The Town Board is to be disbanded and replaced by an elected body in the near future. The Board's technical and administrative staff will, presumably, continue to serve the new body. In general all staff (and councillors) are interested in professional development and the acquisition of new skills and knowledge.

##### ***4.8.5.1.7 Local residents of Fuvahmulah and Addu***

As is to be expected, local residents vary in their skills, knowledge, attitudes, and interest in the wetlands and in other environmental issues, and in their domestic resources and time. Some of the older generation have significant indigenous knowledge concerning the wetlands and other aspects of the island's history and recent development. Some of the younger generation have significant information technology skills and are fully wired into the modern world.

#### **4.8.5.1.8 NGOs / CBOs**

Key informants on the islands consider that few NGOs are active. In Addu, events such as Earth Day are used to spur community action on problems such as solid waste (e.g. beach cleanups). These have significant educational and awareness value. However, all the NGOs are small and have few resources. In Fuvahmulah, because the island is small they are able to advocate effectively on topics such as human rights.

#### **4.8.5.1.9 Education sector**

Information from a key informant meeting indicated that although environmental education exists in the curriculum its teaching could be upgraded with additional resources and equipment.

#### **4.8.5.1.10 Capacity-building**

The project provides a significant opportunity to start building environmental and social management capacity on the island, but it must be realised that planning and management of the wetlands is only one among many environmental management and development issues competing for stakeholders' time and energy. The project activities themselves are intended to build capacity (i) in local government, and (ii) the community and it is not considered necessary to augment them at this stage of project preparation.

### ***4.8.6 Grievance redress***

A three tier grievance mechanism, prepared and tested under CCTFI WCCM, will be established which will be accessible to all community members. The Island Council will be the first level of contact for any aggrieved person. The Community Advisory Board developed under CCTFI WCCM will be further strengthened and complaints received by the Island Council will be sent to the Community Advisory Board for advice as appropriate. In case the aggrieved person is not satisfied, he or she can approach Ministry of Environment and Energy. The E&S Safeguards Coordinator in the PMU will be the contact person in MEE. In case the issue is not resolved, the aggrieved person has the option of approaching judiciary. In cases where vulnerable persons are unable to access the legal system, the Attorney General's office will provide legal support to the vulnerable person(s). The PMU will assist the vulnerable person(s) in getting this support from the Attorney General's Office. The PMU will also ensure that there is no cost imposed (such as for travel and accommodation) on the aggrieved person if the person belongs to the vulnerable groups. The verdict of the judiciary will be final.

The project specific Grievance Mechanism is summarized below:

<b>Tiers of Grievance Mechanism</b>	<b>Nodal Person for Contact</b>	<b>Contacts, Communication and Other Facilitation by Project</b>	<b>Timeframe to address grievance</b>
<b>First Tier:</b> Island Council (Community Advisory Board)	Island Council is the first level of contact in case of any grievance.  Once the Community Advisory Board has been created, it will be the first level of contact in specific grievance related to	<ul style="list-style-type: none"><li>• In the Administration Area of the Protected Area there will be an Information Board listing the names and contact telephones.</li><li>• In the Administration Area of the Protected Area it will be taken one public meeting with pre-decided schedule organized unless every three months.</li></ul>	15 days

	the management of the protected area or any other issue related to land; access and adverse impacts on the community.		
<b>Second Tier:</b> Ministry of Environment and Energy (MEE) – ESDD of the Project Management Unit (PMU).	For wetland protection, will forward the grievance to the ESDD Coordinator of the PMU.	<ul style="list-style-type: none"> <li>Only after exhausting the first and second tiers.</li> <li>Website advertisement, public notices in print media.</li> <li>The aggrieved person can attend the hearing by PMU in person. The ESDD Coordinator will be responsible to ensure that there is no cost imposed (such as for travel, etc.) on the aggrieved person if the person belongs to the vulnerable groups.</li> <li>Further, the project will assist the vulnerable aggrieved person if such a person is requested to attend the hearing in person.</li> </ul>	60 days
<b>Third Tier:</b> Judiciary Power / Assistance to Vulnerable Persons beyond the Project's Grievance Redress Mechanism	Judges will remain as an option for an aggrieved person and/or community in case that the others tiers haven't been effective.	<ul style="list-style-type: none"> <li>Only for vulnerable person(s) as per the grievance mechanism of the project.</li> <li>Only after exhausting at least both of the second and third tiers of the grievance mechanism.</li> </ul>	As per established judicial procedures

#### ***4.8.7 Communication Strategy & Consultation Plan***

The project's communication strategy should be aimed at:

- (i) managing resident's and other stakeholders' expectations: this is a small project with a very short timescale; it will not bring physical solutions to problems such as flooding, and will not provide significant employment or generate significant economic opportunities although there will be some support for protected wetlands linked environmentally friendly livelihoods;
- (ii) generating inclusivity in the planning process by emphasising that the planning process will develop solutions to real problems rather than just create a heavier workload for the administration;
- (iii) there is a real issue of youth disaffection on the islands (e.g. under-attainment in education because of a "what's the point" attitude; unemployment; increasing drug use) and there are constraints on the quality of environmental education in schools; the project could make a small contribution to both aspects.

The project team lead by the E&S Coordinator has undertaken number of consultations during the project preparation and summary of the consultations are provided in Appendix N. Further consultations will be included as part of number of consultancies for wetlands conservation, coral reef monitoring solid waste management and mainstreaming climate change into island development planning during implementation. These will be duly documented in the respective outputs of the consultancies. In addition, the technical coordinators, E&S Coordinator and the Conservation Officers will undertake continuous consultations with stakeholders and report as part of monitoring.

#### ***4.8.8 Training***

Training will be provided for the Conservation Officers on how to monitor and report on environmental and social safeguards requirements by the E&S Coordinator. They will be also provided training on the use of Grievance Redressal mechanism, consultations and reporting.

All contractors' are expected to disseminate and create awareness within the workforce ESMP compliance, and any staff training necessary for their effective implementation. Where contractors do not have existing environmental staff, E&S Coordinator and Conservation Officers will make arrangements for adequate capacity-building within the workforce to be involved.

Where construction work is to be undertaken by community members, training should be provided by the E&S Coordinator and Conservation Officers of the project team. That training should consist of an introductory talk, dissemination of the guidelines, and an on-site talk prior to the start of each new task within component implementation.

## 5 GENDER DEVELOPMENT FRAMEWORK

### 5.1 Status of women in Maldives

The gender assessment carried out by Asian Development Bank in 2007 points out that despite Maldivian women being among the most emancipated in South Asia and the Islamic world, there are concerns related to the fact that few women actually participate in the labor market, that the share of female-headed households is amongst the highest worldwide, and that female-headed households are especially vulnerable to poverty.

The Human Development Report, 2013 shows that Maldives has a GII value of 0.357, ranking it 64 out of 148 countries in the 2012 index. In Maldives, there is no institutional discrimination along gender lines in access to education and health services or for jobs in the public sector. School enrollment rates for girls and boys are almost the same and are very high (at 94% for primary and 55% for secondary school) as are the adult literacy rates (98%). Women are employed in the government and in manufacturing, and they account for 70% of active persons in agriculture. Despite all this, in Maldives, 6.5 percent of parliamentary seats are held by women, and 20.7 percent of adult women have reached a secondary or higher level of education compared to 30.1 percent of their male counterparts. For every 100,000 live births, 60 women die from pregnancy related causes; and the adolescent fertility rate is 10.2 births per 1000 live births. Female participation in the labour market is 55.7 percent compared to 76.8 for men.

The ADB study of 2007 points out following gender related issues:

- Gender gaps persist in various aspects of social development due to stereotypes and limited opportunities for women to work outside the home.
- The female employment participation rate has declined from 60% in 1978 to 21% in 1995—from one of the highest in the region to one of the lowest in the world.
- Divorce is very common in the Maldives and the divorce rate remains high despite the introduction of the codified Family Law in 2001.
- The Maldives has one of the highest rates of female-headed households in the world, at 47%. Almost a quarter of these had no income-earning member, with only 21% economically active in the week preceding the census.
- Malnutrition is a major contributor to complications and mortality of women during childbirth, and underweight babies. Women are also at risk during complicated pregnancies due to the lack of affordable transport to atoll referral hospitals or the capital in the case of complications experienced while giving birth.
- The Maldives has a legal system that is a combination of common law and *Shariah* provisions. The main areas where women face legal obstacles to their participation in development are property rights, inheritance and provision of legal evidence. In *hudood* offenses, a woman's word does not carry the same weight as a man's in a *Shariah*-based court of law, therefore in cases of sexual offense, it is a man's word against a woman's, with onerous provisions for presentation of evidence such as medical documentation of injuries.
- Violence against women is a serious problem which is largely ignored by the legal system, with recent Government reports estimating that one in three Maldivian women aged 15-29 had experienced some form of physical or sexual violence at least once in their lifetime.
- The rules of inheritance favour men, as they are defined in terms of the person's relationship to the deceased, and assume that men will provide maintenance for women automatically.
- Gender discrimination exists in the realm of public service and politics. Only 15% of the legislators and senior officials in the Maldives are women.
- The government is the largest employer in the Maldives, and employs 62% males and 38% females. Females however make up 54% of temporary government jobs and are concentrated in the education, health and welfare sectors, whereas males dominate in the services sector and the senior ranks of the public service. Women are also under-represented in positions of political leadership. There are four women in the

cabinet of 22 (13.6%), 6 women in the Majlis out of 50 (12%) and 11 women in the Special Majlis out of 113 (9%).

## 5.2 Gender Development Framework

Gender Development plan is being designed under the project as part of ESMF which will help analyze gender issues during the preparation stage of sub project and design interventions. At the sub project level, gender analysis will be part of the social assessment and the analysis will be based on findings from gender specific queries during primary data collection process and available secondary data. The quantitative and qualitative analysis will bring out sex disaggregated data and issues related to gender disparity, needs, constraints, and priorities; as well as understanding whether there is a potential for gender based inequitable risks, benefits and opportunities. Based on the specific interventions will be designed and if required gender action plan will be prepared. The overall monitoring framework of the project will include sex disaggregated indicator and gender relevant indicator.

The participation of beneficiaries and focus on poverty reduction are two other key determinants of the effectiveness and sustainability of any project. Any project must address the constraints on women's participation in project both at design stage as well as during construction. The project must also focus on the linkage between gender and poverty, by identifying, for example, households headed by females and those households' special needs. An adaptive, learning, and process-oriented approach works better than a blue print approach; continuous dialogue between the executing agency and the beneficiaries is therefore important. Project beneficiaries are likely to have a stronger sense of ownership when the project gives them enough time, design flexibility, and authority to take corrective action. In this way, they find it easier to incorporate their earlier learning and negotiate with project staff and service providers. Therefore, a mechanism must be built into the project to allow such two-way interactions between the beneficiaries and the service providers. Therefore gender analysis will be an integral part of the initial social assessment at the screening stage itself.

The GD framework outlines the specific issues linking with corresponding strategies and activities which will be given due consideration in the project. This will ensure women's participation in the value-chain in order to benefit from project activities. The major tools are used to identify and deal with gender issues in the project cycle: gender analysis, project design, and policy dialogue.

*Gender analysis should* be an integral part of the initial social assessment at the screening stage itself. The issues identified can be scaled up during the feasibility and detailed analysis can be carried out during the DPR stage.

The project designs should be gender responsive based on the gender analysis, and should be included in the DPR. The findings and recommendations from the gender analysis during project planning and feedback from beneficiaries during implementation must be discussed thoroughly to determine the need for further action.

**Suggested Gender Development Plan for the project is presented below.**

Gender issues	Strategy	Proposed activities
Lack of awareness	Awareness campaign about the project for the community focusing on the vulnerable group including women.	Formation of women groups around specific project areas. Share information about the project benefits with local community.
Low Level of literacy	Support functional literacy campaign and develop extension programmes to take the benefits from the project as per the needs of illiterates.	Undertake literacy programs as built- in activities coordinated with literacy programmes.  Develop the implementing strategies to communicate real time information specifically for economically weaker section.

Gender issues	Strategy	Proposed activities
		Develop audio-visual aids and documentary for training programs about the project for illiterate women groups
Excluded from Opportunities and because of social boundaries as a result low level of participation in decision making process	<p>Rapport building with Women Development Office at District or local level involving them in Programmes</p> <p>Gender sensitization to all stakeholders including project entities.</p> <p>Ensure Women's participation during meetings, project implementation and monitoring .</p>	<p>Carry out meetings and interaction programme with and orientation to women in the community.</p> <p>Conduct leadership training for women members of commodity groups.</p>
Lack of knowledge on and access to technical knowhow	Promote need based technical awareness and support services.	<p>Organize training on technologies</p> <p>Provide opportunities of exposure or study visit to women's group to develop their leadership capacity</p>
Disparity in Wages	<p>Accord Priority Employment to women in project generated construction activities.</p> <p>Promote equal wages for equal work</p>	<p>Inform women groups regarding proposed construction works. Identify women interested to work; assess their skills and involve them as per their capabilities.</p> <p>Monitor women wage rate and do the needful to ensure wage equality for similar type of construction works.</p> <p>Inclusion of the above elements in the contractors' document.</p>

Please refer to Appendix O for Social Action Plan including Socio-Economic Baseline Studies (BSES); Social Impact Assessment; and Preparation of a Resettlement Action Plan (RAP).

APPENDIX A: TOPOGRAPHIC FEATURES OF FUVAHMULAH



## APPENDIX B: LAND USE PLAN OF FUVAHMULAH



## APPENDIX C: VEGETATION CLASSIFICATION OF FUVAHMULAH

### Bandaara Kilhi description of biotopes

TYPE	CODE	NAME	DESCRIPTION
Tree	BK- T01	Mixed Trees - 1	<ul style="list-style-type: none"> <li>- A densely vegetated area with palms and hibiscus dominating the tree line</li> <li>- Pandanus is more common towards the edge of the lake</li> <li>- Some funa trees can be found on the southern side of this marked area</li> <li>- Other species found in the area include, jambolan, noni, terminalia, uni and several types of ground cover species</li> <li>- The dominant ground cover species are fern</li> </ul>
Tree	BK- T02	Mixed Trees - 2	<ul style="list-style-type: none"> <li>- A densely vegetated area with funa dominating the tree line</li> <li>- Other species found in the area include Jambolan and hibiscus</li> <li>- Not many ground cover species are found in this area</li> </ul>
Tree	BK- T03	Mixed Trees - 3	<ul style="list-style-type: none"> <li>- A few large funa trees</li> <li>- Some taro farms located in this area</li> </ul>
Tree	BK- T04	Mixed Trees - 4	<ul style="list-style-type: none"> <li>- A few large funa trees</li> <li>- A few taro farms located in this area</li> </ul>
Tree	BK- T05	Mixed Trees - 5	<ul style="list-style-type: none"> <li>- A densely vegetated area with palms and hibiscus dominating the tree line</li> <li>- Pandanus is more common towards the edge of the lake</li> <li>- Some Funa trees can be found on the northern side of this marked area</li> <li>- Other species found in the area include, mango, jambolan, noni, terminalia, uni and several types of ground cover species</li> <li>- The dominant ground cover species are fern</li> </ul>
Shrubs	BK- S01	Mixed Shrubs - 1	<ul style="list-style-type: none"> <li>- Scattered variety of species such as pandanus, nit pitcha, and hibiscus</li> <li>- Some jambolan and noni species scattered can also be found in this area</li> </ul>
Shrubs	BK- S02	Mixed Shrubs - 2	<ul style="list-style-type: none"> <li>- Mostly short pandanus and hibiscus trees</li> <li>- A large number of scattered jambolan can also be seen in this area</li> </ul>
Shrubs	BK- S03	Mixed Shrubs - 3	<ul style="list-style-type: none"> <li>- Mostly short pandanus and hibiscus trees</li> <li>- Some jambolan trees can also be found in this marked area</li> </ul>
Shrubs	BK- S04	Mixed Shrubs - 7	<ul style="list-style-type: none"> <li>- Mostly an open area with a few plants of guettarda, pandanus, and hibiscus</li> <li>- Most of the open area is covered with fern</li> </ul>
Shrubs	BK- S05	Pandanus, Hibiscus - 1	<ul style="list-style-type: none"> <li>- Mostly short pandanus and hibiscus trees</li> <li>- Some scattered jambolan trees can also be found in this marked area</li> </ul>
Shrubs	BK- S06	Pandanus, Hibiscus - 2	<ul style="list-style-type: none"> <li>- Mostly short pandanus and hibiscus trees</li> <li>- Some scattered jambolan trees can also be found in this marked area</li> </ul>
Shrubs	BK- S07	Pandanus, Hibiscus - 3	<ul style="list-style-type: none"> <li>- Few pandanus and hibiscus trees</li> </ul>
Shrubs	BK- S08	Pandanus - 1	<ul style="list-style-type: none"> <li>- A row of pandanus growing on the edge of the lake</li> </ul>

TYPE	CODE	NAME	DESCRIPTION
			<ul style="list-style-type: none"> <li>-The occasional hibiscus or noni plant can also be encountered in the area</li> <li>-In some areas along the edge of the lake, cladium may also be found, connecting to the marsh behind this row</li> </ul>
Marshes	BK- M01	Mixed Marshes - 1	<ul style="list-style-type: none"> <li>- Most of the area is covered in grass with ferns and young cladium</li> <li>- Occasional appearance of Uni, Noni and young palms can also be found in the area</li> <li>-Shrubs are also more in this area, compared to the adjacent marshy area</li> </ul>
Marshes	BK- M02	Mixed Marshes - 2	<ul style="list-style-type: none"> <li>- Area has been recently burnt (past 5 years)</li> <li>- Pioneering species include young cladium and fern species</li> <li>- Occasional appearance of Uni, Noni and young palms can also be seen in the area</li> </ul>
Marshes	BK- M03	Mixed Marshes - 3	<ul style="list-style-type: none"> <li>- Area has been recently burnt (past 5 years)</li> <li>- Pioneering species include young cladium and fern species</li> <li>- Occasional appearance of Uni, Noni and young palms can also be seen in the area</li> </ul>
Marshes	BK- M04	Mixed Marshes - 4	<ul style="list-style-type: none"> <li>- A large area that has been recently burnt (past 5 years), and</li> <li>- Pioneering species include young cladium and fern species</li> <li>- Occasional appearance of Uni, Noni or young palms can also be seen in the area</li> </ul>
Farmland	BK- F01	Farms-1	<ul style="list-style-type: none"> <li>- Mostly land based farms (on the northern side of this marked area) with complementary tree species to provide shade in the area</li> <li>- Species grown include: eggplant, chili, cucumber, banana, watermelon, etc.</li> <li>- Taro plots are more common on the southern end of this marked area</li> </ul>
Farmland	BK- F02	Farms-2	<ul style="list-style-type: none"> <li>- Mostly integrated taro farms with complementary tree species to provide shade in the area</li> </ul>
Farmland	BK- F03	Farms-3	<ul style="list-style-type: none"> <li>- Mostly integrated taro farms with complementary tree species to provide shade in the area</li> </ul>
Farmland	BK- F04	Farms-4	<ul style="list-style-type: none"> <li>- Mostly integrated taro farms with complementary tree species to provide shade in the area</li> </ul>
Farmland	BK- F05	Farms-5	<ul style="list-style-type: none"> <li>- Mostly integrated taro farms with complementary tree species to provide shade in the area</li> </ul>

#### Dhadimagu Kilhi description of biotopes

TYPE	CODE	NAME	DESCRIPTION
Tree	DK- T01	Palm, Jambolan - 1	<ul style="list-style-type: none"> <li>- An area covered mostly in Palm trees</li> <li>- To the north and east, closer to the outer boundaries of this marked area, some Funa trees can also be found</li> <li>-Whereas jambolan is more common on the inner boundaries of this marked area</li> <li>- Relatively few ground cover species are found in this area</li> </ul>
Tree	DK- T02	Palm, Jambolan - 2	<ul style="list-style-type: none"> <li>- Mostly palm trees with a few scattered jambolan trees</li> <li>- Some taro fields area also found in this area, but most of it is outside the protected area or in the adjacent</li> </ul>

			marked area "Farms -3"
Tree	DK- T03	Funa -1	<ul style="list-style-type: none"> <li>- This area has the only thick stand of funa found in the protected area</li> <li>- It is also an area of ecological importance due to the high concentration of bats in these trees</li> <li>- The trees along the inner boundaries of the area are more scattered and it is evident that the trees in this area have been felled to make room for agricultural purposes (taro farms)</li> <li>- Almost no ground cover species are found in the area</li> <li>- The microclimate underneath the trees is cool and moist</li> </ul>
Tree	DK- T04	Mixed Trees - 1	<ul style="list-style-type: none"> <li>- A large number of tree species such as palms, mango, sea hibiscus, nit pitcha, along with scattered pandanus</li> <li>- A few banana and taro plantations are found on the outer boundaries of the marked area</li> </ul>
Tree	DK- T05	Mixed Trees - 2	<ul style="list-style-type: none"> <li>- Scattered palms, with a few hibiscus, mango and jambolan trees</li> <li>- One household falls inside the marked area</li> </ul>
Tree	DK- T06	Mixed Trees - 3	<ul style="list-style-type: none"> <li>- This area is on the edge of the community households,</li> <li>- A mix of species including palms, jambolan, mango, ornamental species</li> <li>- Some taro fields may be found in the area, but most are located in the adjacent marked area "Farms – 4"</li> </ul>
Shrubs	DK- S01	Mixed Shrubs - 1	<ul style="list-style-type: none"> <li>- Scattered variety of species such as pandanus, nit pitcha, and hibiscus, all of which are usually less than 3m in height</li> <li>- Some scattered jambolan and noni species can also be found in this marked area</li> <li>- The ground cover is dry <i>cladium</i> and fern</li> </ul>
Shrubs	DK- S02	Mixed Shrubs - 2	<ul style="list-style-type: none"> <li>- Scattered variety of species such as pandanus, nit pitcha, and hibiscus, all of which are usually less than 3m in height</li> <li>- Some scattered jambolan and noni species can also be found in this marked area</li> <li>- The ground cover is dry <i>cladium</i> and fern</li> </ul>
Shrubs	DK- S03	Mixed Shrubs – 3	<ul style="list-style-type: none"> <li>- A very open area with a few plants of <i>Guettarda</i>, pandanus, hibiscus, and noni</li> <li>- Most of the above species are less than 3m in height</li> <li>- Most of the area is covered in grass, fern or dry <i>cladium</i>, or either open, suggesting that the area was cleared in the past</li> </ul>
Shrubs	DK- S04	Pandanus, Hibiscus - 1	<ul style="list-style-type: none"> <li>- A dense pocket of pandanus and hibiscus trees</li> <li>- Jambolan trees can be found growing in the centre of the area and on the southern side of the marked area</li> <li>- A few palm trees can also be seen in the southern side of the marked area</li> </ul>
Shrubs	DK- S05	Pandanus, Hibiscus - 2	<ul style="list-style-type: none"> <li>- Mostly hibiscus and pandanus trees</li> <li>- A short amount of palms and the occasional bananas</li> </ul>
Shrubs	DK- S06	Pandanus, Hibiscus - 3	<ul style="list-style-type: none"> <li>- A dense pocket of pandanus and hibiscus trees</li> <li>- A few jambolan and palm trees can also be seen in the marked area</li> <li>- The occasional <i>Guettarda</i> and noni species can also be seen in the marked area</li> </ul>
Shrubs	DK- S07	Hibiscus - 1	<ul style="list-style-type: none"> <li>- Mostly hibiscus with a few jambolan and pandanus trees</li> </ul>
Marshes	DK- M01	Cladium - 1	<ul style="list-style-type: none"> <li>- <i>Cladium</i> (short) species dominate the marshy area here, with the occasional pandanus species,</li> <li>- Line of fern on the outer area (away from the lake)</li> </ul>

			<ul style="list-style-type: none"> <li>- The greatest concentration of the water lettuce species (invasive) is found on the southern end (floating on the water of the lake) of this marked area. The size of the area is roughly 15ft x 10ft</li> <li>- A small cover of the love vine species (invasive) is also found on the northern side of this marked area. However it does not seem to be affecting the vegetation much</li> </ul>
Marshes	DK- M02	Cladium - 2	<ul style="list-style-type: none"> <li>- <i>Cladium</i> (tall) species dominating this marked area of the marshes</li> <li>- Some shorter cladium growing on the outer area (away from the lake</li> <li>- The occasional pandanus species (very sparsely distributed)</li> </ul>
Marshes	DK- M03	Mixed Marshes - 1	<ul style="list-style-type: none"> <li>- Area has been recently burnt (past 5 years)</li> <li>- Pioneering species include young cladium and fern species</li> <li>- Occasional appearance of Uni, or Noni can also be seen in the area</li> </ul>
Marshes	DK- M04	Mixed Marshes - 2	<ul style="list-style-type: none"> <li>- Area has been recently burnt (past 5 years)</li> <li>- Pioneering species include young cladium and fern species</li> </ul>
Marshes	DK- M05	Mixed Marshes - 3	<ul style="list-style-type: none"> <li>- A large area that has been recently burnt (past 5 years)</li> <li>- Pioneering species include young <i>cladium</i> and fern species</li> <li>- Occasional appearance of uni, noni or young palms can also be seen in the area</li> </ul>
Marshes	DK- M06	Mixed Marshes - 4	<ul style="list-style-type: none"> <li>- Area that has been recently burnt (past 5 years)</li> <li>- Pioneering species include young <i>cladium</i> and fern species</li> <li>- Occasional appearance of uni, noni or young palms can also be seen in the area</li> </ul>
Farmland	DK- F01	Farms-1	<ul style="list-style-type: none"> <li>- Mostly integrated taro farms with complementary tree species to provide shade in the area</li> <li>- Other types of crops such as chili, eggplant (aubergine), etc. are found rarely</li> </ul>
Farmland	DK- F02	Farms-2	<ul style="list-style-type: none"> <li>- Mostly integrated taro farms with complementary tree species to provide shade in the area</li> </ul>
Farmland	DK- F03	Farms-3	<ul style="list-style-type: none"> <li>- Mostly integrated taro farms with complementary tree species to provide shade in the area</li> <li>- Other types of crops such as chili, eggplant (aubergine), etc. are found rarely (located mostly in the south eastern side of this marked area)</li> </ul>
Farmland	DK- F04	Farms-4	<ul style="list-style-type: none"> <li>- Mostly integrated taro farms with complementary tree species to provide shade in the area</li> <li>- Other types of crops such as chili, eggplant (aubergine), etc. are found rarely</li> </ul>
Farmland	DK- F05	Farms-5	<ul style="list-style-type: none"> <li>- Mostly integrated taro farms with complementary tree species to provide shade in the area</li> </ul>

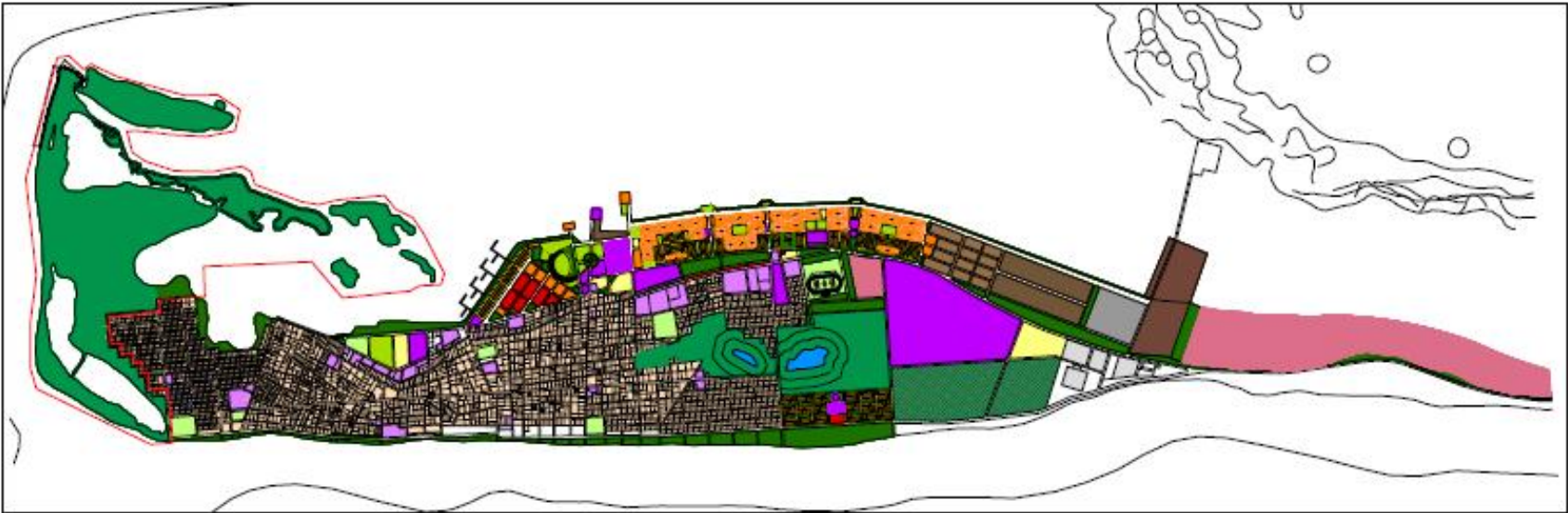
**S. HITHADHOO**  
DATE: 01.01.2022  
SCALE: 1:50,000

**Legend:**

- Residential (Blue)
- Public Services (Orange)
- Government (Green)
- Industrial (Yellow)
- Special Area (Purple)
- Special Area (Pink)
- Special Area (Light Blue)
- Special Area (Light Green)
- Special Area (Light Yellow)
- Special Area (Light Purple)

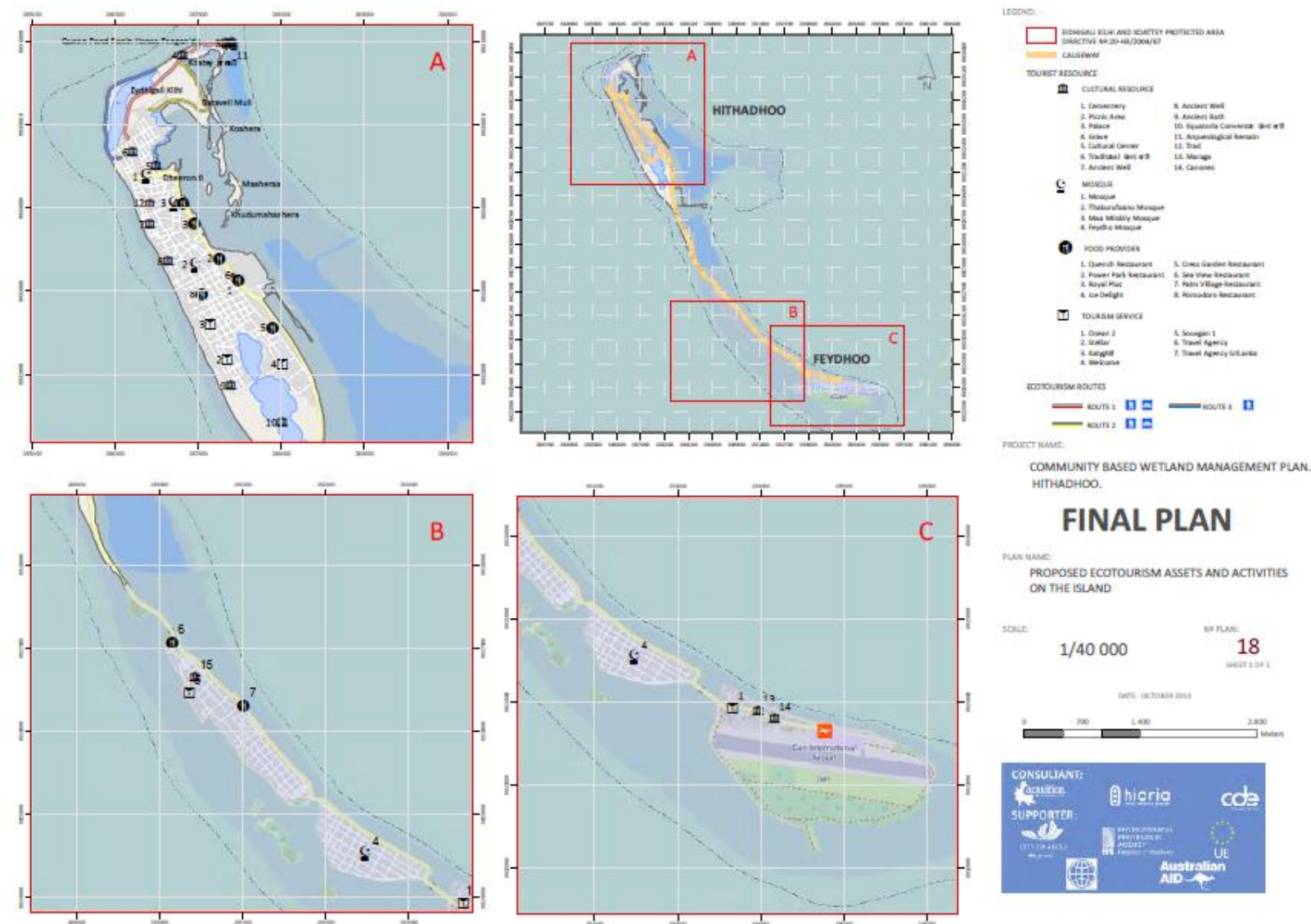
**WASTE MANAGEMENT SITE**

**APPENDIX E: HITHADHOO WETLAND AREA LAND USE PLAN**



[illegible]

APPENDIX G: HITHADHOO PHYSICAL CULTURAL RESOURCES MAP



## APPENDIX H: EXAMPLE OF DIVER INDEMNITY FORM

### Reef Check Waiver of Liability

I acknowledge that Reef Check is a volunteer program. I recognize that I do not have to participate. I acknowledge that I have chosen to follow the Reef Check survey methodology because it provides one suitable way of collecting scientific information, and not because it minimizes any of the risks of scuba diving. I recognize that scuba diving is an inherently risky activity and I expressly assume all risk associated with scuba diving in any way affiliated with Reef Check. Moreover, I hereby release and hold Reef Check harmless for any and all negligent acts in any way related to Reef Check activities. I have chosen to do this volunteer work of my own free will for the purpose of contributing to science and coral reef conservation and I agree that I, and only I, shall be responsible for my safety, and any injuries I may sustain. I agree that I will not hold liable or responsible the Reef Check Foundation or any personnel associated with any of the above, whether employees, agents, independent contractors, team leaders or other volunteers. I absolve all of them from any responsibility for my safety or any injuries, which I may suffer in the process of following the Reef Check survey methodology, or any deviation from it.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Full name (print): \_\_\_\_\_

This is an example of an indemnity release form which could be tailored to the CCTF Reef Monitoring programme. Any modifications to the wording must be checked by a competent lawyer before it is authorised for use.

## APPENDIX I: GUIDELINES FOR IWMC

### 1. IWMC Specifications

**Scope of Works:** As indicated in contract documents, plans and drawings.

**General:** All work shall be carried out by skilled tradesmen under the direct supervision of the Contractor at all times.

All work shall be carried out in accordance with the drawings, plans and documents. All measurements given on the drawings are in millimeters.

#### **Concrete Base Slabs:**

*Excavation:* Excavation shall be undertaken to the required width, depths and dimensions of footings shown on the Drawings.

The foundation level shall be defined as the level at the underside of the 200mm concrete base slab. The base of the excavation shall be compacted and trimmed to ensure that at no point the level is more than 25mm above or below the foundation level.

Any over-excavation of earth below foundation level shall be backfilled and re-compacted.

Surplus excavated material shall be used in the construction of embankments, or spoiled as directed by the project officer.

The excavation shall be kept free of water.

*Foundation:* Plastic damp proof sheeting must be placed over foundation prior to installation of formwork and reinforcement. The free edges of the plastic damp proof sheeting must be overlapped by 200mm and secured with tape.

The foundation area shall be appropriately protected until concrete is poured.

The levels and dimensions of foundations shall be recognised as subject to confirmation or alteration before construction, and the Project officer may direct such changes of the levels and of dimensions of footings as may be necessary to ensure a satisfactory foundation.

*Formwork:* Formwork shall be provided to produce hardened concrete to the lines, levels and shapes shown on the Drawings.

It shall have adequate strength to carry all applied loads, including the pressure of fresh concrete, vibration loads, weight of workers and equipment, without loss of shape.

Forms shall be mortar tight and designed to allow removal without risk of damage to the completed structure.

Formwork material used shall be sound and suitable for the purpose intended and surface finish specified.

Provision shall be made for the accurate location and firm support of fittings, bolts, anchorages and formers of holes as shown on the Drawings.

Temporary fittings used for the support of the formwork shall be arranged to permit removal without damage to the concrete.

The type and quality of material selected for formwork and the workmanship used in construction shall be such that the surface finish specified shall be obtained.

Timber for formwork shall be well seasoned, free from defects and, where in contact with fresh concrete, free from loose knots.

Timber form panels shall be constructed from plywood or particle board with hardwood or softwood studs and wales. Form panels shall be not less than 15mm thick.

Form panels shall have uniform lengths of not less than 2m, except where the dimensions of the member formed are less than the specified panel dimensions.

Plywood panels shall be placed with the grain of the outer plies perpendicular to the studding. Dimensions and position of forms shall be carefully checked after the forms are erected and all joints as erected shall be mortar tight.

The interior surface of the forms shall be treated to ensure non-adhesion of the mortar. Commercial quality form oil or grease will be acceptable, but the oil or grease used on forms against surfaces to be exposed shall not stain or discolour the concrete surface.

The coating shall be uniformly spread in a thin film and any surplus shall be removed prior to placing concrete.

Forms shall be treated before placing reinforcement to ensure that the form release agent will not contaminate the surface of the reinforcing steel or construction joints.

Formwork hardware shall be treated with a form release agent and so arranged that it may be removed from the concrete without excessive jarring or hammering.

Forms shall be aligned accurately and the location of all fittings, hold formers, etc. checked prior to placing concrete.

Where forms are to be reused all dirt, chips, hardened concrete, mortar and all foreign matter shall be removed from the forms.

*Reinforcement:* The type and size of reinforcement steel shall be as shown on the Drawings, plans and documents. Wire shall be annealed iron wire not less than 1.25mm diameter.

Steel bar reinforcement, unless promptly incorporated into the concrete, shall be stored under a waterproof cover and supported clear of the ground, and shall be protected from damage and from deterioration due to exposure.

Steel bar reinforcement shall be free from loose or thick rust, grease, tar, paint, oil, mud, millscale, mortar or any other coating, but shall not be brought to a smooth polished condition.

Steel bar reinforcement shall be formed to the dimensions and shapes shown on the Drawings. Reinforcement shall not be bent or straightened in a manner that will damage the material. Bars with kinks or bends not shown on the Drawings shall not be used.

Heating of reinforcement for purposes of bending will not be used and bars bent by any method shall not be straightened and incorporated within the works.

The steel bar reinforcement shall be placed top and bottom of the slab to form a grid at 200mm x 200mm centres and shall be placed to allow a minimum of 50mm concrete cover top and bottom, and shall be clear of the edge by 50mm.

All Steel bar reinforcement shall be overlapped by 350mm and spliced with wire.

Steel bar reinforcement shall be accurately placed to the dimensions and details shown on the Drawings.

Steel bar reinforcement shall not be supported on metal supports which extend to any surface of the concrete, on wooden supports, nor on pieces of aggregate.

*Control Movement Joints:* Control movement joints shall be built into slab where shown on the Drawings and at all points of potential cracking. The joint spacing shall not be greater than 6 metres and shall be continuous across the full width of the base.

Reinforcement mesh and bars shall be clear of the control movement joints by 50 mm.

Control movement joints shall be 12mm wide, straight and completely clean and free from any hard or incompressible material for the full width and depth of the joint.

*Inspection:* Inspection of foundation, formwork and reinforcement shall be made by the Project Officer before concrete pouring is commenced.

The Contractor shall give the Project Officer 24 hours minimum notice prior to inspection.

*Concreting Materials:* Cement must be sulphate resistant Portland cement. All cement shall be transported in watertight containers and shall be protected from moisture until used. Caked or lumpy cement shall not be used.

Course aggregate must have a nominal size of 20mm and not be smaller than 14 mm.

Coarse aggregate shall consist of clean, hard, durable, crushed stone, crushed river gravel, screened river gravel. If required, coarse aggregate shall be washed to satisfy these requirements.

Fine aggregate consists of Quartz sand and equivalent hard clean uncoated grains of uniform quality having a nominal size of less than 5mm.

At least 40% of total aggregates by mass must consist of Quartz sand. Under no circumstances may any portion of Quartz sand be substituted with coral or marine sands.

Water shall be clean potable water free from contamination. Under no circumstances may potable water be substituted with sea water.

Storage and handling facilities shall be such as to prevent the aggregates becoming intermixed or mixed with foreign materials, and to prevent segregation occurring.

If foreign matter is introduced or the area reaches a condition where, in the opinion of the Project Officer, foreign matter may be introduced to the aggregates, production of concrete and delivery of materials shall cease until the condition is corrected to the satisfaction of the Project Officer.

*Concrete Mixing:* The mix shall be determined by strength and not by proportions.

Concrete must be mixed to achieve a minimum compressive strength of 20N/mm<sup>2</sup> after 28 days.

*Quality Control:* The Contractor shall supply and keep available on the job at all times a standard slump test cone for the Project Officer or his own Supervisor/ Foreman. Concrete supplied for the various locations shall have the mix design adjusted so that slumps are in accordance with the following ranges.

	<b>Maximum</b>	<b>Minimum</b>
C- 20 Concrete	100mm	50mm

In all cases the Contractor shall satisfy himself as to the degree of workability consistent with the concrete strength required and the method of compaction used.

At the request of the Project Officer the contractor must take a pair of specimens moulded from one sample to confirm the compressive strength of the concrete. The compressive strength of the concrete represented by the pair of specimens moulded from one sample shall be the average compressive strength of the two specimens unless the two results differ by more than 3MPa, in which case the higher result shall be taken to represent the compressive strength of the lot of concrete.

Concrete not in accordance with this specification or otherwise determined defective shall be removed from the site and replaced by the Contractor at his own expense.

*Concrete Pour:* Each slab shall be poured in 1 (one) operation.

Concrete shall be deposited in the forms within one hour after the introduction of water to the cement and aggregate. Particular care shall be taken to avoid honeycombed or bony concrete.

All concrete shall be sound, solid, free from voids and not be bagged, plastered or patched unless directed by Project Officer.

*Surface Finish & Tolerance:* The slab shall be wood floated finished with a slope of 30mm from the centre line to the edge as shown on Drawings.

Concrete around the structural galvanised pipes must be raised 50mm above the slab and sloped away to shed water.

The top surface of the base shall also not deviate at any measurement from a 3m straightedge, laid in any direction, by more than 5mm. Notwithstanding this requirement, the surface shall not pond water.

Honeycomb faces and voids shall be filled with cement mortar as directed by the Project Officer.

*Thickness:* Thickness measurements of the concrete base shall be determined by survey from the level difference between the foundation and the slab surface on a 5m grid. Checks using a suitable probe may be carried out whilst the concrete is being placed. The readings shall be rounded off to the nearest 5mm.

Where the thickness of the slab is more than 10mm below the specified thickness the concrete shall be removed and replaced.

Where the thickness of the slab is 10mm or less below the specified thickness may be accepted providing that it represents isolated sections within a lot and such sections comprise less than 5 per cent of the area of the lot.

Where the thickness of the base exceeds the specified thickness, conformance of the base is dependent on strength.

*Curing:* All concrete, immediately after initial set has taken place, shall be protected against quick drying and covered with building paper properly anchored down and kept continuously wet for a period of at least 3 (three) days after pouring or as directed by the Project Officer.

The use of a curing agent of the sprayed membrane type may be permitted as an alternative to the above method.

Details of the curing agent shall be submitted to the Project Officer 14 days minimum in advance of its intended use.

*Sealing of joints:* A hot tar or bitumen joint sealant may be used sealant.

Before applying the sealant, the joint should be thoroughly cleaned to remove any laitance, dust or other deleterious matter.

*Backfilling:* Excavations for the construction of the slab shall be backfilled to the level of the surrounding ground with material from cuttings, or with other material acceptable to the Project Officer and compacted.

### **Blockwork**

*Set Out:* The Contractor shall set out the masonry wall structure as shown on the Drawings in sufficient detail to identify the location, length and height of the wall.

Should the Contractor propose changes to location, length, height, design levels or strength, to suit the Contractor's purposes or construction techniques, the Contractor's proposals shall be presented for the Project Officers approval.

Changes to suit the Contractor's construction procedures shall be at the Contractor's cost.

The surface on which the first course is to be laid shall be clean. It shall be checked for vertical and horizontal alignment and any excessive discrepancy shall be corrected before masonry construction is commenced.

Masonry shall be placed in horizontal courses and to the details as shown on the Drawings.

*Mixing Mortar:* All blocks shall be of size and type specified in the documents, plans and drawings.

Mortar shall be made up of 1 part cement to 4 parts sharp sand. Mortar ingredients shall be accurately measured. The cement used shall be Portland cement. The sand shall be clean, sharp and free from salts, vegetable matter and impurities. Water shall be clean potable water free from contamination.

Mortar shall be thoroughly mixed in a mixer until smooth plastic mass is obtained without lumps of lime or other materials.

The materials are to be mixed dry before water is added. Only sufficient water shall be added to provide reasonable trowelling consistency.

All mortar shall be used within 30 minutes of mixing and, if not so used, shall be discarded. Excess water shall not be added to improve workability. On no account shall mortar, which has partially set, be revived or reused.

*Mortar Joints:* Bed joints and perpendicular joints shall be 10mm thick. In hollow masonry units, mortar shall be face shell bedded and for structural work shall be ironed. All joints shall be ironed on both sides.

Build the whole of the masonry as indicated on the Drawing and specified as necessary to complete the building.

All blocks shall be laid on a full bed of mortar and the vertical and all other joints shall be completely filled with mortar. All walls shall be plumb, true to line and shall have horizontal joints level and be plumb from bottom to top of wall.

All blockwork shall have joints finished flush.

*Protection and Cleaning:* All exposed block faces shall be protected from damage during the progress of the work and any faulty joints shall be filled in and pointed up.

Blockwalls shall be left in a clean condition free from imperfections and excess mortar.

### **Render:**

*Render Application:* Cement render finish shall be applied to the concrete block in 2 (two) coat work.

Surfaces not initially rough shall be thoroughly hacked to provide a good key for each coat.

Mixing shall be done with approved gauges and the ingredients thoroughly mixed dry and used fresh.

Work shall be carried out under suitable weather conditions to obviate the effects of undue suction and all necessary protection shall be provided.

*Render Mix:* Each application coat shall be mixed in the following proportions:

Dash Coat	1 (one) part Portland cement to 2 (two) parts coarse sand
Floating Coat	1 (one) part Portland cement
6 (six) parts washed sand	

*Surface Finish:* The finished thickness shall be nominal 16 mm with no part less than 13 mm thick. The floating coat on any wall shall be completed in 1 (one) operation.

The floating coat shall be steel trowelled smooth to a true even finish.

Finish to all work shall be perfectly flat, even, straight, hard, true and free from cracks, blisters, blemishes, watermarks, stains and other imperfections.

All internal angles and arises shall be finished straight and true. All dummy work shall be removed and made good at the cost of the contractor.

All plastering shall extend from slab surface to the top of the blockwork, and along all horizontal and vertical blockwork edges. Vertical Corners of all walls shall be finished square.

### **Structural Galvanised Pipe, Metal Work, Timber and Roofing;**

*Inspection:* Three working days notice is to be given to the Project Officer so that inspections can be made at the following stages:

- Delivery of structural steel work and timber on site prior to erection
- Erection completion.

An independent Welding Inspector may be appointed by the Project Officer to undertake field inspections of the weld preparation and welding.

*Delivery, handling and Storage Materials:* Delivery of all structural galvanised pipes, brackets, plates and other components and fixings to the site shall be made at the times and sequence as required for construction timing.

Structural galvanised pipes shall be transported and handled carefully and be protected from damage at all times.

Where necessary or as directed by the Project Officer structural galvanised pipes delivered to site shall be touch up primed and painted prior to being placed in a nominated storage area.

Any damage or loss of structural galvanised pipes, metalwork or timber whilst under the Contractors control shall be at the cost of the Contractor.

Structural galvanised pipes and timber is to be placed on skids above the ground and kept free from distortion and contamination.

All corrugated sheets must be transported, stored and handled so as to minimize scratching of surface coats. Where minor scratching occurs the effected area must be painted with anti corrosion paint. Sheets severely scratched shall be reason for rejection.

*Fabrication:* Before commencing fabrication, the Contractor is responsible for verifying all measurements for correctness.

Any errors that may be found are to be submitted in writing for consideration by the Project Officer prior to proceeding with the fabrication works.

Should the Project Officer require amendment to the drawings, the amendments shall be made and the amended drawings shall be resubmitted without delay.

All structural galvanised pipe, brackets, plates and other components shall be accurately cut to size and shape by sawing, shearing, or cropping. If any cutting method is considered by the Project Officer to be unsatisfactory for a particular detail, another approved method shall be adopted as directed.

Structural galvanised pipe shall be in single lengths, hot dipped galvanized, of the dimensions shown on the Drawings and be of first grade quality.

All rough sheared edges are to be ground off to a neat smooth finish free from distortion.

All holes are to be drilled or punched, or punched and reamed. Flame cutting is not permitted.

Holes in brackets, plates and other components up to and including 10mm thickness may be punched full size, provided that the diameter of the punching die is not more than 2mm larger than the nominal diameter of the bolts to be used, and that surface depressions are not formed around the holes.

Slight inaccuracy in matching of holes is to be corrected by reaming, drifting of unfair holes will not be permitted. Poor matching of holes will be sufficient reason for rejection of the work.

*Welding:* All welding is to be carried out under the supervision of a formally qualified supervisor employed by the Contractor.

Welds shall only be made by welders who have been qualified by testing.

All testing and other work associated with the qualification procedures are to be at the expense of the Contractor.

Surfaces to be welded are to be free from scale, slag, rust, grease, paint and any other foreign material.

Welded connections shall be regarded as typical standard connections developing the full strength of the fabrication.

*Erection:* Before commencing erection the structural steel pipe the Contractor shall inspect all substrates and site conditions to determine that they are in proper condition to receive the work, and provided a setout survey to ensure the work is in accordance with the Drawings.

The Contractor shall advise the Project Officer in writing of conditions or substrates that are detrimental to proper and timely installation at the earliest instant and at least and a minimum of at least 24 hrs notice of any check-surveying requirement.

Commencing installation will be construed as acceptance of the site conditions and substrates as being satisfactory. Any defects that become apparent following commencement of erection shall be rectified at the Contractors expense.

Prior to setting the structural galvanised pipes into the concrete forms they shall be painted with at least 1 coat of anti corrosion paint.

The structural galvanised pipes shall be set accurately in the concrete forms and shall be rigidly braced during concreting operations. Temporary bracing shall not be used to force the structural frame into a correct plumbed position.

Where necessary or as directed by the Project Officer temporary cleats and/or bracing shall be provided, installed, and later removal, to keep the plumb, in true alignment, and to provide a stable structure until permanent bracing is installed.

It is the responsibility of the Contractor to ensure that adequate bracing for construction and safety purposes is in place. Provision, installation and removal of temporary cleats and/or bracing shall be at the expense of the Contractor.

The concrete used to set the structural galvanised pipes shall be of sulphate resistant Portland cement. Concrete backfilling shall be lean a concrete mixed with aggregate of a maximum nominal size of 20mm and have a slump not exceeding 25mm.

Timber members shall be accurately cut to size and shape by sawing.

Templates shall be used to mark the sawing pattern for timber beam connections.

Strengthening plates fitted to timber beams connections shall be regarded as typical standard connections developing the full strength of members.

Timber rafters shall be in single lengths and fitted at even spacings that do not exceed the maximum spacing specifications provided for in the Drawings.

Timber rafters must be fitted to provide a straight line perpendicular to the beam. Each rafter timber shall be straight and parallel to the next.

All holes are to be drilled into timber with the diameter drill being not more than 2mm larger than the nominal diameter of the bolts to be used.

Slight inaccuracy in matching of holes is to be corrected by reaming. Drifting of unfair holes will not be permitted. Poor matching of holes will be sufficient reason for rejection of the work.

Fixing bolts shown on the drawings shall be provided with hexagonal nuts with a square washer at the head of the bolt and a round washer under the nut.

Fixing bolts, washers and nuts shall be fitted and tightened into position as erection work progresses. Timber purlins must be fitted to rafters at even spacings that do not exceed the maximum spacings specifications provided for in Drawings.

Timber purlins must be fitted to provide a straight line perpendicular to the rafters. Each row of purlin timber shall be straight and parallel to the next.

Purlins may be connected by butted one length against the next. The butt connection must only occur over a rafter.

Each length of purlin timber must be secured at the point it passes over a rafter with one (1) deformed shank nail as shown in the Drawings.

Corrugated roofing sheets shall be secured with 5 fastenings per sheet per timber purlin with a minimum horizontal (side) overlap of 1.5 corrugations or as other wise directed by manufacturer/supplier.

The corrugated roof overhang should be as shown in the drawings and allow for 100mm unsupported overhand into the guttering.

The timber fascia shall run parallel to the beam along the front of the structure and be fixed to the rafters using wood nails.

Templates must be used to mark the sawing pattern for timber fascia connections.

The guttering supports shall be fitted to the fascia to allow for a 3 in 1000 minimum fall towards the gutter running stop.

*Finishes:* All metal work shall be cleaned of all rust, dirt, and fabrication or welding detritus. All weld spatters shall be chipped and ground smooth.

On erection of structural pipe work all damaged surfaces, identifying marks, brackets, plates and other components are to be painted or treated with a rust inhibitors/ corrosion protection to the satisfaction of the Project Officer.

All metal surfaces are to be finished to ensure a high quality consistent finish. Remaining paint shall be applied to all exposed timber.

### **Boundary Fencing:**

*Materials:* All posts and lateral bracing shall be galvanised pipe and shall be to the following dimensions:

End, Corner, Strainer and Gate Post 37mm outside diameter

Intermediate Posts 37 mm outside diameter

Lateral bracing 37mm outside diameter

Galvanised chain wire mesh shall be 1800 mm wide of 3.15mm diameter wire woven to a 50 x 50mm square mesh. The zinc coating shall be uniform, continuous, free from imperfections and thoroughly adherent. The coating shall be applied to the wire before the mesh is woven. The weight of the zinc

coating shall not be less than 290 g/sq m of wire surface. The chain wire shall be coated in black or Green PVC after galvanising.

Gates shall be of galvanised tubular steel construction, 3.0 metres in width by 1.8 metres in height, and shall be fitted with substantial hinges, catch, drop bolts and locking chains.

*Erection:* Galvanised fencing posts shall be used where shown on the Drawings, be vertically set in post holes

350mm diameter and 600mm deep and back filled with concrete to the height show in the Drawings.

Surfaces to be welded are to be free from scale, slag, rust, grease, paint and any other foreign material.

The type and size of reinforcement steel shall be as shown on the Drawings, be placed to allow a minimum of 50mm concrete under the bottom and shall be clear of the edge by 50 mm.

The concrete used to set the structural galvanised pipes shall be of sulphate resistant Portland cement. Concrete backfilling shall be lean a concrete mixed with aggregate of a maximum nominal size of 20mm and have a slump not exceeding 25mm.

Posts shall be set accurately in the concrete and shall be rigidly braced during concreting operations. Bracing shall be provided, installed, and later removal, to keep the plumb, in true alignment.

Prior to setting the structural galvanised pipes into the concrete forms they shall be painted with at least 1 coat of anti corrosion paint.

The fence shall be supported in lengths of not more than 3.0m by intermediate posts.

Where minor irregularities occur in the ground the vertical alignment of the fence shall not follow these irregularities, but shall be aligned to a uniform grade between definite changes in the natural slope of the ground.

Lateral cross bars will be joined to corners posts with a threaded “L” shaped galvanized joining socket and to intermediate posts with a threaded “T” shaped joining socket.

Cable wire shall consist of a pair of 3.15mm PVC coated galvanised iron wire tightly twisted around posts at the base and centre. The cable wire shall be installed as shown in Drawings.

Where shown on the Drawings, fencing mesh shall be erected on the outside of the posts and fastened with two turns of tie wire to each cable wire on both sides of each post and at intervals of not more than 900mm between posts and to each post midway between cable wires.

Tie wire shall be 2mm diameter galvanised wire.

*Finishes:* When completed all fencing shall be sound, strong and of neat appearance.

### **Rain Protection:**

Cable wire consisting of a pair of 3.15mm diameter PVC coated galvanised iron wires shall be passed through the galvanised plates as shown on Drawings. The ends of the cable wire shall be tensioned and securely wrapped around the galvanized plates to maintain tension.

A 1m width of debris netting approximately shall be stretched along the cable wire, the edges neatly folded over the cable wire top and bottom and fastened to the cable wire with galvanized tie wire at 500mm intervals. Tie wire shall be 2mm diameter galvanised wire.

## 2. Guide for creating an island waste management plan

Waste management is an island responsibility. Islands have always been responsible for managing the garbage you create. This guide will help a given island to create a plan for managing that waste.

**What is waste?** Waste is anything that is unwanted, irrespective of its value. Waste can be solid, liquid, or gaseous. This guide is for creating a plan to help you manage solid waste.

**Do you need a Waste Management Plan?** Every community should have a plan describing how all of the waste produced on the island will be managed. The type of waste that is produced on each island is very different now to what it was 30 or 40 years ago, and the amount of waste produced every year is getting more and more. Therefore the way waste is managed must also change, and everyone in the island must be responsible for this.

Different types of waste need to be managed in different ways. The majority of waste produced on islands is organic, which is easier to manage than plastics and metals. If wastes are separated, then all types can be managed more effectively and safely.

**What is a Waste Management Plan?** A Waste Management Plan should identify how waste is produced and determine how it can be reduced and disposed of. It should include who will be responsible for overseeing each part of the plan and how it will be resourced. It should also outline how awareness can be raised so everyone in the community manages their waste properly.

**How will this guide help?** This document outlines the steps that need to be taken in creating an Island Waste Management Plan. It also contains suggestions that communities can include in their Plan. Some ideas are presented as questions that will need some research before the right answer is apparent.

Each island is different so not all ideas will necessarily work. There may also be problems or solutions unique to the island that have not been thought of or included. Finding solutions that work on *your* island should be the basis of your plan for managing waste.

**Plan format:** Following the guide is a “blank” Island Waste Management Plan. It contains the key headings and questions followed by space to fill in the answers. An electronic version of this document is also available.

You may choose an entirely different format to create your Island Waste Management Plan, but you should ensure it covers all of the main questions listed in the template.

### Community Involvement

**Who should be involved in developing an island waste management plan?** Managing waste needs involvement from everyone on your island. The plan will work best if everyone who is responsible for making it work is involved in its development. It may not always be practical to involve the entire community in each detail of the plan, but it might be important to provide regular updates and seek input from the community.

It is recommended that an Island Waste Management Committee be formed to oversee the development of a plan and its ongoing implementation. Groups or individuals that may be important to directly include in plan development are:

- Island Office, which may include representatives from the Atoll Office
- Island Development Committee
- Women’s Development Committee
- Health Post, Hospital or other medical personnel

- School representatives and/or teachers
- Major businesses on the island or nearby islands (fish processing, resorts, etc)
- Environmental groups, youth groups or NGO's
- Ministry of Environment and Energy (Solid Waste Section)
- Informal waste sector – those who may already be involved in collecting, separating and disposing of waste

**Who will be responsible for overseeing your waste management plan?** It is important that the work involved in managing waste does not fall unduly on any one section of the community. For example, women have often been responsible for managing waste, but as more waste is produced on each island this task becomes more onerous. To ensure that this plan does not result in an unfair burden on some people, the following questions should be considered:

- Who has been responsible for managing waste on the island?
- Why have they had this responsibility? Is this fair?
- How much time and resources have they put into managing waste in the past?
- How much time and resources will be required to implement this plan?
- How can we make it fair so that the work and resources required to manage waste are shared by everyone in the community?

**What is the island's goal for managing its waste?** A vision for your island will create a common point that everybody can aim for. Some examples are:

- We strive to protect and enhance our island environment by keeping our forest, shore and waters free of waste, by reducing the amount we produce, reusing all that we can, recycling materials and responsibly disposing of the remaining residuals.
- Our Island will be a clean community with a waste free shoreline to ensure future generations enjoy a healthy, safe and enjoyable standard of living here.
- We will work with our neighbouring islands to promote clean islands, safe shores and waste-free seas.
- You should formulate a vision that everyone on your island can agree on.

### Collecting Information

Often communities do not know how much waste they produce and how that has changed over the years. Before we produce a waste management plan we need to know:

- What kind of waste is produced on the island?
- How much waste is produced?
- Who produces the waste?

### What kind of waste is produced on the island?

Waste can be separated into different categories. Some types of waste are easier to manage than others because they decompose more quickly. Some wastes can be recycled, others burnt or composted. Some types of waste are also more harmful to the environment and human health than others. Therefore different types of waste need to be managed in different ways.

Common categories include:

- Organic matter:** leaves, branches, uncooked food waste, fruit, coconut husks, even tree trunks – anything that is NOT made by people.
- Fish products:** fish heads, skeletons, skins, dead fish (smelly stuff) if there are a lot, otherwise you might put them with organic matter.
- Hazardous waste:** batteries, asbestos roof panels, used engine oil, old lights (with mercury in them).
- Medical waste:** old prescription medicines, used needles, bandages and other materials from health posts or hospitals (these may be handled by the health post).

- v. **Plastic:** there are many different types of plastic wastes, including drink bottles, cooking oil containers, shopping bags as well as bulk plastics such as chairs etc. Recyclable plastic bottles and containers usually have a recycle triangle stamped on them.
- vi. **Metal:** steel, aluminium and copper metal objects, including clean tin cans and other containers.
- vii. **Glass:** bottles, containers, old windows that might be a safety hazard.
- viii. **Clothing and shoes:** these may be reusable.
- ix. **Nappies and other sanitary wastes:** they present special nuisances (odour) and health problems
- x. **Residuals:** anything else that can't be put in a large separate category, such as plastic bags.

**How much of each kind of waste is produced?** The amount of each waste may guide how you will handle it. For example:

*If you have a lot of organic matter you might decide to do something to reduce or reuse it rather than disposing of it.*

*If you have very little glass then you may decide to handle it as hazardous waste, but if you have a lot of glass then you might investigate recycling options.*

Typically island communities have 60 to 70% organic matter by weight, 5 to 15% by weight metal, 5 to 15% by weight plastic, 20 to 30% by weight residuals and less than 1% hazardous wastes. What do you have?

It is also useful to track waste production over time. If you see an increase or decrease in one type you may have to adjust your management practices. For example:

*If you are seeing an increase in the number of plastic grocery bags and these are creating litter on the streets or in the ocean then you may decide to shift to reusable cloth bags to carry groceries from the store. You could ask shopkeepers not to put groceries in plastic bags unless specifically requested by a customer.*

The amount of different types of waste you produce should also determine how you use your waste management centre. You can move the signs attached to each bay depending on the volumes of each type of waste, and how you dispose of it.

**Where is the waste produced?** Who or how waste is produced may help you choose strategies to manage it.

*If a lot of food waste is made in homes and most people have gardens then you may want to encourage home composting.*

*If a lot of waste comes from sweeping the streets and most of it is organic, you may want to ask the sweepers to separate out the bits of plastic so you can reuse the organic matter as mulch and you may want to set up dustbins for litter.*

Common waste sources:

- Homes
- Businesses (stores and offices)
- Industry (fish processing, boat building, etc)
- Street cleaning (municipal waste)
- Agriculture
- Other

**Where does the waste go now?**

People often don't give much thought to where their waste goes (and what the impact might be of disposing that way). Assessing where waste is now can help you plan for improvements. Common disposal methods in the Maldives are:

- Into the sea (along the shoreline)
- Along the sides of roads
- Buried or stored in a landfill (on the island or on another island)
- Dumped on the surface in a designated area (or many areas)
- Spread under trees
- Burned (in one place or many places)
- Dumped in the deep ocean
- Incinerated (usually medical waste and some resorts)

### **What are the problems with waste disposal on the island now?**

Each disposal method has environmental, health and aesthetic consequences. Common problems include:

- Health: mosquitoes, rats, cuts from metal and glass, infections
- Environment: ground water pollution, air quality (burning), reef damage
- Aesthetic: odours, ugly to look at, in the way, embarrassing to show others

Changing the way waste is managed will help to avoid these problems. You should also consider in your plan whether (and how) you will clean up waste that has already accumulated.

### **Waste Management Options**

Once we have collected some information we can start to think about the options that are available for managing our wastes.

**Reduce, Reuse, Recycle:** When we develop a waste management plan we must always remember that **reducing, reusing and recycling** waste is preferred over burning and burying.

Trying to reduce the amount of waste created by the community is often the least expensive and most environmentally friendly way to manage waste. Typical strategies include:

**Reducing** waste by not creating it in the first place. For example:

- Putting leaves, small branches and other organic matter collected when sweeping streets under shrubs and trees as a mulch or compost to improve the soil.
- Using large branches, logs or coconut tree stems to line the edge of paths.
- Using cloth bags instead of plastic to carry groceries home.
- Buying products with less packaging
- Sharing or borrowing items and equipment
- Choosing re-usable items rather than disposables
- Maintaining and repairing clothes, tools, appliances
- Buying things in large quantities reduces the number of containers.

**Reusing** objects over and over stops more of them coming to the island. For example:

- Composting organic matter to reduce its volume and fertilise soil for garden and agricultural use.
- Shredding organic matter to reduce volume and produce a mulch for use under shrubs and trees.
- Reusing plastic bags for shopping,
- Reusing glass jars and plastic bottles for storage of water and food
- Using rechargeable batteries
- Covering fruit crops with plastic bottles to protect them from bats and rats.

**Recycling** materials into new objects, such as melting metal, plastic or glass to make new cans or bottles.

Collecting recyclable materials such as metal and plastic to trade, sell or give these materials to recycling companies.

There are lots of different ways to reduce, reuse or recycle waste, and communities always come up with innovative new ways to do so. Sharing ideas with neighbouring islands may introduce more ideas.

**Burning and Burying:** Reducing the amount of waste that is produced is the most important element of good waste management. However, there will always be waste that is produced by each community that will need to be disposed of. In particular, residual waste is waste that cannot be recycled or reused (eg composting) and therefore needs to be disposed of in some other way.

**What options are there to dispose of the waste?** An Island Waste Management Plan should identify how waste will be disposed. Options to consider are:

- Drying and burning organic waste using best burning practices (at high temperature to reduce smoke, such as on an elevated platform which allows oxygen to circulate). **This should not include hazardous wastes, metals or plastics.**
- Burying wastes in a location away from the shoreline and away from the water supply. **This should not include hazardous wastes, metals or plastics.** Burying these wastes with large quantities of organic waste can cause serious contamination issues.
- Using certain sorts of waste to assist in land reclamation or erosion control such as crushed glass and construction and demolition wastes. **This should not include hazardous wastes, metals or plastics.**
- Transferring residuals to a regional landfill, such as Thilafushi.

*Deep channel ocean dumping may be necessary for large volumes of fish waste. It is **not** acceptable to dump other sorts of waste in the ocean.*

**How will waste be separated for better management?** Different types of waste need to be managed in different ways. Separating waste into different categories allows for the disposal of organic waste, which decomposes quickly, through composting or burning, thus reducing the volume of waste that is more difficult to dispose of. Recyclable materials need to be clean and separated from other waste in order for recycling companies to be interested in them.

*Remember it is very difficult to manage a pile of mixed waste!*

Separating waste at home means everyone is helping out. Separating it at a waste management centre may require extra staff. Strategies could include:

- Different containers (for organics, plastics, metals) in each house, business or industry. These may be colour-coded so everyone learns which is which.
- Separation when delivering waste to the centre (by household or collection contractor?).
- Collecting different types of waste from homes on different days (i.e. plastic on Monday, organic waste on Tuesday, etc.).
- At a waste management centre (by who?).

A number of islands have tried separating waste at the waste management centre. This is often not very effective – it is much easier if waste is separated at the household before it gets to the waste management centre. This is the preferred strategy in many parts of the world!

**Where will recyclable materials go and how often?**

Collecting metal, plastic or other recyclable materials is the easy part. Sorting them and finding a market for them can be more of a challenge. The amount of space you need to store them may be a factor (can this be reduced?). Coordinating with other islands on selling or transporting materials to market is also something to think about.

Metal can often be sold if it is in a large enough quantity, clean and sorted (different types of metal command different prices).

Certain plastics (containers) can also be sold, but it is more difficult to get large quantities of the same kind together. Coordination with other islands may be the solution.

In some cases glass and even paper can be recycled if there is enough and it is clean and ready to transport. Find a market and find out what that market needs before collecting!

- What markets are there for recyclable materials?
- Does anyone buy these materials?
- Will someone offer reduced cost to transport these materials off the island in order to sell them in Male' or a foreign port?
- Where will you store recyclable materials?
- How quickly will that area fill up (how often will you need to transport them somewhere else)?
- Can you reduce the volume of recyclable materials so you can store more of them and make transport easier? Can-crushers, shredders and bailers are options.
- Can recycling strategies be coordinated with other islands to reduce transportation or handling costs?

## **Moving Waste**

**How will waste and recyclables get to the waste management centre and to final disposal?** Waste does not usually move by itself (sometimes the wind or ocean helps), but we often don't think about how it will be moved and that can cause problems. If a waste management centre is far from homes how will the waste get there? Who will be responsible for getting it there? Will everybody agree to this?

Collection from homes and businesses should consider:

- Distance to disposal or recycling centre
- Wheelbarrows and buckets from households if nearby
- Community dustbins for waste, recycle bins for metal and plastic
- Regular pick up by contractor or community run truck
- Collecting recyclables on different days to encourage separating
- Collecting residuals only after recycling has been removed
- Cost recovery for pick up, sorting and managing waste (who pays) Transferring recycling and residuals from a waste management centre
- Frequency that material will need to be moved. Most WMC's can only hold three (3) months of materials. Emptying them should occur more frequently than that.
- Distance to the lagoon or shore accessible to dhoni or landing craft.
- Weight and volume of materials.
- Packaging (sacks, bulk bags, boxes, bins) to carry the material to the boat.
- Size of boat, dhoni, landing craft that can fit in the harbour.
- Truck or other equipment needed to move material from the centre to the boat.
- Person responsible for organizing emptying the waste management centre or selling recycling materials.

### **Infrastructure Requirements**

Waste management centres don't make waste disappear. They are places to sort and temporarily store small amounts of materials. Typically a waste management centre can only hold about 3 months of a community's waste – less as the population increases or if more waste is produced.

Building and operating a disposal site or a waste management centre takes time, organization and resources.

**What equipment is needed to implement this plan?** Equipment costs money to purchase, to operate and to maintain, but it may be essential to making the Plan work properly. The community should consider if it needs and can afford:

- A waste management centre: to sort and temporarily store recyclables and residuals, for drying waste to burn, to compost organic materials, to act as a central area for all island waste.
- A pick up truck, pull cart (dhamaa gaadiyaa) or wheelbarrows: to collect waste and recyclables.
- Hand tools: to maintain the waste management centre and surrounding area.
- A shredding machine: to reduce organic materials for mulch or easier composting.
- A metal or glass crusher: to reduce the volume of cans and other containers.
- A shredding machine to reduce the volume of plastic bottles.
- A dhoni or landing craft: to take recyclables to market or waste to a regional landfill.
- A generator to provide power to the waste management centre and to run machinery.
- An incinerator to burn nappies and other sanitary wastes
- A burning barrel or frame: for safe, clean burning of dry residuals.

**When will this infrastructure be operated?** Planning the frequency of services will help control the costs of operation and ensure the community has access to infrastructure. Considerations include:

- Hours and days of operation
- Days for collection or delivery of waste and/or recyclables
- Frequency (weekly, monthly, bi-monthly) to transfer waste or recyclables
- Burning days during dry periods (daily, weekly, monthly)
- Island clean up days (monthly, quarterly, annually)

**Who will be responsible for the equipment and/or infrastructure and its operation and upkeep?** The whole community is ultimately responsible for making sure your island is clean and safe, but certain tasks may need to be delegated. Options include:

- Delegating oversight to either the Island Office, the Island Development Committee, or the Women's Development Committee.

- Forming a waste committee to provide oversight and be accountable to the community. This may comprise members of the Island Office, the Island Development Committee and the Women's Development Committee.
- oA staff person hired to coordinate waste transfer, ship recyclables or to manage the waste management centre.
- Hiring a private contractor to collect from houses, manage the centre and/or be responsible for transferring recyclables or waste to disposal.

## **Funding Options**

**How will equipment and services be purchased, operated and maintained?** The level of service needed by the community will determine the cost. Volunteer services are low cost, but require more diligence to maintain. Paid services cost more and require higher levels of scrutiny to ensure the service being paid for are being provided.

Costs can include salaries, purchasing equipment (capital cost), operating equipment (operating cost), maintaining equipment (maintenance costs) and replacing infrastructure (replacement cost).

You should determine how much it will cost to implement your waste management plan. Funding options might include:

- A one-time levee or charge to each household for capital equipment
- Accessing island funds
- User-pay fees (monthly) for collection and disposal services that will cover the operating, maintenance and replacement cost.
- A fee per bag of waste collected
- A lower fee for clean sorted recyclable materials
- A fixed monthly fee per household
- A higher fee rate for businesses that produce more waste
- Cooperative arrangements with neighbouring industry(s) and islands
- Start up or infrastructure opportunities through government or NGO's
- Voluntary service

One option is to determine different costs for different levels of services and then ask for community feedback to decide what people are willing to pay to have a clean island.

The costs of waste management should be shared amongst all those people who produce the waste and the amount people pay should be linked to the amount of waste they produce and the level of difficulty required in managing it.

An anonymous survey form could be used to gauge people's willingness to pay for different levels of service.

Costs may vary between MRF 30 to 50(+) per household per month for the management of household waste. Waste produced by industry and business may be charged at around MRF300 per m3 of waste produced. The community may also wish to discuss the cost of managing street sweepings with the island office. This cost may be around MRF 15 per household.

You will also need to think about who will collect the money, who will keep it safely, who will do the book keeping and who will make the decisions about how it will be spent. You will also need to think about how to address people who can not pay or do not want to pay.

## **Raising Awareness**

**How will we involve the community?** Education and awareness is an ongoing process. Changing attitudes about waste management, reducing litter and increasing recycling requires constant reminders to ensure success. One part of the Plan, and a responsible group of people, should be dedicated to maintain an ongoing awareness campaign. This may include:

- Training by NGOs for individuals or groups in the community so they can teach others
- Community meetings to discuss good waste management practice
- Regular Island Clean-up days where people are reminded of the consequences of poor waste management
- Notices, posters and announcements to regularly remind people of the island's waste management guidelines
- Targeted discussion with individuals, schools and businesses
- Inclusion of good waste management in school classes
- Incentives at the household level for good waste management and disincentives for bad waste management

**How will the Island Waste Management Plan be communicated?** The Island Waste Management Plan will only work if everyone responsible, which is usually the entire community, agrees to it. Some ideas for sharing and seeking feedback to the plan are:

- A community meeting and community announcements
- Notifications, posters or other awareness tools
- Conducting information gathering surveys and providing feedback on the outcomes during Plan development
- Providing access to the draft Island Waste Management Plan
- Discussion with neighbouring islands, resorts and the atoll office

## **Sharing Ideas**

Associations with other islands are an effective way to share ideas and reduce the cost of waste management. A simple strategy is to organize an association for waste management, perhaps including broader common environmental issues.

- Create an island committee dedicated to waste management
- Nominate one or more individuals to work with other islands
- Establish monthly or quarterly telephone, internet or email conferences
- Organize an annual forum, conference or seminar to discuss waste issues
- Involve major businesses (fish processing, factories, resorts) – they produce waste
- Invite guest speakers, ministry representatives and NGO's to provide updates and new ideas about waste management
- Start slow, build trust, collect facts, identify solutions:
- Share what you are doing with waste on your island
- Identify common areas of concern
- Explore ways to share tasks (organizing recycling collection)
- Consider opportunities to assist the government to produce supportive legislation, regulation or guidelines

Capitalize on good ideas to help communicate waste management issues (sadly garbage is not a hot topic for most people, but a good solution might capture their attention and help your own training program).

### **Signoff and Revisions**

**Who will sign off on this plan?** Formally adopting an Island Waste Management Plan brings clarity to the community about how their waste will be managed in the future.

Options for signing off on the plan include:

- A community vote
- Signatures from the Island Office
- Signatures from the Island Development Committee
- Signatures from the Women's Development Committee
- Signatures from the Waste Management Committee

Once the plan is approved you should consider:

- Posting a copy which all community members can access
- Forwarding a copy to the Ministry of Environment, Energy and Water
- Forwarding a copy to the Atoll Office

**How will the Island Waste Management Plan be revised?** Some things in the Plan may need to change over time. The population of the island, the nature of the waste produced, government policies supporting waste management, and cost of operations are all things which may vary, to name a few,

and your plan may need to be modified accordingly. You should also monitor how well the plan is working and be prepared to modify the plan to address any challenges that arise.

Establishing a fixed process and timeline will provide clarity on how changes will be made. Things to consider are:

- A fixed date or year for review (one year, two years, or five years)
- A process for minor changes (agreement by committee, posted notices)
- A process for major revision (notification, creation of a special committee)

### **3. Community Mobilization Workplan**

Community involvement in the planning and implementation of projects is complex. The ERC has adopted and developed a community based approach to waste management in the Maldives. The approach involves a community driven development processes for procurement of waste management infrastructure, equipment and for waste management planning. The Ministry of Atoll Development has advised that waste management committees should be established consisting of a representative from the Island Office, Womens Development Committee, the Island Development Committee and two members from the community to coordinate community driven activities on the island. The role of the Government is essentially to provide support to the community and the committee for waste management activities.

The benefits of community involvement include a clear idea of the possible community based solutions to problems that have arisen follow the ARC/CRC program intervention, including perspectives on willingness and ability and most importantly the possibility of getting commitment from the community to take responsibility for waste management on the islands.

#### ***Proposed Community mobilisation activities***

The three approaches described below compliment each other and mostly will be used together. In all approaches the main focus will be given to:

- Establishing the Island Waste Management Committee (IWM Committee)
- Supporting the Committee to mobilize the wider community
- Further developing/ evolving the IWMP
- Implementing and monitor the IWMP

#### **WASTE MANAGEMENT – the community perception**

##### ***~ Communities Awareness~***

Although many islands understand that waste management is a priority issue in their islands, but this is not seen in action in daily life. Waste management actions include household separation of waste and participation in waste management activities at the Island waste management Centre (IWMC). Possible suggestions that can be tried, alone or in combination to encourage behavior change are:

- Community awareness programs;
- Formal/ informal educational programs tailored to school children; and
- Incentives programs like awards schemes or opportunity to access equipment etc...

Another unbalancing equation is the willingness to participate in good waste management practices and the expected outcomes from it. Many complaints are being forwarded to ERC saying that WMC is full and is a breeding ground for mosquitoes, thereby spreading diseases. During monitoring visits many

householders complain about the location of the WMC saying it is too far away which leads to communities going back to their old practices, i.e. dumping everywhere. A way forward with these issues could be:

- Involve communities in the development and evolution of Island Waste Management Plans to develop and resolve priority issues with waste management on the island.

Willingness to pay for waste collection or transfer is generally low among all communities. Waste is put at the bottom of the list in paying for services, i.e. after electricity, water and cable TV.... Few people want to pay for waste. Strategies to promote communities willingness to pay for waste service may include:

Communities could be familiarized with the polluter pay principle which includes user pays for services and extended producer responsibility:

- Surveys to find willingness and ability to pay – consider acceptable ways of payment
- Forecast the total amount to be generated through fee collection per month/ year/household – budget
- Estimate the true cost of providing waste services including IWMC operation, waste transfer and recycling etc
- Look into innovative ways of raising additional revenue to support services such as social fund raising activities or extended producer responsibility such as bottle deposit systems funded from companies producing plastic bottles)
- Education through comparing costs and benefits to the community and environment from improved waste services.

Possibly the top of the list should be the perception of responsibility; waste is generally seen by communities as the problem of ‘others’. Many have identified “others” to be the government (MEE) or Atoll Office or Island Office or WDC or even the WMC supervisor. Is it the government who should take care of everyone’s waste? Or is it the Atoll Office? Or the Island Office? This problem is common but not generalized to islands where Katheeb change often. Possible ways to reiterate community responsibility could include:

- Engage the community through the Island Waste Management Planning process about roles and responsibilities through out the life cycle of waste produced on the islands,
- Identify any consensus amongst community members about which waste streams and which part of the waste cycle the community can influence and which part is beyond their capacity.
- Working with the community undertake a capacity and needs assessment to determine the skills and equipment needs of the community in relation to island based waste management.
- Provide case studies that illustrate island role models or best practices islands

\* It might be best to plan these solutions in conjunction with surveys for willingness and ability to pay within community and other sources of funds.

The general perception towards waste management explained above maybe one way to classify communities as high priority communities for community mobilisation activities.

### *~ Institutional Strengthening communities ~*

The effort and initiative taken by model communities and their best practices should not go unnoticed. In addition to the practical island solutions found by these communities they need follow- up support to sustain good waste management practices.

- Provide communities with working models of institutional arrangements for island waste management  
Mobilise community leaders to form a WM Committee

- Work with the community through the Island Waste Management Planning process to establish clear roles and responsibilities and a mandate for the WM committee.
- Guide communities towards national awards or explore means of recognizing effort and initiative - sense of accomplishment and reward

Maintaining the drive in good waste management practices and monitoring the situation for supplementary services. Would you choose composting over burning?

- Finalizing the IWMP make it public - bulletin boards, community meetings
- Ongoing activities for disseminating information – join forces with health posts and schools
- Set community baseline targets and monitor achievements and identify areas for improvements to set new targets.

### **Initial Steps for planning field trips**

Through Island Chiefs, identify the community leaders and stakeholders in waste management within the island communities. (In the past in this project, they were identified as IO, WDC, IDC, Health post, Schools and community representatives). The intention here is not to redo the whole process again but to include those who participated before and more importantly to engage and involve community based organizations.

- Schedule field trips according to the time schedule of the community in consultation with the IO.
- Identify through them the support required from their perspective and establish common vision of what they want to achieve in their community
- Facilitate the necessary community mobilisation activity.

### **Checklist for visiting islands**

- General island information sheet
- Summary of waste attitude in the island and possible approach to be used
- Island reports – actions and recommendations
- Status of preparation and implementation of IWMP's
- Clear picture of government plans or proposed projects for the concerned region
- Necessary awareness materials

### **Field trip agenda**

- Pre meeting with island chief to check the progress of IWMP and island waste situation
- Visit island WMC and other dumping areas (standard form to check)
- Consultation with IO, Committee members and CBO's (separate training can be arranged if a WM Committee is mobilised)
- Meeting with active volunteers in waste management (separate meeting can be arranged with women)
- Agree action items in writing with WM Committee or IO.

#### **a) Household Approach**

To support households in playing their expected roles, it is important to recognise that within a community, households may belong to a variety of groups (men/ women; children; youth...)

- Community stakeholder appraisal which would help identify which group among the community is more active and has ability to influence other householders
- Establish common vision for the islands
- Present ideas like roster for volunteers (rotating basis) to organize them more

- effectively
- Assess training materials and support required
- Facilitate community awareness sessions with volunteers from community

***Important roles of households:***

- Reduce waste as much as possible.
- Encourage more re-use of waste materials within the household.
- Encourage separation at household level
- Make compost with organics or use as mulch after cleaning the streets.
- Burn separated organics and other combustibles at designated place.
- If a collection system is in place, set out the non-combustible waste at the agreed time and place to be taken to WMC; if not check the days the WMC is open and take it there.
- Participate with neighbors in activities to keep the environment clean

**b) Business Approach**

Waste management as a profitable business entity might not be the most viable option in small islands. But profit coupled with community responsibility could motivate private contractors to handle waste collection transfer and other supporting functions. Meetings could be facilitated between the following groups with the IO and committees for further discussions.

- Shop owners
- Boat-builders
- Other profit making enterprises in the island

\* Resorts could be part of this group depending on the agreed contribution

***Important roles of Business:***

- Facilitate coordination between this group and the IWM Committee to reflect a common vision for island
- Facilitate the inclusion of roles and responsibility of the business community into the IWMP
- Plan funding from each group
- If required liaise with IO to make formal agreements with the private contractor and provide advice and assistance in establishing institutional arrangements for revenue collection.

**c) CBO approach**

This approach would most likely work in communities where there is a good relationship between island office, committees and the community. Also the level of support from volunteers and initiative from the community could be critical. From the island reports it is seen that WDC is the most active committee in WM in most islands. Youth groups or *Club Jamiyyas* could be encouraged to join forces with WDC or work independently where WDC is not functioning well.

Youth groups are actively showing interest and concerns for environmental issues and solid waste management in their community. Taking examples from this, it would be beneficial for WM Committees to coordinate efforts with CBO's for effective community mobilisation activities.

***Possible roles of CBO's:***

- Act as partners in the dialogue between the island community and IO
- Mobilise members for action in waste management; which would include but is not limited to assigning a supervisor at WMC and setting rules and guidelines
- Mobilise members to carry out household surveys to find willingness to pay; if successful which would lead to managing fee collection (method of payment)
- Arrange and conduct awareness programs - community competitions, clean-up days

- Coordinate with schools and health post to disseminate information
- Watchdog function - as a supervisor and performance monitor for the effectiveness of waste management in the island

#### ***Awareness materials:***

Irrespective of the island approach used, the following awareness materials need to be compiled or prepared, most of which have already been prepared by ARC/CRC, ERC and NGO's.

- Presentation CD's, leaflets, posters and other materials to support trainers; interactive and practical training guides for trainers
- Community wide awareness program
- Support to volunteers who are actively involved in island waste management
- Design games and fun activities for teaching waste management in schools
- Materials from nationwide awareness programs when they are put in motion

#### **Other Follow-up Support**

Follow-up support for islands that have started with IWMP's could even start before the field trips for priority islands. Priority islands would come into the IWMP follow-up list after they have started work on IWMP's. It is expected that some level of planning would be done on each community at the end of the field trip to that island.

To make the follow-up procedure more standard and effective, guidelines for reviewing IWMP's needs to be prepared. This would in essence be the IWMP guide in the form of a simpler checklist and guideline for reviewing. Once the checklist for reviewing is in place any staff could make follow-up calls to the islands and simply update the list. The key to an easier process would be identifying the focal contact to call back within the island office or WM Committee.

The next step would be updating the checklist that has been prepared to keep track of islands that have sent IWMP's that are complete or incomplete.

## APPENDIX K: GENERIC ESMP TOR

### Objective and Scope of Preparation of Environmental and Social Management and Monitoring Plan (ESMP)

In order to ensure short and long term environmental impacts that would arise due to improvement and rehabilitation work (to be described in the first section based on the sub-project/activity), an ESMP plan will need to be developed as per the scope presented below and in accordance with the ESAMF of the Project:

1. *Identification of impacts and description of mitigation measures:* Firstly, Impacts arising out of the project activities need to be clearly identified. Secondly, feasible and cost effective measures to minimize impacts to acceptable levels should be specified with reference to each impact identified. Further, it should provide details on the conditions under which the mitigatory measure should be implemented (ex; routine or in the event of contingencies) The ESMP also should distinguish between type of solution proposed (structural & non structural) and the phase in which it should become operable (design, construction and/or operational).
2. *Enhancement plans:* Positive impacts or opportunities arising out of the project need to be identified during the preparation of the check list and Environmental Assessment process where applicable. Some of these opportunities can be further developed to draw environmental and social benefits to the local area. The ESMP should identify such opportunities and develop a plan to systematically harness any such benefit.
3. *Monitoring programme:* In order to ensure that the proposed mitigatory measures have the intended results and complies with national standards and donor requirements, an environmental performance monitoring programme should be included in the ESMP. The monitoring programme should give details of the following;
  - Monitoring indicators to be measured for evaluating the performance of each mitigatory measure (for example national standards, engineering structures, extent of area replanted, etc).
  - Monitoring mechanisms and methodologies
  - Monitoring frequency
  - Monitoring locations
4. *Institutional arrangements:* Institutions/parties responsible for implementing mitigatory measures and for monitoring their performance should be clearly identified. Where necessary, mechanisms for institutional co-ordination should be identified as often monitoring tends to involve more than one institution.
5. *Implementing schedules:* Timing, frequency and duration of mitigation measures with links to overall implementation schedule of the project should be specified.
6. *Reporting procedures:* Feedback mechanisms to inform the relevant parties on the progress and effectiveness of the mitigatory measures and monitoring itself should be specified. Guidelines on the type of information wanted and the presentation of feedback information should also be highlighted.
7. *Cost estimates and sources of funds:* Implementation of mitigatory measures mentioned in the ESMP will involve an initial investment cost as well as recurrent costs. The ESMP should include costs estimates for each measure and also identify sources of funding.
8. *Contract clauses:* This is an important section of the ESMP that would ensure recommendations carried in the ESMP will be translated into action on the ground. Contract documents will need to be incorporated with clauses directly linked to the implementation of mitigatory measures. Mechanisms such as linking the payment schedules to implementation of the said clauses could be explored and implemented, as appropriate.

The format to present the ESMP in a matrix is provided below:

Stage	Activity	Environmental Issues	Mitigatory measures	Locality	Frequency of Implementation / Application	Cost	Implementation Responsibility	Monitoring Responsibility	Monitoring Frequency	Implementation Progress
Pre-construction / design / planning										
Construction										
Operational										

Important to note the following when using this template:

The EMP that will be prepared should have all sections in place, except the last column on Implementation Progress

What go in as the EMP to the bid and contract documents of construction contractor is the sections highlighted in blue, as Implementation Progress is not relevant at the time of bidding and Operational responsibilities would lie with the council.

Any activity that may be identified as the responsibility of design engineers should not be part of the EMP that goes into the bid and contract documents of construction contractors

**Important to note:** The consultant is responsible to ensure the ESAMF requirements are taken into consideration in the designing of infrastructure.

### The ESMP Presentation

The ESMP should follow the same sequence as the tasks described above including the ESMP matrix provided above.

### Consultant Qualifications

The design consultant team should include an expert with at least 8 years of experience preparing environmental management and monitoring plans for infrastructure construction, improvement and rehabilitation, costing of mitigation measures and preparing contractor clauses necessary to capture ESMP implementation needs.

### Reporting and feedback schedule

All submissions related to the assignment should be submitted to Project Management Unit, as hard copies and electronically. The duration of the consultancy is x months. During the final submission of the ESMP report, if changes requested during the draft report stage have not been incorporated in a satisfactory manner to the client and the World Bank, the consultant will be required to work further on the document until it is considered satisfactory.

## **APPENDIX L - STAKEHOLDER CONSULTATIONS**

### **Introduction**

The Government of Maldives (GoM) is receiving support from the World Bank-managed Climate Change Trust Fund (CCTF) to deal with adaptation and mitigation of climate change. A multi-donor Maldives CCTF was established in December 2009 with the aim to build a climate resilient economy and society in Maldives through adaptation to climate change as well as mitigation for a low carbon development path. The total resources pledged by the European Union and the Government of Australia were US\$10.3 million. Three projects that have been implemented under the CCTF so far include: (i) Wetlands Conservation and Coral Reef Monitoring for Adaptation to Climate Change project (WCCM) (P128278); (ii) Clean Energy for Climate Mitigation project (CECM) (P128268); and (iii) AASWM pilot project (P130163). All the three projects are planned to end on November 30, 2014. The EU expressed its intention to support the second phase with a supplemental contribution of EUR 3.85 million. With support from CCTF second phase (CCTF-II), GoM proposes a project named Climate Change Adaptation (CCA) Project in the southernmost atolls (Addu/Seenu and Gnaiviyani) to undertake an integrate approach to respond to climate risks while ensuring environmental sustainability in a select geographical area. It is envisaged that this comprehensive approach of combining natural resources management and SWM may create synergy and establish a self-sustained system.

The proposed development objective of CCA Project is to demonstrate climate adaptive planning and management through the adoption of a multi-sectoral approach in Addu and Gnaviyani Atolls.. The key intermediate result indicators for the project will be:

Establishment of a Protected Wetland Management system for Hithadhoo and Fuvahmulah to provide ecosystem-linked benefits to the community.

Strengthened coral reef monitoring framework (monitoring protocols and CoralDatabase) for improved management and decision making.

Improved capacity of Atoll/Island Councils of Hithadhoo and Fuvahmulah on atoll/island level SWM.

Increased awareness and capacity on mainstreaming climate change adaptation in island development planning in Atoll/Island Councils.

The project has five components: (1) wetland conservation; (2) coral reef monitoring; (3) development of an Island level integrated solid waste management system; (4) mainstreaming climate change into island development planning and (5) Project Management that have been proposed by GoM for financing under CCTF II.

### **Stakeholder consultation meeting**

Project's Environment and Social Safeguard coordinator held consultation meetings with Atoll council and local community of Gn. Fuvamulah and Addu City for the purpose for project preparation and development of Environment and Social Assessment and Management Framework for CCTF phase II. In these meetings E&S coordinator gave a brief of CCTF phase II and all the activities related to project. And with the experience for CCTF phase 1, Grievance Redress mechanism was discussed.

### **Meeting with Fuvamulah Atoll Council**

Location: Atoll Council office

Participants:

1. Mr. Abdulla Falah Shareef – president of Fuvamulah Atoll Council
2. Mr. Hussain Saeed – Atoll Council Member

3. Mr. Ahmed Isam – Atoll Council Member
4. Mr. Ahmed Mujthaba – Atoll Council Member
5. Ahmed Mohamed – Director at Atoll Council
6. Mr. Rifath Naeem – E&S coordinator
7. Ms. Hawwa Rasheed – Wetland Facilitation Officer

### **Discussion Points:**

The Environment and Safeguard Coordinator gave a brief of the project and summary of the proposed ESAMF to the participants.

Regarding the pre-feasibility study for regional waste management, council highlighted that waste management is a very big concern and council is faced with lots of challenges to have a sustainable waste management system in the island. Also council feels there have been enough studies done on the subject and council and the locals are fed up with repeated surveys done regarding the topic. President of Atoll council likes to see more on ground activities for proper management of the waste rather than another study. President proposes that the bank look into the previous studies.

President of the Atoll council requested World Bank to see if there is any possibility to include more drainage work in the CCTF two. He highlight that drainage is a very big concern, and there is much to be done to address the whole drainage issue.

Regarding the coral reef monitoring component, even thou there is no dive school in the island at the moment with the introduction of guest house tourism in the island, there are going to be many dive schools opening soon. Since Fuvamulah is one of the least studied reefs among the inhabited islands in the Maldives, this will be a very good opportunity for the island. Council also request to give priority for locals when selecting participants for training.

Council is happy with the Environment and Social Grievance Mechanism used on CCTF one and council had no issue of using the same Environment and Social Grievance Mechanism in CCTF II as in CCTF I. Council request that apart from Atoll Council office, complain forms made available in Island Council offices in Fuvahmulah.

Council expressed their gratitude to the donor agencies for the financial help. Also raised concern that big portion of CCTF funding goes to Hithadhoo project and they feel Fuvahmulah is left out.

### **Meeting with local community and Community Advisory Board (Fuvahmulah)**

Location: Atoll Council office

Participants:

1. Mr. Hussain saeed Atoll – CAB Chairperson
2. Mr. Mohamed Liraar – President of Miskiymagu Council
3. Mr. Abdulla Nasir – president of Hoadhadu Council
4. Mr. Khalis Shareef – president of Dhiguvaandu Council
5. Mr. Ali Waseem Hussain - president of Funaadu Council
6. Ms. Aishath Ali – Women’s development committee
7. Mr. Faizan Faiz – Volunteer
8. Mr. Abdulla Ibrahim – Volunteer
9. Mr. Ibrahim Hassan – president of dhadimagu zuvaanuge jamiyya
10. Ms. Shuau Shareef – School
11. Ms. Aminath Sima – School

12. Mr. Ali Waseem Hussain
13. Mr. Rifath Naeem – E&S coordinator
14. Ms. Hawwa Rasheed – Wetland Facilitation Officer

### Discussion Points:

The Environment and Safeguard Coordinator gave a brief of the project and summary of the proposed ESAMF to the participants.

Members of the community raise concern about the capacity of the contractor for the CCTF one and requested more involvement of the community.

Regarding the waste management studies plan for the CCTF II, it was highlighted that waste is one of the biggest challenges faced by the community, and so far numerous number of surveys and studies have been conducted by the government. Islanders have been waiting for a waste management project for a long time.

Everyone agreed that more drainage work is needed for the island, the work that been carried out in CCTF one is not enough to solve the flooding issue in the island. Community request if it's possible to include an island level drainage project for CCTF II.

It was highlighted that many community consultations have been taken place so far, and public opinions are collected in all these consultations but the projects that community get don't reflects with the opinions and request from the community. World Bank was requested to reflect on these suggestions from local community as same level as the policy level decisions. Islanders feel that they should have a bigger saying on project on their island rather than the ministry.

Community was informed that Environment and Social Grievance Mechanism used on CCTF I will be used for CCTF II. Community had no issue with the current mechanism.

Meeting with <u>public</u>					
Venue: <u>Atoll Council</u>					
Date: <u>10/9/2014</u>					
Time: <u>13:30</u>					
Name	Designation	Office/ Sector	Contact Number	E-mail	Signature
<u>Aishath Ali</u>	<u>Member</u>	<u>W.D.C</u>	<u>7412272</u>	<u>aishath-ji@hotmail.com</u>	<u>[Signature]</u>
<u>Khalis Sharaf</u>	<u>Councillor</u>	<u>Digamander Council</u>	<u>7792476</u>	<u>khalis@digamander.gov.mv</u>	<u>[Signature]</u>
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<u>Mohamed Khazim</u>	<u>Councillor</u>	<u>Mislay mekulan</u>	<u>7981626</u>	<u>kizbiy@hotmail.com</u>	<u>[Signature]</u>
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## **Meeting with Addu City Council**

Location: City council

Participants:

1. Mr. Abdulla Sodiq – Mayor
2. Hussain Hilmy – council member
3. Aishath Moosa – Admin officer

### **Discussion Points:**

The Environment and Safeguard Coordinator gave a brief of the project and summary of the proposed ESAMF to the participants.

Mayor expresses its gratitude to all the donor agencies and World Bank. He is happy with the works that been carried about in CCTF I. He highlighted with some of the challenges the project have been facing which have delayed the work. But in overall he is satisfied with the project activities.

He highlighted that some of the issues that delayed the project was due to lack of communication with PMU and City council. He explained the importance of proper communication between PMU and the City Council as council are responsible to answer any questions raised by the local community, so it real important that City council is in loop for all the communications regarding the project. And requested we all should learn from our experience from the CCTF I, so that we can finish the CCTF II without any hiccups.

Mayor was pleased to hear that all the eco-tourism work planed in CCTF one, including visitor center will be continued in CCTF II. He added that they already have stated to see the positive output of the project; local community is showing a lot more interest in the area and supporting the conservation efforts. He also mention that still some illegal activities such as sand mining and waste dumping take place, and requested that we should put more effort to manage the protected area.

Regarding the regional waste management pre-feasibility study that will be taking place in the CCTF II, Mayor Feels that there is no need for a study as there have been number of studies and survey done in the Atoll so far. He continued saying that these studies are very recent and was carried out by CDE (who is also the CCTF I WCCM ecotourism ESIA consultant). Addu City Mayor requested if it was possible to use above mention waste management plan and relocate the funds for visitor center.

Council is happy with the Environment and Social Grievance Mechanism used on CCTF I and council had no issue of using the same Environment and Social Grievance Mechanism as CCTF I in CCTF II. Even though no grievances were officially reported there have been some issues and City Council was able to resolve these issues without many difficulties.

## **Meeting with local community and Community Advisory Board (Addu City)**

Location: City Council

Participants:

- 1 Mohammed Fulhu – Ranfaru
- 2 Ahmed Aslam – Hiyaa, Hithadhoo
- 3 Ahmed Naeem –
- 4 Ibrahim Rasheed – Loojan , Hithadhoo
- 5 Shakeeb Ahmed
- 6 Aishath Ibrahim – Golden house

- 7 Fathmath Haneefa - Bilimaguge
- 8 Mariyam Shafiya – Saushan
- 9 Aminath Zeena – Noomaraage
- 10 Mohammed Zihan Zuhair –
- 11 Mohammed Lisam – Kudhehimaage
- 12 Shafiulaa Ibrahim – Dhoshalhamaage
- 13 Juvaria Ali – Marin gold
- 14 Nasrath Nasir – Freelifa
- 15 Javaazaa Mohammed didi – Ahsheyridge
- 16 Mariyam Mohamed – Mirazge
- 17 Fathmath Didi- Karusathu
- 18 Fathmath Zubair – Nanreethige
- 19 Ahmed Habeeb- Dhonalhamaage

### **Discussion Points:**

The Environment and Safeguard Coordinator gave a brief of the project and summary of the proposed ESAMF to the participants

Participants talked in length with communities experience with donor funded projects, most of the time community have been let down, and due to past experience big proportion of the locals are skeptical about the project. But members attended the meeting highlighted that they have high hopes for Ecotourism works that are to be carried out in Hithadhoo Protected area. Participants were pleased that all the eco-tourism activities that were planned in CCTF are going to be continued in CCTF II.

Participants request World Bank and PMU to monitor the works more closely; mostly due to the past experience for such projects. Road development project, Addu convention center project and many other development works that were carried out for the SAARC summit were repeatedly mentioned and communities are very much frustrated about the low quality of workmanship in these projects.

Participants request that project should arrange an easy mechanism for the public to get information about the project activities. Public interest in the area is increasing day by day and more people like to know what's happening in the protected areas. Also request that project includes more outreach programs.

Regarding the regional waste management pre-feasibility study, it was highlight that waste management is a really big environment and health issue faced by the islanders. And current waste management center does not have capacity to manage the waste and much waste is dump into sea and different parts of the island.

It was noted by the participants that there is a big need for awareness regarding all project components. At the moment very small number from community have information about the works carried out in the protected area. Participants requests for a copy of wetland management plan and information about the livelihood opportunities and limitations that may come with implementation of the protected area.

## 11 ستمبر 2014ء

ردیف	نام	تاریخ	موضوع	ملاحظات
1	دوره دوم	7999 575	موضوع	
2	دوره دوم	7959003	موضوع	
3	دوره دوم	7908508	موضوع	
4	دوره دوم	7832886	موضوع	
5	دوره دوم	7913666	موضوع	
6	دوره دوم	7990304	موضوع	
7	دوره دوم	7899507	موضوع	
8	دوره دوم	9635613	موضوع	
9	دوره دوم	7717241	موضوع	
10	دوره دوم	7912741	موضوع	
11	دوره دوم	7946835	موضوع	
12	دوره دوم	7825701	موضوع	
13	دوره دوم	7873274	موضوع	
14	دوره دوم	7857879	موضوع	
15	دوره دوم	7668999	موضوع	
16	دوره دوم	9801096	موضوع	
17	دوره دوم	7526239	موضوع	
18	دوره دوم	7683494	موضوع	

## 2014 ۱۱ رجب المرجب ۱۴۳۵

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## **APPENDIX M: TERMS OF REFERENCES FOR SOCIAL ASPECTS**

### **ToR for Social Action Plan, Socio-Economic Baseline Studies; Social Impact Assessment; and Preparation of a Resettlement Action Plan**

#### **I INTRODUCTION AND OBJECTIVES**

About the project

The social action plan (SAP) has three main objectives

- a. to present the project area and the impacts of land acquisition for project civil works on the people who own properties to be acquired, live on the land to be acquired, and/or derive their income from the land or enterprises operating on the land to be acquired.
- b. to present the entitlement policy for compensation and assistance to people affected by the project.
- c. to present an action plan for delivery of the compensation and assistance outlined in the policy, to the persons identified as entitled to such assistance; plan for gender development and indigenous people development plan as and when required.

#### **II SCOPE OF WORK**

Social Impact Assessment

The social impact assessment will be carried out for the project that will require (i) involuntary taking of private or government land leading to either (i) loss of livelihood and / or sources of livelihood (ii) displacement including those who are non- titleholders; (iii) adverse impact on common property resources. The objectives of the Social Impact Assessments are

- to provide the minimum information on social impacts as part of the preliminary screening of the project site.
- to verify the legal status of the land required; document existing structures, land plots, and other physical assets at the project site to establish a cut-off date for entitlements in accordance with the policy as given in ESMF, identify project affected persons including those who are vulnerable,
- to provide the socio-economic baseline information required for preparation of the entitlement framework.

*Preliminary Screening:* The consultant shall make initial visits to the site under consideration for project. Coordinated with the other screening exercises being undertaken (environmental, techno-economic), an assessment shall be made of the potential magnitude of social impacts, Any major social impact issues such as large scale resettlement, relocation or impact on habitation, loss of livelihood, acquisition of private land and impact on vulnerable groups shall be identified. Areas with no or minor social impacts shall be identified as part of analysis of alternatives.

Following the site selection, a verification exercise shall be undertaken. The verification shall establish the legal boundaries of the site, and identified current usage of the land in terms of squatters, land encroachments, fixed and movable structures, trees and wells, etc.

*Census and Socio-economic baseline information:* The consultant will collect census information. Consultant will also carry out socio-economic survey. The census and socio-economic survey shall gather information on the various categories of losses and other adverse impacts likely under the project. The losses shall be categorized according to type. These losses will vary based on the local context.. The survey may include but not be limited to:

Types of impact and number of PAPs against each impact type such as:

- (i) Loss of land and other productive resources attached to land such as residences, commercial structures, trees, etc.
- (ii) Loss of livelihood and / or sources of livelihood
- (iii) Temporary loss of assets, livelihood or sources of livelihood
- (iv) How project will impact women differently – on livelihood, displacement, access to resources, etc
- (v) loss of structures, temporary or fixed, within or outside of ROW.
- (vi) loss of access to public services (roads, water supply, irrigation, schools, medical facilities, shops).
- (vii) loss of access to forest or protected areas;
- (viii) loss of access to common property resources, and
- (ix) disruption of social, cultural, religious, or economic ties and networks.

Furthermore, census and socio-economic survey shall identify potentially affected populations, with special attention to vulnerable groups such as women-headed households; households below poverty line; etc. The census survey information shall include but not be limited to

- (a) demographic characteristics (age, sex, marital status, literacy level, peer relations, numbers, and categories of affected people)
- (b) settlement pattern.
- (c) main and secondary forms of livelihood including specification of the resource base, seasonal and permanent use of resources including land based of salaried employment for different household members, labor mobility and migration, the importance of informal networks and labor exchange patterns and the potential impact of disrupting these patterns, skill base, training need assessment for livelihood enhancement income through various sources, expenditure pattern, economic vulnerability, asset base,
- (d) status of access to market, health facilities, banking, communication, etc
- (e) if any persons have already been displaced, information on them should be collected for two time periods at the time of displacement and at present

As part of the socio-economic survey, an assessment shall also be made of what is the likely replacement value of the various assets lost is based on the following considerations

- (a) entitlements to affected persons shall be based on replacement value.
- (b) as part of this assessment, consultations and discussions shall be held with a representative number to the different categories of affected persons, to assess their views on what constitutes fair compensation or assistance, their preferences for resettlement actions, and reactions towards the project and
- (c) a suitable methodology shall be developed to classify different types of assets, and the measurements taken to determine quantities of losses, i.e different types of land use, land categories, tree, crops, structures, businesses etc, and the unit of measurement such as area of land, number of trees, floor area or other measurements for houses etc.

The survey shall form the basis for the full base line socio-economic survey to be undertaken subsequently of all project affected persons (PAPs). The survey instruments must be pretested in field before full survey is initiated.

*Reporting.* The findings from the Social Impact Assessment shall be presented in a report. The information collected shall be gender segregated. This shall include

- Baseline information on socio-cultural and economic parameters of the project area
- assessment of current land acquisition practices, their appropriateness and potential impacts for this project.
- estimates of the type of losses expected as a result of the project, broken up in categories of commercial, cultivated, homestead, enumeration of structures, trees and other assets
- identification of the categories of affected persons, bases on the identified losses, and estimates of their numbers.

- it is important to analyze the data in such a way that the report captures the likelihood that some persons may lose different kinds of assets. Therefore, the number under each category is not mutually exclusive and in identifying different person's losses and entitlements, provision must be made for recording and compensation for more than one.
- the status of squatters and encroachers, if any.

Based on this information, consultant will finalize the RPF and entitlement framework provided in ESMF.

## SOCIAL ACTION PLAN (Including RAP, IPDP and GAP)

### Preparation of Resettlement Action Plan

The information collected during the Social Impact Assessment shall form the basis for preparing a Resettlement and Rehabilitation Action Plan (RAP). The RAP should contain at a minimum the following section

- (a) Summary findings from the Social Impact Assessment
- (b) Summarized description of applicable legal framework of Country and Bank's policies and

Entitlement framework. The RAP should clearly bring out why and how laws and policies are applicable and what measure has been taken in the project to address them.

- (c) Data on expected impacts and numbers and categories of affected persons.
- (d) Consultation and participation arrangements, of RAP and other stakeholders and framework for continued consultation during implementation stage
- (e) Mitigation measures
- (f) Gender action plan
- (g) Institutional arrangements, including grievance procedures.
- (h) Implementation procedures
- (i) Timetable of activities, with Gantt charts showing the various elements of the plan, coordination of land, contracting, and construction,
- (j) Monitoring and evaluation of land acquisition and resettlement process.
- (k) Budget and costs,

### II. Preparation of Gender Action Plan

The consultants will carry out Gender analysis as an integral part of the social assessment at the screening stage itself. The issues identified can be scaled up during the feasibility and detailed analysis can be carried out during the DPR stage. The project designs should be gender responsive based on the gender analysis, and should be included in the DPR. The findings and recommendations from the gender analysis during project planning and feedback from beneficiaries during implementation must be discussed thoroughly to determine the need for further action. Listed below are the key action points:

#### General Checklist

- Identify key gender and women's participation issues.
- Identify the role of gender in the project objectives.
- Prepare terms of reference (TOR) for the gender specialist or social development specialist of the client
- Conduct gender analysis as part of overall Social Assessment.
- Draw up a socioeconomic profile of key stakeholder groups in the target population and disaggregate data by gender.

- Examine gender differences in knowledge, attitudes, practices, roles, status, wellbeing, constraints, needs, and priorities, and the factors that affect those differences.
- Assess men's and women's capacity to participate and the factors affecting that capacity.
- Assess the potential gender-differentiated impact of the project and options to maximize benefits and minimize adverse effects.
- Identify government agencies and nongovernmental organizations (NGOs), community-based organizations (CBOs), and women's groups that can be used during project implementation. Assess their capacity.
- Review the gender related policies and laws, as necessary.
- Identify information gaps related to the above issues.
- Involve men and women in project design.
- Incorporate gender findings in the project design.
- Ensure that gender concerns are addressed in the relevant sections (including project objectives, scope, poverty and social measures, cost estimates, institutional arrangements, social appendix, and consultant's TOR for implementation and M & E support).
- List out major gender actions.
- Develop gender-disaggregated indicators and monitoring plan.

### III. Public Hearing of Resettlement Action Plan:

The consultant will assist project authorities in conducting public hearing on an advanced draft RAP. The draft RAP should be presented at a public hearing at island level for soliciting comments from potentially affected persons and other community members. The RAP will be finalized after taking into account the proceedings of public hearing.

### IV. Disclosure of Social Action Plan:

The consultant will also assist project in disclosure of draft SAP documents including RAP, and GAP in all major affected settlements and at island and country level. The disclosure will be in local language and minutes of the meeting will be annexed in the final SAP documents.

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