SFG2960

Maldives Clean Environment Project
Environmental and Social Assessment and Management Framework (ESAMF) & Resettlement Policy Framework (RPF)

Ministry of Environment and Energy
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Abbreviations and Acronyms

AASWM	Ari Atoll Solid Waste Management
ADB	Asian Development Bank
BP	Bank Policy
BPEO	Best Practicable Environment Option
E&S	Environment and Social
EA	Environment Assessment
EEZ	Exclusive Economic Zone
EIA	Environment Impact Assessment
EPA	Environment Protection Agency
EPPA	Environment Protection and Preservation Act
ESAMF	Environmental and Social Assessment and Management Framework
ESDD	Environment and Social Due Diligence
ESIA	Environment and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environment and Social Management Plan
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GoM	Government of Maldives
GPS	Geographical Positioning System
IDA	International Development Association
IEE	Initial Environment Evaluation
IUCN	International Union for Conservation of Nature
IWMC	Island Waste Management Center
LGA	Local Government Authority
LCRED	Labor, Commerce, Research, and Economic Development
MEE	Ministry of Environment and Energy
MEMP	Maldives Environment Management Project
MoFT	Ministry of Finance and Treasury
MoFA	Ministry of Fisheries and Agriculture
MoGF	Ministry of Gender and Family

MoHF	Ministry of Health and Family
MRC	Marine Research Center
MVR	Maldivian Rufiya
NGO	Non-Governmental Organization
OP	Operational Policy
PAP	Project Affected Person
PDO	Project Development Objective
PMU	Project Management Unit
PSP	Private Sector Participation
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
RWMC	Regional Waste Management Center
SAP	Strategic Action Plan
SEA	Strategic Environment Assessment
SIA	Social Impact Assessment
SW	South West
SWM	Solid Waste Management
WMD	Waste Management Department
WMR	Waste Management Regulations
WAMCO	Waste Management Corporation
UNCBD	United Nations Convention on Biological Diversity
UNDP	United Nations Development Programme

1 Chapter 1: Introduction to Maldives Clean Environmental Project

1.1 Introduction and Background

The solid waste management sector in Maldives is under extreme stress due to the country's unique geography and economic structure. The national population of approximately 400,000 people and one million tourists that visit Maldives yearly produce large amounts of waste, with tourists producing waste at a rate of nearly six times the resident local population, mostly in the country's eighty plus resort islands and at the international airport.

Therefore, Maldives is significantly challenged to sustainably manage the nearly 365,000[1]T/year of waste generated, and the sector needs urgent support to address this challenge. The bulk of the waste generated in the Male region is transported mixed and untreated, daily by boat to Thilafushi an island close to Male, and deposited on land where it is all burned in an uncontrolled manner. Other inhabited islands follow a similar practice of open burning and/or dumping into the open sea, which contributes to pollution of the Indian Ocean.

The resorts also send their waste to Thilafushi, or, in some cases, they practice their own treatment, such as local incineration and composting. While resorts are required by law to have on site incineration facilities, the majority of them do not operate the incinerators that they have set up as part of the resort facilities. The large amounts of construction waste that is being generated by the large infrastructure projects at the airport and with the bridge construction linking the airport with Male is also transported to Thilafushi. The open burning of waste at Thilafushi and other islands across the archipelago releases highly toxic gases that include carcinogenic substances that significantly impact air quality and public health and, in addition, threatens the country's image of environmentally sustainable high-end tourism. Volume reduction from the open burning of solid waste is minimal due to the relatively low temperatures and anaerobic conditions sustained by this practice.

Empirical evidence shows that years of sea dumping of plastics and other waste materials is destroying the coral reefs which are vital for the country's fish stock and local livelihoods. The fisheries sector alone provides the economic livelihood of 26% of poor households and 11% of total employment nationally. The coral reefs also play a pivotal role for the tourism sector. The country's physical existence is threatened as damaged coral has reduced the reefs protection of the atolls and islands against climate change impacts, particularly sea level rise.

These issues have contributed to the population's demand for improved solid waste management services from the Government and the decentralized administrations responsible for these services. However, service delivery, revenue generation and collection, transportation and disposal have not kept pace with increasing quantities of waste and the national government and the Atoll and Island Councils have been unable to effectively address the issues.

The country's leadership and people recognize the seriousness of the issue. The President has made this a top priority of his administration. The Ministry of Finance and Treasury (MoFT) continues to make significant budget allocations to the Ministry of Environment and Energy (MEE), whose responsibility it is to coordinate policy, and to manage and monitor implementation of operational measures to address these issues.

[1] Not including medical waste, commercial and construction waste, liquid and raw sewage waste, produced daily.

The practice of waste management in Maldives began to significantly evolve after the 2004 Tsunami that left some parts of the country devastated and with stockpiles of debris and other post disaster waste. Prior to this, waste was primarily dumped at sea. The post disaster response compelled the GoM to begin to strategically address how waste should be more sustainably managed.

The first step to this new thinking and approach began in 2006 with the formulation of the country's first Waste Management Policy that was completed and adopted in 2007. In 2008, Maldives amended its Constitution creating Local Governments, such as the Atoll Councils and Island Councils (ICs). In the same year, a Presidential Decree was issued creating the Environment Protection Agency, EPA, as an autonomous agency with its own oversight governing board but with a dotted reporting line to the Minister of MEE, who approves the EPA's budget and is accountable to Parliament for it.

In 1993, the Environment Protection and Preservation Act was adopted placing responsibility for environmental stewardship, management, policy, and coordination, including for waste, with the Ministry of Environment and Energy. In 2013, the Waste Management Regulation was promulgated by the MEE regulating the waste management throughout the country except at resorts. The Tourism Regulation of 2013, regulates the waste generated at the country's resorts and places regulatory responsibility on the Ministry of Tourism. Therefore, the EPA has no authority to regulate the waste on resort islands. The EPA's authority with respect to waste generated on resorts begins only when the waste has left the resort islands.

In 2014, the MEE created the Waste Management Department, headed by a Director General, under the ministry, directly responsible for national waste policy and coordination. However, it was not until 2015, when the 2007 Waste Management Policy was updated, mandating the IC's with the responsibility for managing waste generated on the islands. Therefore, it was the amended 2015 Waste Management Policy that brought the country into line with international best practice of resting the responsibility for waste management firmly with the local governments or municipalities[2].

Construction, demolition and hazardous waste are generally the responsibility of the producer, while, medical waste is administered, managed and operated by the Health Protection Agency but all forms of waste are regulated by the EPA, except for resort waste as stated earlier.

All land in Maldives belongs to the government. Uninhabited islands are owned and administered by the Ministry of Fisheries and Agriculture on behalf of the Government.

The MEE has updated the Waste Management Policy, which centers on creating Regional Waste Management Centers (RWMC) to serve as treatment and disposal facilities for the waste that the Island Waste Management Centers (IWMC) have collected from their communities.

The MEE is currently working on a number of initiatives to roll out the RWMC and IWMC approach, in other regions, and is requesting support of the World Bank and its other traditional Development Partners to support this approach.[3]

[2] This remains largely true, except for the cities of Male and Addu, where in 2015 the government through parliament took back responsibility for Waste Management from Male City Council and Addu City Council, and placed it with the WMD, Ministry of Environment and Energy where it remains today.

[3] IRENA is assisting Government of Maldives for SWM in the Addu Atoll in the south of the country.

While the Government wishes to see greater private sector participation and involvement in the sector, it also recognizes that further work is required in the regulatory, institutional and infrastructure deficit areas before commercial participation with private capital can be further considered. Participation of the private sector is difficult in the short to medium term, due to minimal economies of scale benefits and the perceived and real risks in the areas of public financing and management capacity. Recent market failures in the PPP transactions in other sectors have reduced private sector appetite to get involved and are depriving Maldives of the opportunity to leverage private capital for sector investments.

Therefore, the Bank completed the MEMP project which focused on Zone II in early 2016, but will continue to support the operationalization of the SWM system in this zone. The Government has asked IDA for additional support for investments in Zone IV and V.

1.2 The project objective and description

1.2.1 Project Development Objective

The The project development objective is to support improvements to solid waste management in participating Atolls and Islands.

The PDO would be achieved through the design, implementation, operation and maintenance of integrated solid waste management systems.

1.2.2 Project Components

Component 1: Strengthening and streamlining National SWM Policy Framework and its Implementation (US$ 2.50 million)

This component would channel Bank support to the activities related to the current policy implementation at the national level. This component will also be guided by priorities emerging from the current Solid Waste Bill, a draft for which is being processed in the MEE and AG office for deliberations in the Majlis in the New Year. Candidate areas include reuse of construction debris, Ocean Plastics, Extended Producer Responsibility (EPR), etc.

Sub-component 1a will support the revision of the GoMaldives' Solid Waste Management Policy, 2015, which will be formally launched in 2018, following completion of 5 years of implementation of the current version. The roadmap for this revision will be formed by the outputs from the below sub-components.

Sub - component 1b will provide funding for Technical Assistance on analyzing emerging issues. This would cover options analysis for household waste segregation, handling and treatment of non-biodegradable waste streams through waste minimization, and recycling of suitable streams like plastic bottles, operationalization of EPR, etc.

Sub – component 1c will support IEC campaigns on key issues facing the Maldives in Solid Waste Management. This would include targeted audio-visual campaigns to promote recycling, waste reduction such as plastic bottles with promotion of piped water supply in cities/islands where water quality is found to be adequate.

Sub-component 1d will cover Augmentation and improvements of the curriculum for the MNU course on Bachelor of Environmental Management, including the modules pertaining to waste management.

Sub-component 1e will provide funding support with focus on developing Maldives' leadership position in advocating effective management of marine litter, including Ocean Plastics, especially in

the regional context of South West Indian Ocean. It will also support a national workshop on Operational Issues, Successes and Lessons learnt from the operation of the RWMC in Zone II will be organized after about 6 months of commencement of its routine operation to inform selection and design of RWMC options across the various zones where the system is under development.

Sub-component 1f will support capacity building of various entities involved in SWM arena in Maldives. Initial training of Waste Management Company (WAMCO) staff would be supported along with building of capacity of the EPA including with equipment and vehicles, which would be used for monitoring of illegal disposal of waste in the Maldives.

Component 2: Improving Regional Waste Management Facilities in select Zones (US$ 8.0 million)

This will have two sub-components – one focusing on the residual investments in Vandhoo, where the RWMC has been constructed under MEMP and other in making limited investments in newer Zones.

Sub-component 2a would support investment activities in Zone II for operationalization of the facilities created under MEMP in Vandhoo. This would include provision of equipment, augmentation of storage facilities, and access roads on the site. Currently identified equipment include a Jib crane to life waste containers from vessels bring waste to the island, a solid waste sorting line, and excavator.

Sub-component 2b, based on the outcome of the feasibility study for the integrated waste management system for the other zones included in the project (see details below), fund recommended investments to establish the RWMC facilities to service the new Zones IV and V (with a possibility of including other zones if the need arises).

Component 3: Improving Island Waste Management Facilities in select Zones (US$ 5.0 million,)

This component will support development/completion of island level facilities for managing collection, segregation, on-site treatment and storage of residual waste, until its eventual transfer to the RWMC. The candidate zones for the project are currently IV and V, in addition to residual activities in Zone II.

Sub-component 3a will support a feasibility study for determination of the most suitable integrated solid waste management system for the islands included in Zone IV and V. The study will identify any additional criteria that islands need to satisfy before a particular system – for collection, transportation, segregation and treatment of biodegradables, and storage of the more recalcitrant material to the RWMC – can be implemented. This study will also help choose the most appropriate technology for the treatment and disposal in the RWMC. This component will also fund the ESIAs for IWMCs as these get chosen, as well as the Best Practical Environmental Option study for the selected RWMC configuration.

Sub-component (3b) support the supply of vehicles for collection of waste on the islands, and shredders for islands in Zone II to facilitate that full capacity utilization of the RWMC already constructed under the MEMP.

Sub-component 3c will fund the preparation and implementation of Island Waste Management Plans (IWMPs) across the atolls in Zones IV and V. To be eligible for funding support, each island council would need to have IWMP approved by the EPA, which includes waste minimization approaches, and be subject to the EA and SA in line with the ESAMF, and have fixed a tariff from each generator of solid waste (whether household or other commercial/industrial establishment) to support the implementation of the IWMP. Currently, it is expected that there is sufficient funding to cover all the potentially eligible islands in these two zones (as some islands in zone V are already supported to a limited extent under another Government of Maldives program – LCRED). The support will include investments to operationalize one of the two or three different possible models of integrated waste

management systems depending on population, waste generator profile, land availability, and other relevant parameters.

Component 4: Project Management (US$ 2.00 million)

This component will finance equipment, technical assistance, training and incremental operating costs to strengthen the dedicated PMU established within the MEE. The PMU will assist the Government of Maldives in managing, monitoring, and evaluating project activities. Specifically, it will support staffing and operation of the PMU, establishment and operation of adequate fiduciary and safeguards management system, communication and outreach as well grievance redress. Headed by the Director General of Waste Management Department, the PMU will have the responsibility for ensuring that the Financial Management, Procurement, and Safeguards management for the project preparation and implementation are in conformity with the legal agreements with the Bank. In addition, a communication specialist, and a monitoring and evaluation specialist will also be part of the PMU. A Civil Engineer will also be inducted into the PMU as and when appropriate. In addition, support staff including project coordinators, assistant procurement officer, and assistant financial management officer would also be drafted into the PMU as per need.

1.3 Objective of the Environmental and Social Assessment and Management Framework (ESAMF)

Projects and Programs financed with IDA resources need to comply with World Bank Operational Policies. Therefore, components and related activities eligible for funding under this project will be required to satisfy the World Bank's safeguard policies, in addition to conformity with environmental legislation of the GOM.

However, since details of sites and specific investments of the project are not available at this stage, site-specific Environmental and Social Assessments cannot be conducted. What is possible at this stage would be to carry out an identification of generic issues that are typically associated with activities that would potentially be funded by the project and apply the information to site specific environmental assessments, as and when the need arises.

Therefore, the purpose of this document is to outline a framework for environmental assessment and management, giving details of potential environmental issues and guidelines on what type of environmental assessment tools to be applied for various sub-project activities. This will serve as the basis in the preparation of, site-specific specific Environmental and Social Assessments (ESAs) and/or Environmental and Social Management Plans (ESMPs). As stated earlier, it is being submitted in lieu of a project environmental and social assessments and has formed the basis for appraising the environmental and social aspects of the project. It will be made available for public review and comment in appropriate locations in the Maldives and in IDA's Public Information Center in accordance with World Bank's policy of Access to Information.

It is expected that detailed environmental and social assessments (ESAs, ESMPs) for sites and/or for activities will be carried out (in accordance with this Framework) by the implementing agencies and will be reviewed and cleared by the Environmental Protection Agency (EPA), or any other agency, as applicable, under prevailing national environmental legislation in the Maldives. In addition for all physical activities, prior to the approval of disbursement of funds, IDA will also clear all safeguards documentation.

The objectives of this Environmental and Social Assessment and Management Framework are:

a. To establish clear procedures and methodologies for environmental and social planning, review, approval and implementation of subprojects to be financed under the Project

b. To carry out a preliminary assessment of environmental and social impacts from project investments and propose generic mitigation measures.
c. To specify appropriate roles and responsibilities, and outline the necessary reporting procedures, for managing and monitoring environmental and social concerns related to subprojects
d. To determine the training, capacity building and technical assistance needed to successfully implement the provisions of the ESAMF
e. To provide practical resources for implementing the ESAMF

1.4 Due Diligence Principles

This 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 Categorization. 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 ESAMF 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 Redress Mechanism. To ensure that consultation, disclosure and community engagement continues throughout project implementation, a grievance redress mechanism will be established, scaled to the risks and adverse impacts of the project or subproject, as part of the management system. The grievance redress 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 of the Project Management Unit (PMU) 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 ESAMF. Necessary budget should be allocated to carry out the training plan.

2 Chapter 2: Introduction to Prevailing Environmental Conditions in Project Area

2.1 Introduction

Maldives is an island nation in the Indian Ocean oriented north-south off India's Lakshadweep Islands. The Maldives consists of 1,192 coral islands grouped in a double chain of 26 atolls. The country's atolls encompass a territory spread over roughly 90,000 km^2, making it one of the world's most geographically dispersed countries. Over 200 of its 1,192 islands are habituated by the country's population, with an average of 5-10 islands in each atoll being inhabited islands that have infrastructure such as housing, roads and other facilities built in. The country's total land area is estimated to approximately 300 Km^2, with islands varying in size from 0.5 km^2 to 5.0 km^2. A significant number of uninhabited islands in each atoll have also been converted to resorts and tourism facilities as well as house infrastructure such as industrial facilities and airports.

The atolls are composed of live coral reefs and sand bars, situated atop a submerged ridge 960 km long that rises abruptly from the depths of the Indian Ocean. Maldives is noted as the country placed at the lowest elevation in the world, with maximum and average natural ground levels of only 2.4 m and 1.5 m above sea level, respectively. More than 80 per cent of the country's land is composed of coral islands which rise less than one meter above sea level. The islands consist of coral, sea grass, seaweed, mangrove and sand dune ecosystems which are of great ecological and socio-economic significance. Maldives is home to a number ecologically sensitive marine habitats in shallow and intertidal zones which have been designated as protected areas by the Ministry of Environment and Energy (MEE) and access and any activities in their vicinity are stringently monitored and managed.

The project focuses on three regions in the Maldives. Southern regions (Zone IV and Zone V) which includes the Atolls of Dhaalu, Faafu, Meemu, Laamu and Thaa. The project will also assist in gap filling in the MEMP Project area, the North Central Region (Zone II) on inhabited Islands the project has previously worked on in the Raa, Baa, Noonu and Lhaviyani Atolls. In reference to candidate zones the generic topographic, ecological and climatic conditions across the zones in the Maldives do not vary on great scale thus the descriptions below outline the conditions across the country. The only Zone that have different parameters in terms of housing and population density is the Male region, known as Zone III, which include the Atolls of Kaafu, AlifAlif, Alif Dhalu and Vavvu. It houses the capital city of Male and many of the most populated inhabited islands and resort islands as well as the country's main industrial islands and airport. The region is fairly more populated in comparison to all other zones in the country.

Generic physical characteristics across the atolls, including topographic, geographic and climatic conditions across the atolls do not vary on great scale. The same applies for the biological context as terrestrial ecosystems and marine ecosystems across the atolls are similar, except for minor variations such as the presence of mangroves, wetlands and sensitive marine protected areas. Detailed outlines of these baseline conditions are presented below. While atoll specific details are scarce due to a lack of data, specific environmental and social assessments under the project will establish baseline data for all inhabited islands the project will be working on as well as the island which will be selected for the RWMC. The project will predominantly be working in inhabited islands that have already undergone anthropogenic modifications due to human habitation.

2.2 Physical Environmental

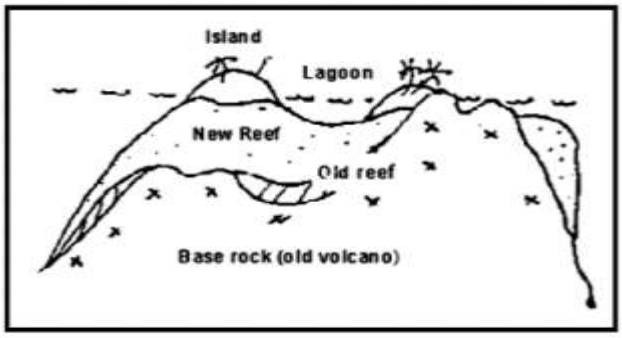
2.2.1 Geographic and Topographic Characteristics Common to All Atolls

The islands of the Maldives are flat, with topographic variations generally less than two meters at highest elevation across. Over 80% of the total land area of the country is less than one meter above

mean sea level and the highest point recorded in the country is a beach storm ridge at Fuvahmulah, in the Southern most Atoll with an elevation of four meters above mean sea level. Historically the Maldives is divided into 26 natural atolls, however based on a scientific evidence concluded in the 2004 the Maldives is classified into 16 complex atolls, five oceanic faros and four oceanic platform reefs. The 2008 Constitution of the Maldives, in its Schedule Two, divides the Maldives into 20 administrative atolls, and the capital Island of Male.

The coral atolls of the Maldives are formed upon minor elevations on the Chagos-Lacadive submarine plateau, which ascends from the deep Indian Ocean. This plateau has provided a base for reef building corals, from where they have risen to the surface as illustrated in Figure 1. Most of the atolls have a number of channels or openings in the outer reef which provide access to the islands in the enclosed interior sea or lagoon of the atoll. The shape of the atolls varies from circular and oval, to pear shaped. Some are fairly large such as Huvadhu Atoll in the south, which has approximately 250 islands and a lagoon area covering approximately 2,800 sq. km. Other atolls are very small and contain only a single island, such as Kaashidhoo and Gaafaru in the North Male' Atoll.

Figure 1. Profile of an Atoll and Lagoon



The islands can be divided physiographically into three zones namely: i) the foreshore or lower beach, ii) the beach crest (beach top) and iii) the inner island. The foreshore or lower beach zone, which includes the beach area between the high tide line and the beach crest, is totally exposed to wave action, wind and salt spray. It is unstable and composed mainly of coarse coral sand in the lower portion and shingle. The beach crest or beach top rises gradually and sometimes abruptly to a height of 0.8 to 1 m above the high tide line and includes a stable beach frontage composed of coral sand and rubble. It is exposed to winds and salt spray and its lower margin is occasionally or, in the case of an eroding beach, regularly inundated by seawater during spring tides. The beach crest may extend 5 to 20 m. The microclimate of the inner islands, protected by the beach-crest communities make them good environments for growth of larger trees.

In total there are 1,192 islands in the coral atolls of the Maldives, out of which 1,074 vegetated islands and approximately 450 un-vegetated islands in the Vegetated islands comprise both natural vegetated islands and artificial vegetated islands. The un-vegetated islands include natural sand banks (Finolhu), natural coral conglomerates above High Tide Level (Huraa) and artificial un-vegetated islands. The distribution of islands by administrative atolls within the project atolls is presented below.

Inhabited Islands in Zone V and VI are built up with housing units, either one (most commonly) or two stories and small home garden plots as well as buildings such as restaurants, office buildings and shops. The islands are planned out with designated areas for industry, harbors and also for solid waste management within its built environment.

Distribution of islands by administrative atolls

Administrative Atolls	Atoll Code	Vegetated Islands	Unvegetated Islands	Total
South Miladhunmadulu	Noonu	64	13	77
North Maalhosmadulu	Raa	79	21	100
South Maalhosmadulu	Baa	66	48	114
Faadhippolhu	Lhaviyani	50	31	81
Male' Atoll	Kaafu	99	54	153
North Ari Atoll	Alifu Alifu	30	28	58
South Ari Atoll	Alifu Dhaalu	45	32	77
Felidhe Atoll	Vaavu	18	21	39
Mulakatoll	Meemu	35	28	63
North Nilandhe Atoll	Faafu	16	19	35
South Nilandhe Atoll	Dhaalu	42	27	69
Kolhumadulu	Thaa	64	33	97
Hadhdhunmathi	Laamu	77	22	99

Table 1: Distribution of islands by administrative atolls within the project Atolls

Freshwater Resources

Freshwater resources are scarce in the Maldives. There are no rivers or streams in the islands. The main source of freshwater in the islands is the groundwater aquifer. Increased extraction exceeding natural recharge through rainfall over the years, has dramatically depleted the freshwater availability in inhabited islands. Sewerage contamination and salt water intrusion have made the water in inhabited islands unfit for portable sources thus many inhabited islands obtain water via reverse osmosis of sea water or rain water harvesting for portable uses and drinking water consumed is usually bottled and transported to the Islands.

2.2.2 Soils

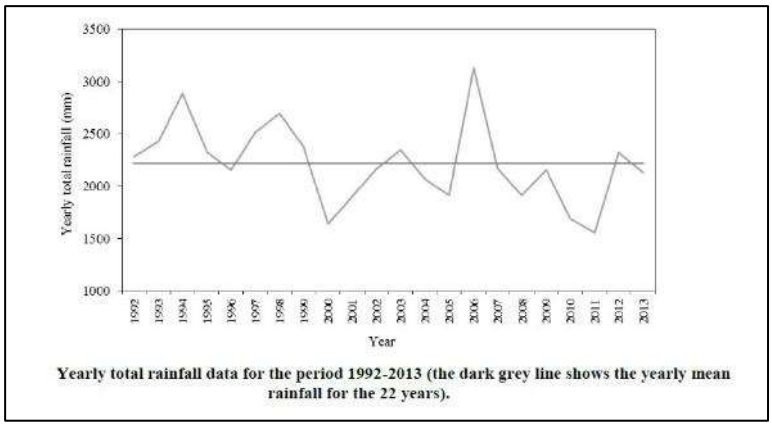
The soils in the islands of the Maldives are geologically young. They consist of substantial quantities of the unweathered coral parent material, coral rock and sand. Soils are coarse in texture and shallow in depth with a top layer of brown soil (0 to 40 cm in depth) followed by a transition zone on top of the underlying parent material of coral reef limestone.In some low-lying areas and areas subjected to significant mechanical breakdown from human activity, fine deep soils are found with accumulated deposits of clay. In the wetland environment called kulhi the depth of the clay is substantial due to the accumulation of material from marine and biological sources over a long period of time, however as the limited wetlands in the Maldives is protected this material is not used for building purposes. In many places, top layers of the soils have a weakly developed structure and at times a 30 cm thick hard-pan layer cemented with calcium carbonate is present, preventing penetration of the roots of most plants except large trees. The water-holding capacity of the soil is very poor due to high porosity and very high infiltration rates. The soils of the Maldives are generally alkaline with pH values between 8.0 and

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

2.2.3 Climatic Conditions

2.2.3.1 Rainfall

Climatic conditions in the Maldives belong to the tropical-monsoon category with temperatures ranging between 24°C and 33°C throughout the year. Climatic conditions in the Maldives is predominantly affected by the large landmass of South Asia situated to the north. The presence of this landmass causes differential heating of land and water. These factors set off a rush of moisture-rich air from the Indian Ocean over South Asia, resulting in the southwest monsoon. Two seasons dominate Maldives' weather: the dry season associated with the winter northeastern monsoon and the rainy season which brings strong winds and storms.



Yearly total rainfall data for the period 1992-2013 (the dark grey line shows the yearly mean rainfall for the 22 years).

Figure 2: Rainfall Patterns in the Maldives

The shift from the dry northeast monsoon to the moist southwest monsoon occurs during April and May and the southwest monsoon Maldives in the beginning of June and lasts until the end of August. Annual rainfall averages 254 cm in the north and 381 cm in the south, with the southern region experiencing more rain. Average monthly rainfall analysis show a general increase in rainfall as the year progressed from January to December. February and March are the driest months while the month of October is the wettest month. Last four months of the year from September through to December, the average rainfall is significantly higher than the rest of the months except in the month of May (Figure-2)

2.2.3.2 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-1 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 3).

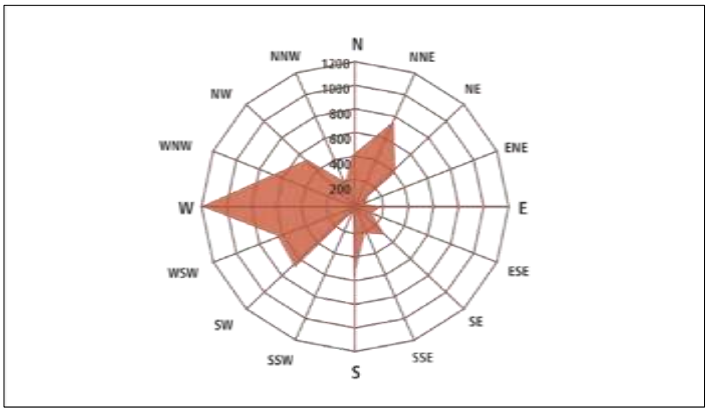


Figure 3: 24 Year Wind Frequency Recorded at Gan Meteorological Center.

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 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	

2.3 Biological Environment

2.3.1 Terrestrial Flora

The tropical vegetation of Maldives differs in the inhabited and in the uninhabited islands. Inhabited islands have small groves of *coconut,* banana, papaya, drumstick and citrus trees by the homesteads, while breadfruit trees and coconut palms are grown in available patches of land. On the other hand,

uninhabited islands have mostly different kinds of bushes (magū, boshi) and mangroves *(kuredi, kandū)* along the waterline as well as some coconut trees.

Despite the poor and infertile soils, and lack of different habitats, the Maldives has a relatively diverse vegetation cover. The plant communities in the islands grow as per the physiographic morphology of the Islands. According to the Fifth National Report to the United Nations Convention on Biological Diversity, the flora of the country consists of 583 vascular plants of which 323 (55%) are cultivated plant species, while 260 are native and naturalized plants. Of the 260 native or naturalized plant species, fewer than 100 are truly indigenous.

Each of physiographic zone in an Island provides relatively uniform environment with its own associated plant community. As a result of the harsh environmental of the foreshore conditions, this zone supports no vegetation except occasional creeping sand-binders such as *Ipomoea littoralis* and *I. biloba* along with a few individuals of *Launaea pinnatifida* and *Portulaca alata* in the upper portion. Due to the extension inland that beach crests form it provides a suitable environment for strand plant communities including a distinct association of trees and shrubs and a few sand-binding creepers and herbaceous plants. These strand plant communities include: the *Scaevola taccada* scrub community (the most common scrub community found on beach crests of both northern and southern islands of the Maldives), \ the *Pemphis acidula* scrub community, which is commonly found on elevated reef rock, coral conglomerate beach rock or hard pan coral in open sites at or above the high tide level and can also be seen growing in association with a similar looking plant, *Suriana maritima;* the *Tournefortia argentea* community is found as a dominant strand community of the beach crest particularly in drier places in some of the northern islands. It is sometimes associated with *Pandanustectorius* and *Scaevola taccada,* the *Guettarda speciosa* community is normally found only on highly elevated beach crests and is characterized by the presence of other species such as *Scaevola taccada, Pandanus tectorius* and a scattering of *Pisonia grandis* and *Cordia subcordata* trees. The microclimate of the inner islands, protected by the beach-crest communities, supports the growth of a number of trees and shrubs, which occur either in pure stands or as a mixed forest. In many islands coconut grows abundantly in the areas immediately adjacent to beach crest vegetation and in moist areas the shelter provided by a complete coconut tree canopy supports the growth of under story tree species such as *Morinda citrifolia* and *Guettarda speciosa*. In some places, *Pandanus odoratissimus, Calophyllum inophyllum* and *Hibiscus tiliaceus* are also found in low numbers within coconut groves. In moist areas small pure stands of *Hernandia nymphaeifolia, Cordia subcordata* and *Barringtonia asiatica* are present.

2.3.2 Wetland Ecosystems

There are at least 75 islands with wetland or mangroves in the Maldives **(Table 3** provided a list of wetland areas designated in the project zones). The wetland or mangrove areas cover a total area of approximately 8.01 km^2 according to a survey conducted by the Ministry of Planning and National Development in 2007. The island of Gan in the Lamu Atoll in Zone IV is noted as one of largest inhabited islands that also has wetland areas. Wetland areas in the Maldives are protected and thus no development activities are allowed in close proximity to these areas on inhabited islands, except for eco-tourism based activities.

Table 3: Wetland Areas in the project Zones

Islands with Wetland Areas in Project Zones			
Island Name	Atoll	Size (ha)	Project Zone
Bodulhaimendhoo	Noonu	23.8	Zone II
Burehifasdhoo	Noonu	5.8	
Kendhikulhudhoo	Noonu	53.2	
Maalhendhoo	Noonu	10.2	
Landhoo	Noonu	10.2	
Maafaru	Noonu	3.8	
Kudafushi	Noonu	3.6	
Karinmavattaru	Noonu	0.8	
Madhirivaadhoo	Baa	1.3	
Goidhoo	Baa	7.4	
Faadhoo	Lhaviyani	1.3	
Maidhoo	Lhaviyani	0.2	
Kanifushi	Lhaviyani	0.4	
Maakoa	Lhaviyani	5.4	
Hudhufushi	Lhaviyani	1,5	
Huraa	Kaafu	4	Zone III
Gaakurali	Meemu	0.1	Zone IV
Kolhufushi	Meemu	5.9	
Kadinma	Dhaalu	1.2	
Maaen'boodhoo	Laamu	8.1	
Gan	Laamu	27.7	
Hithadhoo	Laamu	13.5	
Mendhoo	Laamu	6.7	
Kunahandhoo	Laamu	1.6	

2.3.3 Faunal Diversity

The islands of the Maldives are not known for their abundant wildlife in comparison and demonstrate a rather small proportion of the representatives in comparison to the rich terrestrial faunal diversity of the region. Maldivian reptilian fauna including: two gecko (*Hemidactylus spp*) commonly seen throughout the country; two agamid lizard including the common garden lizard or blood sucker *Calotes versicolar;* the snake skink, *Riopa albopunktata*; and two species of snakes including the common wolf snake *Lycodon aulicus*, and *Typhlops braminus*. One species of frog is known, the short-headed *Rana breviceps*, and a larger toad, *Bufo melanostictus* has also been found. Among the reptiles of the Maldives, the Maldivian Black Turtle (*Melanochelys trijuga thermalis)* is a species of turtle listed on the International Union for Conservation of Nature (IUCN) Red List as 'near threatened'. The Maldivian black turtle is currently found in only three islands which are protected: Kaashidhoo (Kaafu Atoll in Zone III*),* Muli (Meemu Atoll in Zone IV) and Kunburudhoo (Haa Dhaalu Atoll).Maldives has also been noted to be particularly rich in spider species. Some 130 insect species including scorpions, centipedes, rhinoceros beetle and paper wasps were identified during scientific investigations across the Islands. The only native mammals endemic to the country are the two subspecies of fruit bats, *Pteropus giganteus ariel* and *Pteropus hypomelanus maris*. The latter is very rare and has been recorded only once in the Maldives, in Addu Atoll (Holmes et al, 1994). Other mammals, all likely to have been introduced, are the house mouse, black rat, Indian house shrew and cats (Webb, 1988). In the homestead, the domesticated animals reared are chickens and goats.

Over 167 bird species have been recorded in the Maldives including seabirds, shorebirds and terrestrial birds, a majority include breeding residents, southern winter visitors (shearwaters and storm-petrels), and northern winter visitors (mostly waders, raptors, passerines, as well as some terns). For some of the latter, the Maldives lies at the southern end of the major Indus-Valley – West Indian flyway. A few are introductions, and imported as pets. Very few bird species reside in the country, most of which are seabirds. Terrestrial birds are very minimal compared to other tropical islands and most are likely to be introductions. At least 40 to 50 species of seabirds are seen in the Maldivian waters, of which only 13-15 are known to nest and breed in the country. Some of them are terns including S*terna sumatrana, S. albifrons, S. anaethetus, S. dauglli, S. bergi, S. bengalensis, and S. fuscata, S. saunders*i; others include two species of noddies, *Anous stolidus and A. tenuirostri*s, as well as the white tern *Gygis alba monte* which is known to breed only in Addu Atoll (Anderson, 1996). Others such as frigate birds, white-tailed tropic birds, boobies and some shearwaters are also known to breed in the Maldives (Shafeeg, 1993). Most of the shorebirds found are common winter visitors to the Maldives; however, there are some resident and immigrant species. Four subspecies of bird have been identified as endemic to the Maldives (MHAHE, 2002). The bird subspecies endemic to the Maldives are Maldivian pond heron (*Ardeola graii phillipsi),* Maldivian little heron (*Butorides striatus albidulus),* central Maldivian little heron (*Butorides striatus didii phillipsi*), and the Maldivian water hen (*Amouronis phoenicurus maldivus).*

2.3.4 Marine Biodiversity

In contrast to the terrestrial biological diversity found in the country, marine biological diversity shows an outstanding richness, especially in the coral reefs. Indeed, the marine biodiversity of the archipelago is among the richest in the entire region, and the Maldives' has been recognized as having one of the world's most diverse marine ecosystems.

More than 250 different species of hermatypic corals exist, belonging to 41 genera from the north and 55 from the south. Over 1 200 reef fish species have been recorded15 (Pernetta, 1993). As many as 5 000 different shell species, 100–200 sponge species, more than 1 000 species of marine crustaceans and over 100 species of echinoderms exist. A large range of different types of marine algae16 have also been documented (Pernetta, 1993). In addition, a variety of sharks, eels, rays, dolphins, whales and aquarium fish are commonly observed throughout the archipelago. Five species of endangered turtles, namely loggerhead turtles, green turtles, hawksbill turtles, olive ridley turtles and leatherback turtles, are also know to live in Maldivian waters (Frazier and Frazier, 1987).

A recent research study, carried out by the Marine Research Section (MRS) of the Ministry of Fisheries and Agriculture, has documented economically important fish species in the Maldives. Some 900 species have been identified, nearly 300 of which were completely new records for the Maldives, and 7 of which had never before been recorded anywhere in the world17. A second study records some 899 species of pelagic and shore fish, including 201 records new to the Maldives (Randall and Anderson 1993).

At one time, the Maldives was the only country harvesting tuna from the Indian Ocean. Tuna fishing remains particularly important to the economy of the Maldives. Eight different types of tuna and similar fish are harvested commercially form the open seas. Tuna fishing requires live bait fish which are caught in lift nets near the reef and kept alive in the flooded hull of the dhoni. Bait fish are composed of species associated with the reef, and are dependent on a thriving reef environment. Twenty different species, regularly caught and used as bait fish, may be classified in to this group.

Over the last few decades many efforts have been made to ensure the protection of the marine biodiversity and the most sensitive reef ecosystems and habitats of vulnerable charismatic marine species, along with wetlands and mangrove ecosystems have been demarcates as protected areas, However climate change impacts, coupled with other anthropogenic activities, including improper management of solid waste and sea dumping of solid waste pose a great threat to these rich marine ecosystems. **Annex 2** provides a detailed map of all protected areas within the, Maldives. The project Zone II haS a number of protected areas whereas the project Zone IV and V has very few marine protected areas.

2.4 Climate 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. In this context, Zone IV lies in a zone which is more exposed to sea induced flooding, coastal erosion and rainfall related localized small scale flooding.

2.5 Population and Housing conditions common to all Atolls

2.5.1 Population

The total population enumerated in Census 2014 is 407,660. For the first time, in Census 2014, a distinction was made between the resident population and non- resident population. Hence, for analytical purposes, reference to respective population would be made as given in the table below.

Table 4.1: Total Population, by Sex

Population	Both Sexes	Male	Female
Total Population	**407,660**	**230,453**	**177,207**
Resident Population	**402,071**	**227,749**	**174,322**
Maldivian	338,434	171,962	166,472
Foreign 1_/	63,637	55,787	7,850
Non-Resident Maldivian	**5,589**	**2,704**	**2,885**

1_/ Foreign population enumerated in Census 2014 is less than the official figures recorded in Immigration documents (Source: Census, 2014)

Population Growth

Of this total, the Resident Population is 402,071, which consist of 338,434 as Resident Maldivians and 63,637 foreigners. Census 2014 captured 5,589 Maldivians as living abroad, and hence following the notion of previous censuses, the 'Total Maldivian Population' in Census 2014 was 344,023. Between 2006 and 2014, the total Maldivian population had increased by 45,076, i.e. a 15 percent increase. Over the past two decades, however, the population growth rate continued to decline due to decreasing fertility. The total fertility rate declined from 6.4 to 2.2 children per women during this period. The rate of decline has slowed down since 2000 and remains under 2 percent.

Population Distribution

Maldives is one of the world's most geographically dispersed countries and poses wide range of development constraints. The population is distributed within the country among administrative and non-administrative islands. Census 2014 enumerated population from 188 inhabited islands, 109 resorts and 128 industrial and other islands. Table 3 gives a picture of Total Maldivian population distribution by these major categories.

Population in Administrative Islands:

Table below gives a quick glimpse of the total picture as close to 96 percent of the population lives in administrative islands. From 1995 onwards, the female population outnumbered the male population in the Administrative islands. This outcome was caused by the out migration of males for employment.

Table 4.2: Total Maldivian Population by categories, 1985-2014

Census Year	1985	1990	1995	2000	2006	2014
Maldivian population						
Both Sexes	180,088	213,215	244,814	270,101	298,968	344,023
Male	93,482	109,336	124,622	137,197	151,459	174,666
Female	86,606	103,879	120,192	132,904	147,509	169,357
Maldivian Population in Administrative Islands (including Male')						
Both Sexes	175,854	208,423	239,212	262,186	288,101	330,468
Male	89,319	104,622	119,070	129,407	140,914	161,518
Female	86,535	103,801	120,142	132,779	147,187	168,950
Maldivian Population in Resorts and Industrial Islands						
Both Sexes	4,234	4,792	5,602	7,915	10,867	13,555
Male	4,163	4,714	5,552	7,790	10,545	13,148
Female	71	78	50	125	322	407

Population in Non-Administrative Atolls:

With the expanding economic development initiatives of the government, the shift of the population from Administrative islands to non-Administrative island has increased over the years. As illustrated by the above table, the Total Maldivian population residing in Non-Administrative islands increased from 4,234 in 1985 to 13,555 in 2014. This owes to increased number of operating resorts, agricultural islands and other ongoing projects in such islands. Population in resort islands accounted for 77 percent of the residents in these islands.

Population in Male' and Atolls:

The Maldives population is vastly distributed across atolls consisting of small islands. Administratively there are 20 Atolls. Though there is no official categorization of urban and rural areas, capital Male' is widely referred to as the urban center and the rest of the Atolls recognized as the rural area. Census 2014 showed that 38 percent of the population lives in Male' the capital, while majority of the population resides in the Atolls. In Maldives, as in other small island states, internal migration and growth of urban area can be attributed to inequalities between the Capital and the rest.

Male' population has increased rapidly over the past decades. Male' remained as the country's fastest growing and most populated island. The development of tourism within Male' Atoll, rapidly expanding government and private sector, and establishment of major health and educational facilities in Male', have created significant disparities between Male' and the Atolls. In addition, developments in Male' attracts migration from all parts of the country. It passed the threshold of 100,000 population in 2006, making it one of the most densely populated cities in the world. Today, with the resident population, this rate stand as 65,201 per km2 (population density of Male' exclude Hulhumale' and Villinmale').

Population Structure

The population growth and the changing age-sex composition of the Maldives resembles that of a developing country with a relatively large proportion of people in the adult age categories (below 30 years of age), and a relatively small proportion of people in the older age categories (above 60 years).

The age cohort of 10 to 14 years is the smallest among the child population in 2014, reflecting on the shift of 0-4 years of population of 2006. In 2014, the population pyramid broadens at the youth age, showing a passing demographic window of opportunity of the Maldives population.

2.5.2 Housing

There were a total of 68,249 resident households in the census 2014, out of which 55,949 were Maldivian households and 12,300 as other households. Out of the total households 39 percent of households are in Male' and 60 percent of households are found in administrative islands of the Atolls and 1 percent in the non-administrative islands of the atolls.

The types of Household types are divided into 2 categories, which are housing units and collective living quarters. A nationwide total of 65,765 falls in to the category of housing units. Out of this 96 percent are house/flats/apartments. A total of 2,484 have been recorded as collective living quarters which consist of labour quarters / staff quarters and other collective living quarters. These account for 4 percent of all households.

Table 5: Total Households by type of housing, by locality, 2014

			Atolls		
Type of Households	**Republic**	**Male'**	**Atolls**	**Administrative Islands**	**Non-Administrative Islands**
Housing Units	65,765	25,673	40,092	39,919	173
Collective living quarters	2484	1066	1418	968	450

Source: Census, 2014

Given that 38 percent of the total population resides in Male', the average household size in Male' for a Maldivian household is 5.5 and other households is 6.1. Household size for the whole nation for Maldivian households was at 5.4 percent and 8.1 percent for other households.

3 Chapter 3: Environmental and Social Legislation, Regulatory and Institutional Framework in the Republic of Maldives

3.1 Republic of Maldives Environmental Policies and Legislation

The Ministry of Environment, Energy and Water originally held the mandates for protection and preservation of environment. Under a reorganization 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 reorganized, 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.

3.1.1 The Environment Protection and Preservation Act (4/93)

The basic environment law, Law No.4/93 Environment Protection and Preservation Act (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: 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: 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: The Ministry of Environment, Energy and Water [*now the Ministry of Environment and Energy*] shall be responsible for formulating policies, as well as rules and regulations regarding the environment in areas that do not already have a designated government authority already carrying out such functions.

Protected Areas and Natural Reserves: 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. 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): 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. 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: 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: 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. 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: 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: 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. 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: 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.

Definitions: Under this Law: (a) The "environment" means all the living and non-living things that surround and effects the lives of human beings; and (b) A "project" is any activity that is carried out with the purpose of achieving a certain social or economic objective.

3.1.2 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.

3.1.3 Environmental Impact Assessment Regulation (No. 2012/R-27) and Amendments

The Law No. 4/93 on Environmental Protection and Preservation stipulates under Article 5, any development work or project should have an Environmental Impact Assessment consented to by the Ministry of Environment, Energy and Water [*now the Ministry of Environment and Energy*]. This

regulation also deals with the selection of sites or islands for economic and social development by relevant authorities. Accordingly, the project will be required to undertake EIAs for the regional waste management facilities and submit an EIA screening form to EPA. EPA will then determine whether an EIA or ESMP is required for the development activity for the island waste management centers. The first regulation was put in place in 2007, followed by significant update to the regulation in 2012.

This regulation has undergone number of amendments in 2013, 2015 and 2016. These amendments included revision of EIA review period and associated costs, qualification required for monitoring the Environmental Management Plan, revision to the list of projects that requires EIAs, projects that can be undertaken by simply applying mitigation measures defined by EPA such as for dredging of harbors, clearance of vegetation within allocated plots for households and for roads, transferring EIA decision making to Minister of Tourism for tourism related activities; categorization of EIA consultants, point system for consultants to assess performance and license suspension, a code of conduct for consultants, and increment to the fine for non-compliance of regulation and violations.

3.1.4 Regulation Governing Reclamation and Dredging of Islands and Lagoons of Maldives 2013/R-15

The Article 22 of the Constitution states that the State shall undertake and promote desire based economic and social goals through ecologically balanced sustainable development and shall take measures necessary to foster conservation, prevention pollution, the extinction of any species and ecological degradation from any such goals and this regulation is constituted for the purpose of pursuing this undertaking. It determines the guidelines that would minimize the damage caused to the environment due to reclamation and dredging pursuant to Article 3 of Environment Protection and Preservation Act. This regulation is enforced by the Environmental Protection Agency.

3.1.5 Stone, Coral and Sand Mining Regulation

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.

There is another similar regulation named "Regulation on Coral Mining (1990), which is only applicable to coral mining from the 'house reef' of islands and the atoll rim reefs.

3.1.6 By-law - Cutting Down, Uprooting, Digging Out and Export of Trees and Palms from One Island to Another

This regulation is enacted under Act 4/93 (environment Protection and Preservation Act). As such, this regulation is a compilation of guidelines to be adhered towards chopping, uprooting, removing and transfer between islands, of palms and trees in the Maldives.

Palms and trees may only be chopped, uprooted, removed or transferred between islands out of mere necessity. No one shall be exempted from this regulation except the parties/exemptions mentioned in Article 4 of this regulation.

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 [*now the Ministry of Environment and Energy*].

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 and Energy 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.

3.1.7 Dewatering Regulation (213/R-1697)

This regulation is constituted for the purpose of ensuring that the drainage of water in the islands of The Maldives in the process of dewatering and subsequent dumping of discharge water into the soil or to the sea, is conducted with minimal impact to the environment. Given water is the source of life and one of the essential elements forming the environment, the purpose of this regulation is to avoid contamination of the groundwater table, to mitigate the damage caused to the water table; and to protect the habitat, the environment, the public and all living organisms from the impact of dewatering.

This regulation is enacted from the rights vested on the Ministry from article 3 of Act 4/93(Maldives Environment Protection and Preservation Act). This regulation is enforced by the Environment Protection Agency on behalf of the Ministry.

In addition to the institutions of the state, it is a responsibility of every individual to protect the groundwater table of the islands of the Maldives and to manage it in a sustainable manner. The process of dewatering for any industrial purpose shall be conducted on any island pursuant to the guidelines prescribed in this regulation and after having obtained permission in writing from the implementing agency or from their delegate.

3.1.8 Heritage Act (27/79)

The Heritage Act (Act No: 27/79) was ratified on the July 22, 1979, which is basic and only prohibits the destruction and vandalizing 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 (archaeological sites, findings of artefacts, sites of historical significance) have taken place.

3.1.9 Tourism Act (No. 2/99)

Recent amendments related to EIA regulation as it applies to tourism sector is of importance:

Clause 15: Permanent change to the [natural] environment, land and island

(a) Any form of development which may permanently change the [natural] environment of an island, plot of land or lagoon, lent for the development of tourist resorts shall be conducted with written permission from the Ministry of Tourism.

(b) The permission for any development which will change the existing [natural] environment permanently as mentioned in sub-clause (a) shall be granted by the Ministry only after making an Environment Impact Assessment (EIA) report of that proposed development.

(c) The authority to decide on matters that will bring a permanent change to the [natural] environment as mentioned in sub-clause (a), and to do the EIA report concerning those matters, and to grant permission for those matters, rests only with the Ministry of Tourism

(d) All regulations required to be in place under this clause shall be made by the Ministry of Tourism.

3.1.10 Regulation on the Protection and Conservation of Environment in the Tourism Industry (2009)

This regulation is made pursuant to Law No. 2/99 (Maldives Tourism Act) and stipulates the standards for the protection and conservation of environment in the tourism industry. The purpose of this regulation is to protect the environment in the tourism industry and to encourage and facilitate sustainable development of tourism. In this regulation, unless the context otherwise requires, "tourism industry" means any island leased for the development and operation of a tourist resort, tourist hotel, tourist guest house, yacht marina, and islands leased under the Maldives Uninhabited Islands Act (Law No. 20/98) and all other places and facilities registered under Ministry of Tourism and Civil Aviation for the provision of service to tourists. In this regulation, unless the context otherwise requires, "property leased for the purpose of tourism" means islands leased for the development and operation of a tourist resort, tourist hotels, tourist guest houses, yacht marinas, and islands leased under the Maldives Uninhabited Islands Act (Law No. 20/98).

The regulation focuses on number of activities including waste management including requirements such as (i) bins to collect waste to be kept in various areas in an easily accessible manner in all resorts, picnic islands, marinas or such places leased for tourism purposes and such bins need to be in a clean and sanitary state, with the lid closed; (ii) food and beverages, putrefying items, plastics, paper, glass, iron and items such as cans and toxic or hazardous waste to be kept in separate bins for each type, and shall be labeled as such; and (iii) waste disposal in tourist resorts, picnic islands, and marinas operating in the Maldives shall be carried out in a manner that would have the least impact on the environment, and in accordance with the laws and regulations and in accordance with the following rules prescribed by the Ministry of Tourism and Civil Aviation. It is important to note, the regulation allows food waste and biodegradable waste to be dumped into the ocean in the absence of a designated area in the region.

3.1.11 Land Act No 1/2002

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 Land Act 1/2002, as subsequently amended.

Where land is required for national or government use, leased for companies with 100% government share or with significant investments between the government and foreign investors the land tenure is administered under the Land Act (1/2002). In accordance with the Land Act, the policies on Land can be ordained by the President in consultation with the cabinet.

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; and

- For state 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 as "state dwelling". Such parcels are issued by the respective Atoll Office and must not exceed 4,000 ft^2 (372 m^2). The parcel is forfeit if not developed ("settled") within five years. State dwellings are heritable and divisible, down to no smaller than 600 ft^2 (56 m^2).

State dwellings can be privatized 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 to the seller on the purchase price. 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.

Under the Varuvaa system land is leased out to individuals not to undertake major economic activities, but to obtain benefits from the island in terms of the coconuts they generate from the islands. However, lessees undertake annual crop cultivation on islands where cleared agricultural land is available. The rents of Varuvaa islands are fixed by the number of mature coconut palms on the island. It should be emphasized that some of these islands may not even have any coconut palms and as such may not generate any effective income.

Goi land refers to a particular area of the inhabited island with special vegetative characteristics. Coconut palms and tree species grown on *goi* land belong to the government. *Goi* land is rented to the highest bidder by the Ministry of Atolls Development. The lessee rents smaller plots for farming. In general, the lessee gets 12.5% of the income generated by farmers. *Faalabba* is a land area generally located close to residential areas. Islanders grow coconut palms and tree species with the permission of the Island Council. Half of the trees grown belong to the person who planted them and the other half is the property of the state. Most islands have communal land for the cultivation of annual crops. No rent is charged for cultivation on this land and no standard regulation exists for its use. Land for agriculture is allocated to residents by ISlanc Councils 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. On some islands plots change hand every year, whereas on other islands farmers can hold the plots as long as they continue cultivation. The complexity of land tenure systems on inhabited islands has serious implications for the development of agriculture.

When land is required for public projects, the standard practice adopted by GoM is 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. Maldives Land and Survey Authority established in 2011 is responsible to 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.

Where land is required for national or Government use, leased for companies with 100% government share, or with significant investments between the government and foreign investors, the land is administered under the Land Act (1/2002) and requires ordination by the President in consultation Cabinet before being allocated.

3.1.12 Decentralization Act (2010)

The final version of the Decentralization Act was passed in April 2010 and was ratified in May 2010. The Decentralization Act provided for the Local Government Authority (LGA) which was established in late 2010. Under the Decentralization Act Island Councils are accountable to Atoll Councils and Atoll Councils are accountable to the LGA.

The Constitution mandates Councils to provide democratic and accountable governance; foster the social and economic well-being and development of the community; and establish safe, healthy and ecologically diverse environment. The Constitution entitles Councils to a grant from central government and to raise own revenues.

Chapter 4 of the Decentralization Act has direct relevance to the administration of this Project. The Act gives island councils specific powers and responsibility for, amongst other things:

- Administering and developing the island in accordance with the Constitution and statutes and providing municipal services as prescribed in this Act;
- Preparing island development plans in consultation with the community, and submitting the plan to the Atoll Council;
- Implementing development projects planned and assigned by the government in line with the island development plans formulated by islands and submitted to the Atoll Councils;
- Assisting Government Ministries and Atoll Councils in monitoring the progress of various development projects;
- Formulate island level policies necessary to discharge the powers and responsibilities conferred to the island council by this Act, and formulate and implement required regulations for the purpose.

Services rendered by the Island Council to the people of the island under this Act include disposing of waste in a reasonably safe manner at the island level so as it does not create any inconvenience to the community. Under this Act the Island Councils have the power to charge a fee or rent in order to obtain funds for the services they provide including for safe disposal of wastes. Such fees to be charged shall be determined in consultation with the people of the area and in accordance with the Laws of Maldives. The fees may be charged for the following service:

Under Chapter 14 of the Act the Island Councils have the power to formulate regulations on matters which fall within their jurisdiction with advice of the Local Government Authority. In addition, with the advice of the Local Government Authority, the city councils, atoll councils, and the island councils have the power to make regulations about waste management and disposal on their islands.

3.2 Specific Legislations on Solid Waste Management Sector

3.2.1 National Solid Waste Management Policy of 2008 and 2015

Building on its predecessor of 2008, GoM announced its new SWM policy in 2015. Under this policy, the government commits to provide equipment and resources required for waste management in all inhabited islands of the Maldives.

The policy details out 10 goals or targets as listed below:

1. Each person should be responsible to the waste generated at the individual level and should comply with rules and regulations established locally;
2. All household waste should be managed as per the requirements of the local council;
3. Each inhabited island should submit and approve an island waste management plan for the island;
4. Waste collection should be undertaken based on a fee based system for households and industries alike;
5. Make agreements with government utility companies active in different inhabited island to manage waste generated in the islands;
6. Establish waste management system in each inhabited island that is suitable to meet the requirements of the population and quantity and type of waste generated;

7. Establish regional waste management facilities in different regions of the country;
8. Establish mechanism to transport all residual waste out of the island to a Regional Waste Management Center;
9. Promote generation revenue through waste management practices and use of such revenue to waste management at island level; and
10. Undertake waste management training and awareness campaigns at the national level.

3.2.2 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 is implemented by the Environmental Protection Agency. This regulation focus on following five areas:

1. Waste management standards: Defines standards for waste collection, transfer, treatment, storage, waste site management, landfills and managing hazardous waste;

2. Waste management Permits: Defines approval procedures for waste sites;

3. Waster transfer: Standards and permits required for waste transport on land and sea, including trans-boundary movements;

4. Reporting requirements: Defines reporting and monitoring requirements and procedures; and

5. Enforcement: Defines procedures to implement WRM and penalties for non-compliance.

3.3 Social Laws and Regulations

3.3.1 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 ft2 (372 m2). The parcel is forfeit if not developed ("settled") within five years. State dwellings are heritable and divisible, down to no smaller than 600 ft2 (56 m2).

State dwellings can be privatized 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. 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 Organization (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.

Maldives Land and Survey Authority established in 2011 is responsible to 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.

3.3.2 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.

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 (ADB, 2007), UNDP's 2010 Situational Analysis (UNDP, 2010), and FAO's factsheet on Women in Agriculture, Environment and Rural Production (FAO, undated).

3.3.3 Other Social Laws related to the Project

Legislation relating to human rights and labor is listed in **Table 6** below.

Year	***Name***	***Details***
1984	*International Convention on the Elimination of All Forms of Racial Discrimination*	Accession 24 April 1984

1990	*Prevention of Terrorism Act (Act No.10/1990)*	The Act prohibits acts of terrorism, and imposes severe punishment for offenders.
1991	*Convention on the Rights of the Child*	1991 Ratified 11 February 1991
1993	*Convention on the Elimination of All Forms of Discrimination Against Women*	Accession 1 July 1993
2002	*Optional Protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography*	Ratified 10 May 2002
2004	*Convention Against Torture and other Cruel, Inhuman or Degrading Treatment or Punishment*	Accession 20 April 2004
	Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict	Ratified 29 December 2004
2006	*Human Rights Commission Act (Act No. 6/2006)*	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.
	Human Rights Commission of Maldives	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. 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.
	Optional Protocol to the International Covenant on Civil and Political Rights (OPICCPR)	Ratified 19 September 2006

	International Covenant on Economic, Social and Cultural Rights (ICESCR)	Ratified 19 September 2006
	Optional Protocol to the Convention on the Elimination of All Forms of Discrimination Against Women	Ratified 13 March 2006
	Optional Protocol to the Convention Against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment	Accession 22 June 2006 (founding member)
2008	*Employment Act (Act No. 2/2008)*	Specifies the rights and duties of employers and employees. The Employment Act specifically prohibits forced labor, discrimination at the work place, and child labor.

3.4 Environmental Health and Safety Guidelines for the SWM Sector in the Maldives

3.4.1 Environmental Standards Associated to SWM

It is over the last decade or so that the Maldives has progressed in developing national environmental standards in order to maintain a clean and healthy environment. Among these the following regulations and guidelines set forth the environmental standards that are pertinent to the Solid Waste Management (SWM) sector. The Waste Management Regulation (WMR) 2013, sets forth the minimum standards to be maintained during waste management operations. The regulation is implemented by Environmental Protection Agency (EPA) which holds the overall responsibility of ensuring that the standards are met by the operator and individual/operator that partake in SWM within the country. The WMR defines standards for waste collection, transfer, treatment, storage, waste site management, landfills and managing hazardous waste.

The EPA has also developed Waste Incineration Guidelines (WIGs), published in 2016, which are intended to facilitate the construction and operation of waste incinerators safely and to mitigate the adverse environmental and health impacts that may arise during the set up and operational cycle. The WIGs present the minimal standards to be maintained and precautions to be undertaken during waste incineration. However the standards presented in the WMR and the WIGs are considered as the minimum requirements applicable to the sectoral context as per the overarching regulation. While the WIGs stipulate the minimum standards to be maintained in order to limit emission values for plants incinerating waste, the country as a whole has not yet developed a comprehensive framework and standards for managing air emissions. Air quality is monitored by the EPA relative to the Ambient Air Quality Standards of the United States Environmental Protection Agency, which has been recognized as the international best practice.

As typical SWM activities lead to the production of waste water, the National Waste Water Standards also hold applicability within the sector. The following sections present a brief snapshot of each of the existing environmental guidelines and relevant standards currently applied in the Maldives. The outline is based on information shared by the Ministry of Environment and Energy in the form of both official and unofficial translations of the regulatory instruments and information available on the EPA public domain.

3.4.2 WMR 2013: Standards Governing Waste Management

Annex-A of the WMR present the minimum standards to be maintained in waste management. It outlines a set of practices to be followed and maintained during the collection, land and sea transport of waste, waste treatment, storage and the management of waste disposal centers and hazardous waste. The standards on collection outline practices to be maintained with regard to the waste categories domestic, commercial, waste generated in resorts, construction and demolition waste and agricultural waste. It also stipulated the occupational health and safety standards that need to be maintained by individuals partaking in waste management activities throughout the management stream. The standards do not make any specific reference to any specific international standards or best practices. The Standards do not include specific guidance on leachate and emission management during solid waste operations. The EPA is the main designated body for the implementation of the WMR.

3.4.3 Waste Incineration Guidelines 2016

The main objective of the Waste Incineration Guidelines (WIGs) is to limit and where possible prevent negative impacts on the environment that are caused due to incinerator operations, predominantly pollution by emissions into air, soil, surface and groundwater, and the resulting risks to human health, from the combustion of waste using incinerators. The WIGs are applicable to all categories of waste incinerators and aim to assist those who partake in the construction and operation of waste incinerators, to achieve the most practical health and environmental outcomes while ensuring a sound final disposal mechanism for solid waste. The WIG outlines standards that need to be maintained and precautionary measures to be undertaken during waste incineration. It also stipulates measures to mitigate and avoid adverse environmental impacts with regard to the incineration of medical waste and hazardous waste, covering collection, storage and transport in addition to incinerator operations.

The WIGs, detail out criteria for site selection to be followed when planning the establishment of waste incineration facilities with the aim of ensuring that the site does not pose any hazard to the surrounding environment and the local community. It sets forth measures on ensuring sound emission control, such as standard practices on segregation of incinerator feed, establishments of buffer zones and metrics for establishments of smoke stacks. It also outlines emission levels to be maintained during operation as well as monitoring and control systems. As per the WIGs, emission should be continuously measure and recorded. At minimal, parameters such as Opacity, Oxygen Carbon monoxide, Hydrogen chloride and Temperature are required parameters. The WIGs also require that facilities have contingency plans developed for events such as accidental spills and discharges, failure of air filter systems, incidents or fire and natural hazards and disasters. The permissible air emission levels to be maintained are at the same level to the European Union standards for the outlined parameters.

In terms of handling of waste, other than medical and hazardous waste, the WIGs do not give specific guidance or standards, instead they endorse the use of the WMR and the National Waste Water Quality Guidelines for management of waste water.

3.4.4 National Waste Water Quality Guidelines 2007

The National Waste Water Quality Guidelines (NWWQGs) were developed in 2007 and the designated authority mandated to administer the guidelines is the Maldives Water and Sanitation Authority (MWSA). Covering both domestic and industrial waste water, the main purpose of the guideline is to provide clear technical guidance to individuals, organizations, license holders, government and regulators in order to manage waste water effluents in addition to following international best practice in terms of cleaner operations and production. The guidelines deal with domestic wastewater quality for discharge into deep sea and provide the maximum concentration of listed components that have to be complied with at all times including coliform, pH and suspended solid levels. The NWWQGs also

provides maximum concentration levels for domestic and industrial wastewater combined, but does not specifically provide guidance on dealing with industrial effluents or leachates of any kind. The country does not have set standards for ground water quality.

Typically waste water discharges from SWM operations fall under the categorization of industrial effluent and leachate, for which the NWWQGs do not present specific standards. The NWWQGs also stipulate that the guidelines are generic and conservative, the standards state that in the event the capacity of the receiving environment to deal with additional waste water, has been exceeded or when the activity generating the waste water is envisioned to produce waste water at extreme lower or higher levels than the standards set in the NWWQGs, an Environmental Impact Assessment (EIA) is required and need to be completed by accredited Assessors approved by MWSA. In addition the producer has to prove to government that best international Clean Production protocols are followed. Based on the recommendations of the EIA report and proof of Clean Production practice, MWSA will issue site specific guidelines for the discharge of waste waters. No exemptions to the Guidelines will be allowed without site specific guidelines to that effect. Monitoring plans are mandatory for all waste water generators as per the guidelines.

3.4.5 WB ESH Guidelines

There are several international best practices and standards development for SWM operations. Among these the World Bank Group Environmental, Health, and Safety (EHS) Guidelines are noted among the most comprehensive standards developed for the sector and guide all support by the World Bank Group. The EHS Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice. The EHS Guidelines for Waste Management cover facilities or projects dedicated to the management of municipal solid waste and industrial waste, including waste collection and transport; waste receipt, unloading, processing, and storage; landfill disposal; physio-chemical and biological treatment; and incineration. Industry-specific waste management activities such as health care waste, also have a relevant industry-sector EHS Guideline. The guidelines also provide performance indicators and industry benchmarks on environmental performance and environmental monitoring.

3.5 Key Institutions Managing Environmental Sector and Solid Waste Management Sector

3.5.1 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 organization 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.

3.5.2 Mandate of the Environmental Protection Agency

The mandate of the EPA is as follows.

1. Planning and administering the protection of places and living species that are designated to be protected according to the provisions of the Environment Act

2. 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.

3. Carrying out all tasks related to the implementation of the Maldives Environment Act.

4. Implementing the Environmental Impact Assessment Regulation.

5. Carrying out the conservation processes deemed necessary based on data gathered regarding the erosion of islands due to natural or human activity.

6. 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.

7. Introducing a system of valuation of the environment in order to recoup any loss to the environment, and implementing this activity.

8. 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.

9. 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.

10. Drawing up guidelines, regulations and standards for the management of solid waste and sewerage, and ensuring that providers of water services follow these standards.

11. 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.

12. Carrying out scientific research and experiments, developing a knowledge base in this area, and disseminating this data to those who require it.

13. Researching the changes to the beaches of islands and the causes of beach erosion, and providing advice to solve these issues.

14. 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.

15. Identifying the impacts of land reclamation, harbor 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.

16. Conducting research and experiments on the environmental pollution in the Maldives, and providing data and professional advice.

17. Conducting research on the taxonomy and habitats of living organisms, and providing data and sharing the experiences with relevant organizations.
18. Conducting research and experiments regarding environmentally friendly biotechnology and biosafety, and providing data and professional advice

19. 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.
20. Monitoring the gases, smoke and particulates in the atmosphere, gathering and monitoring data on these issues, and making it available to relevant parties.
21. Conducting scientific research into the available sources of potable water in the Maldives, monitoring such data, and making it available to relevant parties.
22. Conducting research to identify natural sources of energy in the Exclusive Economic Zone (EEZ) of the Maldives.
23. 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.

3.5.3 Institutions with Responsibilities for Solid Waste Management

Responsibilities for Solid Waste Management are divided across several institutions across various ministries and levels of government. In ascending order of hierarchy, the key institutions with responsibility for solid waste management are;

Island Councils are responsible for the collection, treatment, and disposal of waste from households. This remains largely true, except for the cities of Male and Addu, where in 2015 the government through parliament took back responsibility for Waste Management from Male City Council and Addu City Council, and placed it with the Waste Management Department (WMD) of Ministry of Environment and Energy where it remains today. Specifically, ICs manage the operations of their Island Waste Management Centers (IWMCs) and prepare their Island Waste Management Plans (IWMPs) with support of the WMD and in coordination with the Atoll Councils. They will ensure their IWMP are fully implemented including operating the IWMCs once established and carry out the waste management service on their islands.

Island councils are empowered to make regulations, with advice from Local Government Authority (LGA) in various areas, including SWM services. The LGA is also responsible for building capacity of the Islands councils on various issues which are in their domain, including SWM

Under the Government's current Waste Management Policy, a Regional Waste Management Center (RWMC) is created in each zone/region, to serve as a final treatment and disposal facility for the waste that the Island Waste Management Centers (IWMC) have collected from their communities.

Out of a planned six RWMC country wide only one has been created in the North, specifically in Zone II.

Atoll Councils have a limited function to coordinate the activities and plans of their respective island councils with the Waste Management Department of the MEE.

Waste Management Corporation (WAMCO) is responsible for operating the RWMCs created in each zone.

Environment Protection Agency (EPA) provides regulatory oversight of the solid waste management sector and operations in line with its mandate. The EPA is as an autonomous agency with its own

oversight governing board but with a dotted reporting line to the Minister of MEE, who approves the EPA's budget and is accountable to Parliament for it.

However, the Tourism Regulation of 2013, regulates the waste generated at the country's resorts and places regulatory responsibility on the Ministry of Tourism. Therefore, the EPA has no authority to regulate the waste on resort islands. The EPA's authority with respect to waste generated on resorts begins only when the waste has left the resort islands. Construction, demolition and hazardous waste are generally the responsibility of the producer, while, medical waste is administered, managed and operated by the Health Protection Agency. But, all forms of waste are regulated by the EPA, except for resort waste as stated earlier.

Waste Management Department, Ministry of Environment and Energy, headed by a Director General, under the ministry, directly responsible for national waste policy and coordination. WAMCO has been reinvigorated recently with a fresh induction of key officials. Currently, WAMCO has been contracted by the WMD to manage waste in Male'. It also is responsible for managing the Thilafushi site where the waste from Greater Male' area and the resorts is being transported for final disposal.

Other Agencies: All land is the Maldives is owned by the Government with Ministry of Fisheries and Agriculture (MoFA) owning all uninhabited islands – potential sites for processing and disposal of wastes. Ministry of Housing (MoH) is responsible for allocating land on inhabited islands on recommendation of the Island councils for various purposes, including SWM. MoH also owns Thilafushi Corporation who control the island of Thilafushi which is the only official location where large scale handling, processing, and disposal of solid waste is undertaken.

3.6 Compliance with World Bank Operational Policies

3.6.1 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 MCMP 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)	√

3.6.1.1 Environmental Assessment (OP/BP 4.01)

As per the scope of the MCMP, the project is categorized as an **Environmental Category A** in relation to environmental assessment (EA) requirements, and the project triggers the Environmental Assessment safeguard policy (OP/BP 4.01). The categorization is predominantly due to project activities including the construction of new/upgrading of SWM facilities, addressing management of existing disposal sites and onsite treatment, management and the final disposal of solid waste in proposed facilities.

While the overall project is environmentally beneficial, physical interventions to establish a sound SWM system will lead to significant environmental impacts and need to be stringently mitigated and managed within the context of the project.

An Environmental and Social Assessment and Management Framework (ESAMF) will serve as a roadmap outlining the prerequisite environmental and social screening and assessments that will need to be undertaken for all project activities, as per the national environmental legislations of the Maldives and the Bank's OP4.01 and other triggered safeguards policies. The ESAMF will apply to all components of the project. All subsequent individual assessments ESIAs/ESMPs will be prepared and by the client and submitted for bank approval before any civil works and/or land take.

3.6.1.2 Natural Habitats (OP/BP 4.04)

OP/BP 4.04 – Natural Habitats was triggered because all of the country's islands are surrounded by coral reefs which are significant natural habitats. The overall project will not conduct any activities within designated protected areas and project interventions will facilitate in mitigating pollution and degradation of such ecosystems due to inappropriate SWM. Adequate measure to screen, identify and mitigate any potential impacts to coral reefs, island vegetation and associated fauna and flora will be included in the ESAMF. As the current practices of SWM are detrimental to natural habitats, the proposed actions will help the project islands manage solid waste better and reduce the negative impacts associated with waste generation.

3.6.1.3 Involuntary Resettlement (OP/BP 4.12)

OP/BP 4.12 – Involuntary Resettlement was triggered because it was considered that some of the potential investments, for example the construction and expansion of IWMCs, could lead to future chance find of involuntary loss of crop, land taking as a small percentage of communities rely on surrounding land for agriculture and livelihood. These issues have been taken into consideration whilst developing the ESAMF. The screening protocols and mitigation guidelines outlined will ensure that any interventions considered in future will not cause involuntary resettlement. As an 'insurance' for this issue, an outline Resettlement Policy Framework (RPF) has been provided in the ESAMF, so that if any resettlement issues should arise they can be resolved satisfactorily. All subsequent individual social assessments, including ESIAs/ESMPs, will be prepared and by the client and submitted for bank approval before any civil works and/or land take.

3.7 Adequacy of GOM Environmental Clearances

The Government of Maldives (GOM) has a number of environmental policies, regulations and standards of specific relevance to environmental protection as well as on Solid Waste Management (SWM) as highlighted in detail in the sections above. The main legal instrument pertaining to environmental protection is the Environmental Protection and Preservation Act (Law No. 4/93) of the Maldives, passed in April 1993. This Act provides the Ministry of Environment and Energy with wide statutory powers pertaining to environmental regulation and enforcement. This umbrella law focuses on issues such as

environmental impact assessment, protected areas management and pollution prevention. In addition the GoM also enforces the Environmental Impact Assessment Regulations, which came into force in May 2007, as per the statutory requirements of the EPPA. The EIA Regulations have been the basis for Environmental Impact Assessment in the Maldives and since its advent it has helped to improve the quality of EIAs undertaken in the country. All solid waste management projects have been categorized as types of projects that will require the preparation and subsequent environmental clearance from the EPA Maldives has a sound track record of implementing the Environmental Impact Assessment process. The technical capacity of the EPA is reasonably good in terms of ensuring the adequacy of EIAs and their implementation.

The Waste Management Regulation of the Maldives was gazetted in 2013 and became effective on the 5th February 2014. The Waste Management Department (WMD) of the MEE is mandated to ensure the proper implementation of the regulations. 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. The EPA has also developed Waste Incineration Guidelines (WIGs), published in 2016, which are intended to facilitate the construction and operation of waste incinerators safely and to mitigate the adverse environmental and health impacts that may arise during the set up and operational cycle. The WIGs present the minimal standards to maintain and precautions to be undertaken during waste incineration and the EPA is responsible to ensure sound adherence to the standards.

4 Chapter 4: Generic Assessment of Environmental and Social Impacts

4.1 Overview

The project is expected to bring positive environmental benefits to the project areas through ensuring a sound system for solid waste management is established in the project regions. While the project activities themselves will facilitate in curtailing the major impacts associated with improper management of solid waste still remain moderate risks associated with the operation of solid waste management facilities and final disposal of solid waste that need to be managed accordingly. In addition there is also the uncertainty regarding the exact locations of activities to be carried out under the project and project interventions that will involve physical alterations to the environment, such as those that fall within the activities of Components 2b and 3 which will be fueled by feasibility studies that will determine the nature of the investments.

This ESAMF has been designed to achieve sound environmental practice within the purview of MCMP. The ESAMF provides the mechanism to allow program implementation by screening out or enhancing acceptability of sub-project proposals on the basis of environmental criteria. By a simple process of elimination, the first step in the screening process is to identify subproject activities not suitable for funding. All processes described in the ESAMF can be adjusted based on implementation experience.

The ESAMF will be a living document and will be reviewed and updated periodically as needed.

It is recommended that the following types of subprojects are not financed and therefore should be considered as a "Negative List":

- Sub-projects that involve the significant conversion or degradation of critical natural habitats such as marine and terrestrial protected areas.
- Activities that could lead to invasion or spread of weeds and feral animals or the use of toxic chemicals, intensive use of pesticides.
- Activities that could dangerously lead to the exposure of sensitive/critical/vulnerable habitats.
- Construction of large new infrastructure within or directly adjacent (in buffer zones) to protected areas
- Illegal Activities as defined specifically under the environmental regulations of the Government of Maldives.

Inhabited islands in the Maldives are pre-zoned out with housing and other facilities in one part of the island, small scale industry such as dry fish processing in designated parts and areas located well away from these sites are typically either existing IWMCs or sites where waste is dumped.

While at this time we know that there are areas for SWM pre-designated on islands we do not know exactly which inhabited islands in the Atolls the project will be funding. The MEE has facilitated the preparation of IWMPs on these islands, which is currently ongoing, this plan will identify the exact location of the IWMCs. These sites are always located away from human habituation as the EPA does not allow IWMCs to be sited in close proximity to settlements on the Islands as per the guidance that is provided in the legislature and opt for existing sites where SWM practices take place due to the lack of land on these islands. The MEE will only select islands for funding where Island Waste Management Plants (IWMPs) have been cleared by the EPA.

4.2 Component Specific Environmental Impacts

4.2.1 Component-1

This component would channel Bank support to the activities related to the current policy implementation at the national level. This component will also be guided by priorities emerging from the current Solid Waste Bill, a draft for which is being processed in the MEE and AG office for deliberations in the Majlis in the New Year. Candidate areas include reuse of construction debris, Ocean Plastics, Extended Producer Responsibility (EPR), etc. .

Interventions under this component will not involve any physical interventions and will bring about positive environmental impacts by strengthening the implementation of national level sound waste management activities via policy directives, awareness and education which will help promote sound solid waste management throughout the country. It will also build local technical capacity within the sector which will help maintain the sustainability of sound waste management in the country.

4.2.2 Component-2

Sub-Component 2a
This component will support Activities in the Zone II which will include the following investment activities in Zone II for operationalization of the facilities created under MEMP at the RWMC in Vandhoo. This would include provision of equipment, augmentation of storage facilities, and access roads on the site. Currently identified equipment include a Jib crane to life waste containers from vessels bring waste to the island, a solid waste sorting line, and excavator.

A site specific full Environmental and Social Assessments have already been completed for the RWMC facility and Vandhoo and has been cleared by IDA. Over the project period of the original project the key environmental impacts have been mitigated and well managed, thus the same safeguard instruments, which include the Environmental and Social Impact Assessment (ESIA) and Environment and Social Management Plan (ESMP) for the RWMC will be still valid.

In terms of operational aspects, the key infrastructure components of the regional waste management center (RWMC) including installation of the incinerator and building the sanitary landfill on Ra. Vandhoo and all of the other supportive infrastructure, including two transfer vessels to carry waste from the islands, were completed early 2016. The test run for the incinerator was carried out in early May 2016 and the system has been functioning since mid-2016 and managed by the Waste Management Corporation (WAMCO). An Operation Manual for operating the RWMC is in place and staff training on sound management of the incinerator and operation of the system in a manner that will manage environmental impacts has also been conducted. The Installation of emission controls/monitoring system to monitor compliance with standards as per the ESMP of the RWMC has been completed as well. The RWMC will maintain air emission standards as per the EU standards which have been set in the National Waste Incineration Guidelines. Routine monitoring of the ESMP is conducted by the relevant agencies of the MEE. This ESMP will be valid for this project period as well.

Sub-Component 2b
Based on the outcome of the feasibility study for the integrated waste management system for the Zone IV and V, which will be completed under **Sub-Components 3a** the project will support the establishment of a Regional Waste Management Center (RWMC) and key components of a Regional Waste Management System in the new Zones IV and V. Candidate criteria could include – feasible design within the available budgetary envelope, confirmation of availability of necessary land and compliance with relevant provisions of the ESAMF. The ESAMF stipulates the necessary Best

Practicable Environmental Option Study (BPEO) and Environmental and Social Assessments that need to be conducted during this process in the sections below. Impacts associated with the set up and operation of RWMCs. The development of any waste management facilities designed to receive / process more than 10 tons of waste per day is a Schedule D activity under the Maldives Environmental Impact Assessment Regulations, 2012 and will, therefore, require a Full Environmental and Social Impact Assessment and operations in adherence to the World Bank EHS guidelines on Waste Management Facilities and General Health and Safety.

Potentially the most serious impacts are likely to occur in the construction and operation of the RWMC. Based on past experience in the Maldives, it is not possible to build the RWMC on an inhabited islands due to high population densities, coupled with community opposition. The only available alternative is to construct the RWMC on uninhabited islands or in islands with compatible land use such as Industrial Island. The nature, magnitude and scale of potential environmental impacts of the regional solid waste management component under **Sub-Component 2b** will only be known once the feasibility studies have been conducted under **Sub-Component 3a** and the technology for final disposal and site are known post the Best Practicable Environmental Option Study that will be conducted.

The key impacts that can be envisioned at this stage will be the need for land for the establishment of the RWMC. In the context of the limited land availability due to the geographic setting of the Maldives it is unlikely that there will be uninhabited islands with adequate land area to construct a regional solid waste landfill for waste disposal for a 20+year period. Reclamation of a shallow lagoon surrounding the island is a possible option for expanding the land area in the selected island. Considering the fragile ecosystems in the Maldives, this could result in loss of some areas of coral reef, with potentially irreversible impacts of the marine ecosystem. Considering the environmental damage and the cost incurred for reclamation, the project will not support this option. In order to minimize the adverse impacts on the coral reef system in an uninhabited island, site selection is critical and will be addressed in the BPEO study. Priority should be given to the condition of the reef surrounding the island. Every attempt would be made to select a degraded reef ecosystem, preferably beyond rehabilitation, where the impacts of excavation for a navigation channel for accessing the island, if needed, will be less significant.

4.2.3 Component-3

All parts of this component will support development/completion of island level facilities for managing collection, segregation, on-site treatment of organic waste and storage of residual waste, until its eventual transfer to the RWMC. The candidate zones for the project are currently IV and V.

The first s**ub-component (3a)** will support a feasibility study for determination of the most suitable integrated solid waste management system for the islands included in Zone IV and V. The study will identify any additional criteria that islands need to satisfy before a particular system – for collection, transportation, segregation and treatment of biodegradables, and storage of the more recalcitrant material to the RWMC – can be implemented. This study will also help choose the most appropriate technology for the treatment and disposal in the RWMC. This component will also fund the individual environmental screening, assessments and management plan preparation as per the procedures set forth in the ESAMF. The feasibility study will look at servicing resort islands in the area

Specifically, **Sub-component 3b** support the supply of vehicles for collection of waste on the islands, and shredders for islands in Zone II to facilitate that full capacity utilization of the RWMC already constructed under the MEMP. Under the MEMP, ESMPs were completed for all island level IWMCs, reviewed and cleared by the Bank. These looked at the whole system from collection to final disposal as well as the construction and operation of the IWMCs. Due to limited financing, not all islands could be provided with adequate equipment that were identified under the Island Waste Management Plans

(IWMPs) and this project will simply do the gap filling by meeting the needs as a whole. On some islands it was identified that they would need small pickup trucks to transport the waste, as the provision for vehicles was not in the old project and the government could not finance these the new project will facilitate procurement of these vehicles and equipment. Thus this activity itself does not pose environmental impacts but rather facilitates good environmental management by supporting the IWMCs

Sub-component 3c will fund the preparation and implementation of Island Waste Management Plans (IWMPs) across the atolls in Zones IV and V. To be eligible for funding support, each island council would need to have IWMP approved by the EPA, which includes waste minimization approaches, and be subject to the EA and SA in line with the ESAMF, and have fixed a community owned tariff from each generator of solid waste (whether household or other commercial/industrial establishment) to support the implementation of the IWMP. The IWMPs will also report the current status of waste management and audit the social and environmental conditions and waste management aspects of each Island. Currently, it is expected that there is sufficient funding to cover all the potentially eligible islands in these two zones (as some islands in zone V are already supported to a limited extent under another Government of Maldives program – LCRED). The project area has 43 inhabited islands that are in the process of preparing IWMPs. The guidance for IWMP preparation was instated within the MEE during the MEMP project and takes a comprehensive approach to planning and siting island level waste management activities based on the site specific conditions. The support will include investments to operationalize one of the two or three different possible models of integrated waste management systems depending on population, waste generator profile, land availability, and other relevant parameters

Although activities contained in the Island Waste Management Plans that may be financed under the project are unlikely to cause any irreversible environmental impacts, they will be subject to screening criteria in order to determine their reference to the EA processes. Environmental impacts arising from the construction and operation at IWMC's are not likely to be significant. Approximately 130 IWMC's have been constructed across the Maldives under previous projects and none have progressed beyond an ESMP in terms of environmental assessment requirements. This is predominantly as the facilities often deal with less than 10tons of waste per day. The development of any waste management facilities designed to receive / process more than 10 tons of waste per day is a Schedule D activity under the Maldives Environmental Impact Assessment Regulations, 2012 and will, therefore, require a Full Environmental and Social Impact Assessment and operations in adherence to the World Bank EHS guidelines on Waste Management Facilities and General Health and Safety.

By reducing the volume of waste that is currently dumped in the ocean Sub-component 3c will have long term beneficial environmental impacts. There is potential for impacts on the environment during the construction and operation of IWMC's such as those highlighted below but these can easily be managed. Any adverse impacts that may arise from these activities will be identified and addressed through the EA process.

Typical impacts of IWMC establishment and operations will depend on the types of final disposal of organic waste which will be proposed in the feasibility studies. Initial technical assessments indicate that the following forms technical methodologies such as passive composting, windrow composting, in-vessel composting or small scale anaerobic digesters typically lead to the following key Impacts that pose moderate risks. Only organic waste will be processed and managed at the IWMCs.

All inorganic waste, including metals, plastics and other such material will be collected and stored at the IWMCs and transported to the RWMF where they will be managed via the best suitable option that will be identified by the BPEO study (Please refer subcomponent 2b). Storage of inorganics is typically be done in a manner that is contained, these substances are either cleaned or stored in compartments or in large bins for transport in to the RWMF.

There are no large industries in inhabited islands in the Maldives and the waste coming in will not be from industrial sources. On inhabited islands, typical small scale industry level practices are processing of dry fish and wooden boat building, Organic components are usually disposed with other organic waste and treated at the IWMCs and inorganic waste like containers, plastics, glass etc. collected and stored as residual waste to be transferred to the RWMC.

Construction Phase Impacts

Impacts during the construction phase will pose low to moderate risks in relation to establishment of IWMCs from learning through the MEMP, these are highlighted in the generic EMP presented in Chapter 5. Sites demarcated for IWMCs are located well away from human habituation and the construction methodology associated with the establishment of IWMCs do not require heavy physical interventions, thus noise, dust and safety issues are minimal. The Generic EMP presented in Chapter 5, covers all typical impacts and presents detailed mitigation measures for management of these impacts. It also covers the key operational impacts highlighted below.

Key Impacts from IWMC Operations

Leachate

Leachate and runoff from waste storage and processing areas may contain organic material (biochemical oxygen demand (BOD)), phenols, nitrates, phosphorous, dissolved metals, and other contaminants. Municipal waste that is treated in IWMCs may contain human and animal fecal matter and blood which have a wide range of disease microorganisms. Some household chemicals can possess hazardous properties; examples include pesticides, solvents, paints, batteries, used oils, pharmaceuticals, etc.

Both passive composting and windrow composting leads to the release of leachate that needs to be managed. While groundwater in inhabited islands are already polluted due to saltwater intrusion and contamination from sewage this does not pose a major challenge. Yet leachate needs to be managed on site to prevent runoff in to lagoons and the ocean.

In the case of in- vessel composting very little leachate is produced.

Air Emissions

Releases to the air can include direct stack emissions and fugitive emissions associated with biological processes, as well as emissions from burning of biogas. Direct air emissions can include bio aerosols, particulate matter/dust, ammonia, amines, volatile organic compounds (VOCs), sulfides, odors, etc. The Risk of Fire Biodegradable wastes can be combustible and aerobic degradation can produce sufficient heat to cause spontaneous combustion in certain circumstances.

Risk of Fire

Biodegradable wastes can be combustible and aerobic degradation can produce sufficient heat to cause spontaneous combustion in certain circumstances. Wastes can, in some instances, also contain ashes and other readily ignitable materials that burst into flame under wind conditions, or when contacting flammables.

Odors

Passive and windrow composting facilities typically generate odors during operation, the same applies for accumulated waste such as used cans and bottles. However due to the IWMCs being located well away from residential units and the Islands having a good influx of coastal air flows, odors are typically not sever and complaints have

Vectors and Pests

Under the recently concluded SWM MEMP operations and other projects in the SWM sector, it was confirmed that Maldives does not face the problems of pests (e. g. rodents) at waste sites. In the case of fly breeding, due to the hot weather in the Maldives, larvae usually perish during the composting process the same applies for mosquitoes breeding. In addition health care services and the Island Councils in inhabited islands take stringent measures such as spraying of waste accumulated areas in the Islands with vectorcide a part of routine control against mosquitoes for dengue control programs implemented by the relevant governmental authorities as per WHO standards.

4.3 Social Impacts

The project does not envisage any significant adverse social impacts. However, the interventions leading to the construction and expansion of IWMCs could lead to involuntary loss of crop, land taking as a small percentage of communities rely on surrounding land for agriculture and livelihood. As a result, a resettlement policy framework (RPF) has been prepared as part of the ESAMF in line with the Bank's OP4.12 on Involuntary Resettlement. Potential positive impacts during construction phase include increased employment opportunity in the construction sector. While the construction of IWMCs are likely to be sourced locally, the construction of the RWMC - requiring skilled labor - may involve the use of expatriate/migrant/non-local labor but no influx is expected as the works are small and phased. It is also likely that the construction of the RWMC will be in an uninhabited island where there is no host community. Positive socio-economic impacts can also be expected during operational phase including creation of new employment opportunities in relation to operation of the RWMC, IWMC and waste transport vessels.

The investments under Component C, will be preceded by a Best Practice Environmental Options (BPEO) study embedded in the Feasibility Study (FS). This will assist the Atoll and the Island Councils, as well as its communities, in identifying the scope of the current issues related to SWM and identify potential options of addressing the issues that will be environmentally and socially beneficial to the communities and the best option taking the environment in to key consideration.

5 Chapter 5: Environmental and Social Management Framework

5.1 Environmental and Social Screening under Components 2 and 3

Environmental and social screening is counted to be a useful tool in identifying safeguard issues in large investment programs consisting of many sub-projects. The main objective of Environmental and social screening of sub-projects will be to (a) determine the anticipated environmental/social impacts, risks and opportunities of the sub-project (ii) determine if the anticipated impacts and public concern warrant further environmental/social analysis, and if so to recommend the appropriate type and extent of assessments needed.

At the national level, screening is the process by which proposed developments are reviewed to determine the level of environmental and social 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 and social effects, and if so, what mitigation measures should be applied. The present ESAMF is largely concerned with the project level, but some notes are provided on national screening for completeness.

5.1.1 National Level Screening

The Maldives national requirements for environmental and social assessment are set out in the Environmental Impact Assessment (EIA) Regulations, 2012. 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. According to Schedule D included in Amendment 2 to the EIA regulation 2012, waste management practices that require preparation of an EIA are:

1. Projects involving operation of large incinerators with a capacity of more than 10 tons per day.

2. Development of large waste management centers that treats more than 10 tons of waste per day.

3. Projects that involve development of a landfill by using waste.

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 an EIA or EMP. However as per the World Bank safeguard requirements and experience in similar projects, all projects will be required to prepare ESMP at the minimum.

In practice, all reports are required to be submitted to EPA and a copy of EIA is sent to the respective councils for their contentment. Relevant councils are also invited to scoping meetings. However, EPA should be consulted at the outset, to determine whether the formal national screening process should be applied

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. The project will not engage in land acquisition or any civil works until the relevant safeguards instruments are approved by the World Bank

and disclosed in-country and on the Bank's website, and before all necessary compensations (as applicable) for physical and/or economic resettlement are paid in full.

5.2 Environmental and Social Safeguard Assessments

5.2.1 Environmental and Social Impact Assessments (ESIAs)

For IWMCs

While it is envisioned that many of the Island level activities financed under the project may not require ESIAs as IWMCs have already been established on these islands and require rehabilitation and/or expansion, only new construction of IWMCs will require ESIAs, if deemed necessary as per the screening procedures highlighted above. The project will conduct feasibility assessments for each of the IWMPs prepared and for the IWMCs. These assessments will look at the alternative options for both technology and siting and deduce the best option for each inhabited island that will be selected for funding during project implementation as well as audit the current environmental and social conditions relevant to the project activities.

As per the EIA thresholds of the Maldives government for setting up IWMCs, which are island level facilities, ESIAs are not needed and the EPA only requires an ESMP as the daily amount of waste managed will be less than 10t/d of waste. A majority of islands within the project area already have IWMCs built via other projects and funding sources. These are often abandoned or used just to store residual waste and the project will fund the upgradation and expansion thus the activities will only require ESMPs.

On islands that do not have existing IWMCs, proposed locations for the IWMCs must be allotted during the Island Waste Management Planning process and clearance should be obtained from the EPA.
While the EPA does not need ESIAs unless the activities fall within the set thresholds, in order for the Bank safeguards requirements to be met an ESIA has to be conducted post site selection. Predominantly to ensure that all environmental and social due diligence is completed.

All project ESIAs, EMPS, and other relevant safeguards assessments will be prepared by independent consultants. The IWMPs that will be completed for each project includes an environmental and social audit, including a waste audit as well, it is based on this audit that the IWMPs will be prepared and it will be done for the whole respective island including existing IWMCs and will inform the ESMP preparation. As independent consultants will be working on the ESMPs, the IWMPs the PMU should share these IWMPs with these independent consultants prior to ESMP preparation and field evaluation.

Operation of IWMCs will be managed via the ESMPs prepared. The guidance provided in Table 7: Generic Environmental Management Plan for Management of Environmental Impacts at the Construction and Operational Phase of IWMCs as well as the World Bank Group EHS guidelines presented in Annex 12, need to be used as the main sources of guidance to outline mitigation measures for specific operational impacts that will be identified for each IWMC.

For the RWMC

For the RWMC, more clarity will come in, only post the BPEO and feasibility studies presented in detail in the sections below. The following features with regard to SWM facilities will warrant a full ESIA as per national regulations.

- Any waste management facilities designed to receive / process more than 10 tons of waste per day (as per amendment 2 to the EIA regulation).

- Any waste management facility with an incinerator of capacity of processing 10tons of waste per day.

It expected that whatever the means of final disposal the regional model will certainly deal with more than 10tons of waste per day and thus will warrant an ESIA post the BPEO and Feasibility studies. A detailed TOR to facilitate this process as per both safeguard requirements of the Maldivian Government and IDA are presented in **Annex 7.**

5.2.2 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 **Annex 10**. The project will ensure that all works contracts will include the ESMPs, and the cost of implementing the ESMPs will be identified as an item in the Bill of Quantities for the respective contracts of physical interventions.

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.

5.3 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. The second step of environmental and social 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 subsections below. The application of these guidelines will require appropriate judgement and balance by the component implementation team.

5.3.1 Overall Management of Environmental and Social 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 Environmental and Social Coordinator and the Island level E&S Officer of the project will take responsibility to ensure Environmental and social Management. They would be responsible for undertaking the initial screening together with the relevant Island Council and EPA, ensure appropriate assessment and/or preparation of ESMPs for each IWMC takes place in a timely manner and is included in contract documents and monitoring environmental and social performance and reporting. Similarly, a member of the team should be allocated responsibility as Community Liaison Officers to deal with

relations with people who may be affected by the development, construction or operation of sub-components. A focal point from the island council should be appointed to communicate the concerns of the people to the Environment and Social Officer and his/her name and contact information should be formally communicated to the PMU.

The implementation of most of the mitigation measures will lie with the selected contractor during construction stage of the IWMC and implementation of mitigation measures during operations will be the responsibility of the site owner or operator, in most cases the respective Island/Atoll/City Councils.

5.3.2 Site Selection Procedures for IWMCs

As composting facilities have the potential to impact human health, amenity and environment, location and siting are important factors that should be considered by both potential operators and planning authorities. The EPA has specific screening criteria that assists in determining the location and siting of an IWMC. ICs are required to duly complete and submit the clearance form presented in **Annex 3** to the EPA prior to finalizing the any sites where a new IWMC is to be constructed.

All project activities focused on the rehabilitation and/or expansion of existing facilities need to ensure that sufficient land that meets the criteria recommended by the EPA is available in close proximity to the existing site. In addition to the EPA screening criteria the following aspects need to be taken in to consideration when siting/expanding IWMC facilities for composting activities.

- **Separation distances**
  - 'Separation distance' means the distance between the premises and the sensitive land use, for example, land used for a residential dwellings, hospitals, schools, physical cultural resources such as mosques and cemeteries or other similar use involving the presence of individual people for extended periods.
  - Separation distances are required for composting facilities to protect sensitive land users being affected by odor generated in instances of upset conditions (for example, equipment failure, accidents or abnormal weather conditions).
  - While separation distances are a way to reduce impacts of odor emissions from upset conditions, they are not an alternative to preventing odor from occurring in the first place.
  - A minimal separation distances >300 meters should be maintained between residential dwellings and the IWMCs for passive manually turned composting activities and at least >500 meters for e enclosed aerobic composting and windrow composting processes.
- **Meteorology**
  - The following meteorological factors, including the seasonal fluctuations, should be considered when selecting a location for a composting facility:
    - Rainfall
    - Hydraulic flow/liability of flooding
    - Wind strength and direction
- **Topography**
  - Analysis of the topography of the project area and surrounds helps to determine the potential pathways for the transportation of odor, noise and other impacts such as susceptibility to beach erosion.
  - IWMCs, should be sited well away from areas where threats of beach erosion are apparent. If not alternate locations are available due to limited Island size and space, appropriate measures to mitigate erosion impacts, such as elevated gabion walls and other such erosion control infrastructure need to be included in the design of the IWMC.

- In the event that existing IWMC is located in an area susceptible to sever erosion, appropriate measure to mitigate erosion impacts and control erosion need to be implemented during the rehabilitation work. Where applicable the EPA site screening methodology needs to be adopted to identify a new location.

5.3.3 Environmental Closure of Existing Dump Sites on Islands

On all inhabited islands current waste management practices involve burning of garden waste mixed with inorganic waste. Organic waste, consisting of food waste, is sea dumped. In addition in some islands recyclable material such as plastic bottles, metal cans, old electronic appliances etc. have been collected in the existing IWMCs over long periods of time. Due to these improper practices there are already accumulated residual waste and small open dumps consisting of semi burned waste, mixed with sandy soil that need to be managed. Simultaneously to establishing IWMC operations it is essential to also ensure island clean ups and sound environmental closure of these areas.

The feasibility studies that will determine the nature of waste management activities on each Island need to also propose the procedure to be taken for sound environmental closure**. Annex 6**, presents a detailed set of guidelines, customized to fit the project and country context that needs to be adopted and taken in to consideration during these studies to provide guidance to the relevant authorities to undertake environmental closure of the existing waste management sites on the Islands.

5.3.4 Environmental Standards and Guidelines for Establishing IWMCs

The Island Waste Management Centers 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 Centers, 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 RWMC. The footprint of the individual IWMCs are based on the population size on the island and land area available as described below.

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 as they are usually constructed in existing sites where waste burning and residual waste storage activities have been conducted. Most Islands in Zone IV already have established IWMCs or designated sites as per the Island Zoning plans for waste management activities

IWMC Footprint

Population	**Footprint m^2**
<=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 Island Council 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.

5.3.5 Generic Assessment of Potential Impacts Associated with IWMCs and Mitigation Measures

The T**able 7** below identifies the likely impacts due to construction and operation of IWMCs and proposed mitigation measures. The Generic EMP also presents guidance on mitigation measures in terms of biological treatment processes, such as the broad spectrum of processes proposed to be undertaken post the feasibility studies for each respect island, as per the World Bank ESHS guidelines which are also presented in Annex- 11. Further guidance on ESMP preparation and generic impact management of construction sites is presented in Annex 9 and 10 respectively

5.3.6 Procedure for Management of 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.

Table 7: Generic Environmental Management Plan for Management of Environmental Impacts At the Construction and Operational Phase of IWMCs and the Operational Phase of the RWMC

Generic Environmental Management Plan		
Impact	**Mitigation Measures**	**Responsible Party**
Management of Impacts from Design Poor Considerations		
Negative impacts on ecologically significant wetland and marine habitats	• Ensure IWMC's are not designed with a wetland or marine outfall	EPA, MEE, IC
Contamination of groundwater	• Ensure (i) waste storage areas are covered to prevent contaminated storm water runoff, and (ii) hazardous waste storage area is bounded.	EPA, MEE, IC
Management of Impacts During IWMC Construction		
Negative impact due to noise	• 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	Contractor, EPA, MEE, IC
Negative impact on air quality	• Similar to above (relate to noise), there will not be significant impact on the air quality. Stockpiled material for long period will be covered to manage dust generation due to windy conditions screens or wetting of source materials	Contractor, EPA, MEE, IC
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	Contractor, EPA, MEE, IC

Generic Environmental Management Plan		
Impact	**Mitigation Measures**	**Responsible Party**
Damage to reef during materials unloading	• Ensure adequate arrangements are available on all islands for unloading construction materials using only existing harbor areas	Contractor, EPA, MEE, IC
Negative impact on ground water quantity due to over extraction and quality	• Ensure fresh groundwater supplies are available in sufficient quantities • The proposed small scale civil works will not impact the quality of groundwater significantly *Note:* On almost all the island's ground water quality is poor for portable uses	Contractor, EPA, MEE, IC
Positive impact on island economy	• Continue to encourage the use of labor and material from the island	Contractor, EPA, MEE, IC
Managing Impacts During IWMP Implementation and IWMC Operation		
Positive impact on island economy	• 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	IC, IWMC Operator, MEE,
Positive impact on island waste management	• 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	IC, IWMC Operator, MEE,

Generic Environmental Management Plan		
Impact	**Mitigation Measures**	**Responsible Party**
Negative impact on nearest adjacent households or establishments from waste management activities undertaken	• Ensure training is available to support good operational practice, • Facilitate waste management planning process to address issues raised by the community and ensure they are incorporated in to the IWMP and ESMP accordingly for each Island	IC, IWMC Operator, MEE,
Litter, odor, vector/ raptor nuisance to nearby residences	• Ensure waste is collected at least daily; • Adequate bins with closures are provided at the drop off locations if the IWMP has demarcated them • Regular checks for pests to be undertaken.	IC, IWMC Operator, MEE,
Work place health and safety issues	• Ensure employees are equipped with boots, gloves and coveralls and ear muffs when noisy machinery is used • Adequate training in use of equipment should be provided • Adequate training in workplace health issues relating to handling of compost and other residual material and IWMC operations should be provided.	IC, IWMC Operator, MEE,
Vector breeding, raptor, litter, public health	• Ensure organic wastes are stored in covered bins if biological treatment process does not takes place immediately, cans are crushed and stored in closed facility or in covered bins and that bottles are placed in an area where they will not accumulate water during rainy periods • Drains and leachate ponds should be cleaned regularly and managed as outlined in sections below.	IC, IWMC Operator, MEE, EPA

Generic Environmental Management Plan		
Impact	**Mitigation Measures**	**Responsible Party**
Litter and clandestine dumping	• As per the IWMP the following steps need to be followed • Encourage use of containers or bags for waste at the point of collection for each household and establishment; • Implement a regular collection schedule with sufficient frequency to avoid accumulation of garbage; • Use vehicles appropriate for the geographic conditions and waste types to maximize reliability of collection (e.g., compactor trucks may be appropriate for neighborhoods with wide streets and low-density trash, while smaller vehicles may be appropriate for neighborhoods with narrow streets and higher-density garbage); • Encourage separation of recyclable materials at the point of generation, so that the collection points do not become sorting points for informal sector waste pickers; • Cover collection and transfer vehicles along the entire route of transport to avoid windblown litter; • Clean vehicles used for waste hauling before transportation of any goods, including compost; • Encourage residents to put waste out at designated times and locations;	IC, IWMC Operator, MEE, EPA
Air emissions from MSW collection and transport	Dust can include nuisance dust, hazardous dust (e.g., containing asbestos or silica), and bioaerosols (i.e., particles in the air consisting wholly or partially of microorganisms). • Bioaerosols are of particular concern to the health of waste workers and have been shown to be the source of reduced pulmonary function and increased respiratory disease for those n immediate proximity to waste sweeping and collection activities.	IC, IWMC Operator, MEE,EPA

Generic Environmental Management Plan		
Impact	**Mitigation Measures**	**Responsible Party**
	• Recommended management strategies to minimize dust, bio-aerosols, and odors include: • Establishing frequent waste collection schedules; • Instituting a washing program for waste collection vehicles and for company-owned waste collection and transfer containers; • Promoting the use of bags to reduce the odors from soiling of waste collection and transport equipment. • Vehicle Emissions • Emissions from on-road vehicles may be regulated through national or regional programs. • In the absence of these, specific measures to prevent, minimize, and control vehicle air emissions during waste collection and transport include the following: • Optimize waste collection routes to minimize distance traveled and overall fuel use and emissions • Waste collection and transport vehicle owners and operators should implement the equipment manufacturers' recommended engine maintenance, along with the mechanical maintenance for the safe operation of the vehicle, including proper tire pressure. • All waste transport vehicles must have up to date road worthiness licenses. • Drivers should also be instructed on the benefits of driving practices which reduce both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits	

Generic Environmental Management Plan		
Impact	**Mitigation Measures**	**Responsible Party**
Waste Receipt, Unloading, Processing, and Storage at IWMCs	• Control of the incoming waste stream is necessary to ensure safe and effective processing, treatment, and disposal of the Waste and the quality of end products (e.g., quality compost). • Visually evaluate, weigh, and document incoming waste loads; • Conduct visual inspection of the incoming waste, along with sorting and removal procedures, can minimize this potential hazard; • Reject or, if the facility is equipped to process the waste, segregate potentially hazardous materials or wastes identified, including infectious waste, and manage as a hazardous or infectious waste, as applicable; • Analyze suspected hazardous materials before acceptance so that they are segregated relative to compatibility and so that they can be adequately treated and disposed of; • Separate recoverable secondary materials for recycling and organic waste for composting to the extent practical.	IC, IWMC Operator, MEE,EPA
Noise and Vibration Principal sources of noise and vibration include truck traffic; loading activities, stationary compactors, balers, grinders, and other treatment and conveyance systems.	• Management of noise nuisance to nearby residences. • IWMC operations should be conducted from 8am-6pm • Establish a tree lined buffer zone between the facility and the external environment or locate facilities away from sensitive receptors; • Include noise and vibration considerations during design, including use of models to predict noise levels at specified noise-sensitive locations, using standardized sound power levels for construction plant; • Maintain site roads in good condition to reduce noise and vibration from vehicle movements; • Select equipment that has low noise emission levels;	IC, IWMC Operator, MEE,EPA

Generic Environmental Management Plan		
Impact	**Mitigation Measures**	**Responsible Party**
	• Use buildings to contain inherently noisy fixed plant equipment (e.g., locate waste shredder in the tipping hall, and enclose tipping hall on all sides) and consider use of sound-insulating materials in construction. • Ensure ear mufflers are worn by workers operating noisy machinery.	
Managements Impacts During Biological Treatment at IWMCs including composting with other organic materials for the preparation of soil products (i.e., aerobic treatment), and anaerobic digestion		
Leachate and Runoff from biological treatment	• Install a drainage layer underneath the processing area to provide adequate leachate drainage from composting organics. This may consist of a bed of coarse material such as wood chips, or alternatively the processing platform such as a concrete pad may • Permanently incorporate a drainage layer designed to withstand the loading, working and removal of material. • For small-scale compost facilities or in dry areas, an adsorbent material can be incorporated in the compost and at the base of the pile; • The material processing or storage areas of the facility should have a leachate barrier system that forms a secure barrier between the groundwater, soil, and substrata and the composting or stored organics, as well as systems for collecting and treating leachate such as a concrete pad with open drainage channels that drain in to a leachate collection pond. • Design and maintain the slope and orientation of windrows and/or leachate drains such that free drainage of leachate to a collection drain is facilitated and ponding of leachate is avoided; shape the piles and windrows to maximize run-off and hence reduce infiltration; • Store leachate in a lined earthen basin or in aboveground storage tanks; • During passive composting leachate can be reused to wet the compost piles • For anaerobic digestion, maximize recycling of wastewater to the reactor;	IC, IWMC Operator, MEE,EPA

Generic Environmental Management Plan		
Impact	**Mitigation Measures**	**Responsible Party**
Air Emissions/Odors	• Ensure organic waste is stored in covered bins or composted immediately and compositing process managed to ensure no odor is emitted; • Provide composting training to all laborers and management staff of the facility; • Daily monitoring by the management staff on the composting process. • Use windrow turning equipment that is specially designed to minimize air emissions • Minimize the amount of water added to compost (e.g., by covering compost material) to avoid anaerobic conditions that can cause hydrogen sulfide odors if the compost mixture contains sulfur-containing materials.	IC, IWMC Operator, MEE,EPA
Risk of Fire	• For composting, avoid conditions that can lead to spontaneous combustion (e.g., moisture between 25 – 45 percent and temperatures above about 93ºC. This can be achieved for example by keeping windrows less than about 3m high and turning them when the temperature exceeds 60ºC); • In small anaerobic digesters where possible collect biogas for use or treatment (e.g. energy recovery or flaring); • Design the facility for access by firefighting equipment, including clear aisles among windrows and access to an adequate water supply. • Ensure workers are briefed of fire hazard management	IC, IWMC Operator, MEE,EPA
Ash and Other Residuals	• Design the furnace to, as far as possible, physically retain the waste within the combustion chamber (e.g. narrow grate bar spacing for grates, rotary or static kilns for appreciably liquid wastes), and use a waste throughput rate that provides sufficient agitation and residence time of the waste in the furnace at sufficiently high temperatures, including any ash burn-out areas, in order to achieve a total	WAMCO, RWMC Operator MEE,EPA

Generic Environmental Management Plan		
Impact	**Mitigation Measures**	**Responsible Party**
	organic carbon (TOC) value in the ash residues of below 3wt percent and typically between 1 and 2 wt percent. • Manage bottom ash separately from fly ash and other fluegas treatment residues to avoid contamination of the bottom ash for its potential recovery; • Separate remaining ferrous and non- ferrous metals from bottom ash as far as practicably and economically viable, for their recovery; • Treat bottom ash on or off-site (e.g., by screening and crushing) to the extent that is required to meet the specifications set for its use or at the receiving treatment or disposal site (e.g., to achieve a leaching level for metals and salts that is in compliance with the local environmental conditions at the place of use) • Bottom ash and residuals should be managed based on their classification as hazardous or non-hazardous materials. Hazardous ash should be managed and disposed of as hazardous waste. Non-hazardous ash may be disposed of in an MSW landfill or considered for recycling in construction materials.	
Noise Principal sources include exhaust fans and resulting in noise from the outlet of the stack; cooling system (for evaporation Cooling and especially for air cooling); and turbine generators.	• Noise reduction options that should be considered include: • Selecting equipment with lower sound power level • Installing silencers for fans, suitable mufflers on engine exhausts and compressor components, acoustic enclosures for equipment casing radiating noise where applicable. • Improving the acoustic performance of constructed buildings, apply sound insulation where applicable • Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m2 in order to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the receptor location to be effective • Installing vibration isolation for mechanical equipment	WAMCO, RWMC Operator MEE,EPA

Generic Environmental Management Plan		
Impact	**Mitigation Measures**	**Responsible Party**
	• Taking advantage of the natural topography as a noise buffer during facility design	
Occupational Health and Safety Considerations	• Provide workers with appropriate protective clothing, Gloves, respiratory face masks and slip-resistant shoes for waste transport workers and hard-soled safety shoes for all workers to avoid puncture wounds to the feet. • For workers near loud equipment, include noise protection. • For workers near heavy mobile equipment, buckets, cranes, and at the discharge location for collection trucks, include provision of hard hats; • Establish engineering and materials norms for special facility and stationary equipment design requirements that minimize exposure to hazards (e.g., ventilation, air conditioning, enclosed conveyor belts, low loading and sorting heights, non- skid flooring, safety rails on stairs and walkways, spill protection and containment, noise control, dust suppression, gas alarm systems, fire alarm and control systems, and evacuation facilities).	WAMCO, RWMC Operator MEE,EPA

9. 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:

5.4 Environmental Management in the MEMP Region-Zone II

For Zone II, the MEMP Region, the above mentioned procedures of environmental and social screening and assessment have already been completed and cleared by IDA. As the project will not be working in new Islands but rather supporting operationalization in the islands via provision of equipment and vehicles, the original ESMPs and ESIA for the RWMC will still stand valid.

In the event any new technologies are proposed for any of the Islands the respective ESMPs for the IWMCs will need to be updated, seek clearance from IDA and disclosed as per the procedural guidance and requirements of this ESAMF.

5.5 Environmental Standards and Guidelines Applicable to Component 3a and 2b.

For the RWMC and system that may be financed under Sub-Component 2b, in order to comply with the World Bank's OP/BP/GP 4.01, it will be a requisite to carry out environmental assessment in two sequential stages. At the Pre-feasibility Study phase, investigations at the level of an environmental scoping of shortlisted islands. The scoping exercise will identify significant potential impacts and record any pertinent baseline data, but does not involve an assessment of the data and impact at this time. The environmental analysis will cover ecological, archaeological, water quality, visual and noise amenity, air quality and social considerations. The environmental scoping of shortlisted islands will provide inputs into the Best Practicable Environment Option (BPEO) process which is detailed in the sections that follow. The results of the environmental scoping analysis will be reported at the pre-feasibility reporting stage and will inform the Final ESIA Terms of Reference

The full feasibility study will be undertaken when:

(i) through the BEPO process and has selected the preferred BPEO option, and
(ii) the final site selection process has been undertaken which will be informed by the preferred waste management system selection.

The full ESIA will involve predictive analysis of impacts resulting from the selection of the preferred technology at the preferred site.

A Generic Terms of References (TORs) for the ESIA study are presented in **Annex 7.** The Terms of Reference for the final ESIA, and the Final ESIA will be subject to IDA safeguards review and clearance.

5.5.1 Process for Site and Technology Selection for a Regional Waste Management Center in an Environmentally Sound Manner

A list of potential sites for the RWMC will be identified by the implementing agency in collaboration with the relevant ministries with the mandate for zoning and atoll development. The list of sites will need to take into consideration the multiple intersecting criteria that involve both economic feasibility and environmental sustainability. This is critical if the site and technology selection process is going to take full advantage of the BPEO process. The list of sites will be subject to a scoping process to identify a short list for detailed evaluation for suitability.

The following uninhabited island screening criteria will be further developed in consultation with the relevant agencies of the GOM,that owns all land in the Maldives as well as with the Ministry of Fisheries and Agriculture (MoFA) that owns all uninhabited islands.

- Island is on a known navigatable inter/intra Atoll maritime transport route;
- Island has no obvious residential settlement (approved or unapproved);
- Island has no significant agricultural or other usage;
- Island does not represent a significant land area over and above the area required;
- Island does not appear to have significant natural vegetation;
- Island has a large internal lagoon area;
- Island does not appear to have a significant reef or part of a significant reef system;
- Island is not on a resort or proposed resort reef system; and
- Island is near/ accessible to a population center.

Technical and Financial Feasibility

A technical and financial feasibility study will be undertaken next, in two phases. The first phase will

(i) develop waste management system options estimations (including sensitivity analysis) in order to inform the preferred Best Practical Environment Option selection, and best value processes;

(ii) Conduct a scoping and investigation of shortlisted uninhabited island(s) on which the proposed Regional Waste Management Center(s) may be located.

The second phase will involve undertaking

(i) selection process for the preferred regional waste management system option;

(ii) A detailed technical and financial feasibility study for the preferred regional waste management system option at the final selected site location.

The trigger for moving from Phase I to Phase II will be the successful selection of the preferred regional waste management system option and the final site location. Environmental issues are the key determinant of the BPEO process, therefore environmental aspects will be one of the key parameters for selection of site and technology.

The type and design of the RWMC, (the level of engineering needed for containment of pollution) and specific location(s) and waste management system can be decided only after the endorsement of the Island Waste Management Plans which will outline and confirm the waste management activities that will take place on the islands and feed in to the regional system. The successful completion of community mobilization and activity identification, as well as identification of regional waste management system options and island scoping will provide the triggers for moving onto this component.

The successful completion of selection of the waste management system and Regional Waste Management Center site processes will be the trigger to moving onto the construction of the Regional Waste Management Center and provision of equipment and waste collection vessels.

The Best Practicable Environmental Option (BPEO) Process

The preferred waste management system will be selected using the Best Practicable Environmental Option (BPEO) and Best value processes. The objective of the BPEO process within the context of Component C-2 is to identify the preferred integrated waste management system option for Zone IV. The RWMC will be designed and constructed to reduce the risk of contamination from solid wastes over a 20+ year horizon. Special attention will be paid to (i) the handling and management of municipal solid waste from the islands and resorts, and (ii) the processing and storage of recyclable wastes. A routine and regular waste collection service will be provided to transfer wastes from participating islands within the catchment area of the RWMC. The operation of the RWMC and transfer services will be managed by the agency designated by the MEE.

The BEPO process entails a systematic and balanced assessment of a range of different waste disposal options, in order to identify the option which provides the maximum environmental, economic and social benefits. A BPEO analysis involves a process of identifying viable scenarios for waste management, followed by a process of performance assessment against a number of decision criteria such as environment, feasibility and cost, in order to determine which scenario is the preferred option. **Figure 4** below outlines some of the key characteristics of a BPEO study.

Key characteristics of a BPEO study:

- The process is essentially strategic – it is geared towards identifying a preferred overall strategy from the perspective of the environment as a whole, as opposed to detailed optimisation of the selected scheme.
- A structured and systematic process is used to identify and compare strategic options. The presumption is that a BPEO study will generally be an open and transparent process, documented to make explicit the reasoning, data and assumptions.
- Alternatives should be evaluated in terms of their projected implications for environmental quality. Consideration also needs to be given to questions of practicability (including financial costs and/or benefits, as well as wider social and economic considerations), as well as the overall strategic objectives, in order to reflect the wider context in which the decision is being taken.
- The process should involve consideration of environmental effects in both the short term and the long term, requiring consideration to be given to the relative importance of different indicators of environmental performance (e.g. short-lived versus persistent pollutants).
- Effects on the environment are not necessarily restricted to direct emissions of pollutants to land, air and water from the process (or activity) itself; life cycle considerations (such as energy demand) may also have a part to play in the decision process.
- There is an accent on consultation as an integral part of the study process – an informed study of alternatives necessarily involves taking into account the values and perspectives of a range of stakeholders.

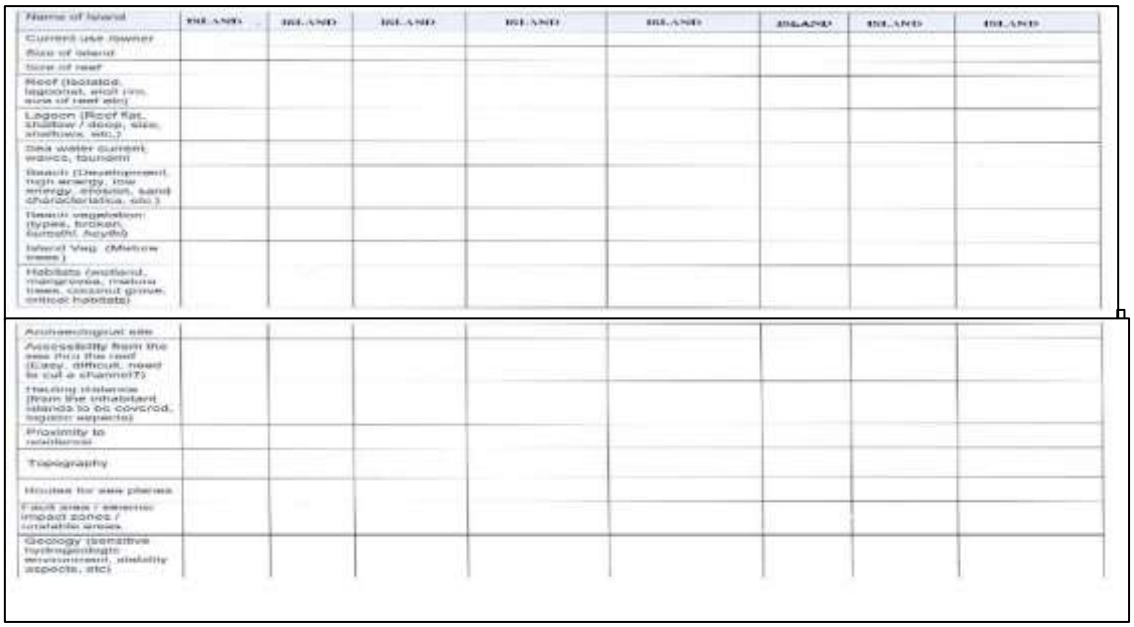
Figure 4: Key Characteristics of BPEO Study

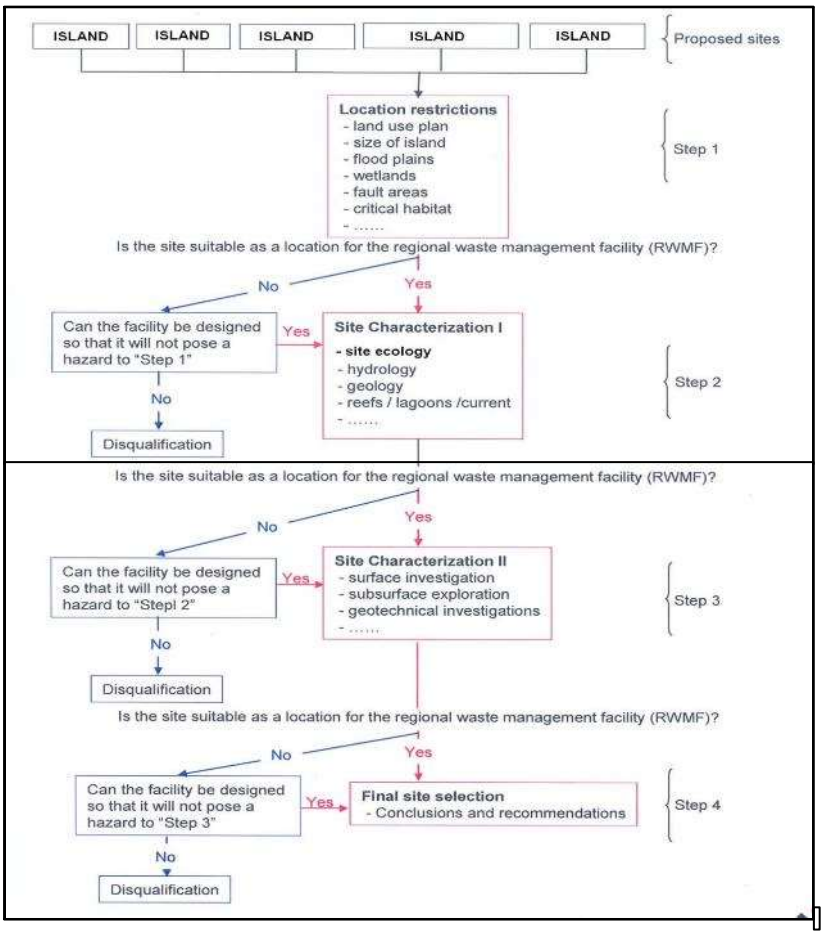
The BPEO study will be conducted simultaneously with the proceedings of the feasibility study. Once the preferred best value waste management system option has been selected it then needs to be tested at the local level, through the planning process, ESIA and competitive tendering processes, to determine the best 'practicable' option which delivers best value.

The BPEO approach implicitly recognizes that the preferred option may differ from location to location because of variation in local needs, resources, impacts, and in the relative significance of criteria. Because of the nature of the analysis required, the concept is not sufficiently precise to be used to justify the selection of specific sites, but is appropriate to use in conjunction with broad areas of search.

Figure 5 provides the criteria for the final selection of the island(s) on which the Regional Waste Management Facility(s) will be located. The detailed scoping investigation leading to the final site selection will be undertaken during the technical and financial feasibility study phase.

Figure 5: Island Selection Criteria during BPEO Study





Environmental and Social Impact Assessment

Environment and Social Assessment will identify physical/chemical, biological, socio-economic and cultural impacts that are likely to arise during the construction and operational activities at the RWMC. An Environmental Assessment will be conducted in accordance with the Government of Maldives Environmental Impact Regulations (2007) and the World Bank's OP/BP 4.01 to identify and mitigate potential adverse environmental impacts. A Generic TOR for the ESIA is presented in **Annex 7.** The ESIA will also include an ESMP for the RWMC looking at the construction and operational phases and also outline a monitoring criteria.

5.6 Compliance During RWMC Operations

Industry Sector EHS Guideline during

During the design, construction, operation of the IWMC's and the RWMC the implementing agency and operators of the facilities are required to adhere the World Bank Industry Sector EHS Guidelines on Waste Management Facilities **(Annex 12) and** the World Bank General EHS Guidelines. Specific measures based on potential impacts of RWMC operations are also outlined in the Generic EMP presented in **Table 7** above.

All measures highlighted for the mitigation of impacts due to the operation of Waste Management facilities in relation to the respective forms of final disposal as well as collection and processing are presented in the EHS guidelines and need to be duly incorporated in to the respective ESMPs for all project interventions. Site specific construction stage impacts for the RWMC will need to be identified during the ESIA process and included in the respective ESMP.

National Guidelines on Emissions to Air and Water

Operation of all RWMCs should meet the National Waste Incineration Guidelines 2016 and National Waste Water Quality Guidelines 2007. The National Waste Incineration Guidelines include the EU standards for air emission which are acceptable to the IDA safeguard requirements as well.

5.7 Resettlement Policy Framework

It is not expected that people will be adversely affected by actions undertaken as part of the projects. Indeed, the avoidance of a need for resettlement is one of the screening criteria. However, the interventions leading to the construction and expansion of IWMCs could lead to future chance finds of involuntary loss of crop, land taking as a small percentage of communities rely on surrounding land for agriculture and livelihood. As a result, a resettlement policy framework (RPF) has been prepared as part of the ESAMF in line with the Bank's OP4.12 on Involuntary Resettlement (**Annex 13).**

5.8 Consultation Plan

The project team, led by the E&S Coordinator, has undertaken a number of consultations during project preparation and a summary of the consultations are provided in **Annex-11** of the ESAMF. Further consultations will be undertaken as part of the feasibility studies and assessments. These should be duly documented in the respective outputs of the consultancies. In addition, the technical coordinators, E&S Coordinator and the island level officials will be required to undertake continuous consultations with stakeholders and report as part of safeguards monitoring.

5.9 Gender Development Framework

A Gender Development plan is being designed under the project as part of the ESAMF, 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 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 an understanding whether there is a potential for gender based inequitable risks, benefits and opportunities. Based on the assessment, specific interventions will be designed and a gender action plan will be prepared. The overall monitoring framework of the project should include a sex disaggregated indicator and a 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 Gender Development 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.

A 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 programs to take the benefits from the project as per the needs of illiterates.	Undertake literacy programs as built- in activities coordinated with literacy programs. Develop the implementing strategies to communicate real time information specifically for economically weaker section. 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	Rapport building with Women Development Office at District or local level involving them in Program. Gender sensitization to all stakeholders including project entities. Ensure Women's participation during meetings, project implementation and monitoring.	Carry out meetings and interaction program with and orientation to women in the community. Conduct leadership training for women members of commodity groups.
Lack of knowledge / access to technical knowhow	Promote need based technical awareness and support services.	Organize training on technologies. Provide opportunities of exposure or study visit to women's group to develop their leadership capacity.
Disparity in Wages	Accord Priority Employment to women in project generated construction activities. Promote equal wages for equal work.	Inform women groups regarding proposed construction works. Identify women interested to Work; assess their skills and involve them as per their capabilities. Monitor women wage rate and do the needful to ensure wage equality for similar type of construction works. Inclusion of the above elements in the contractors' document.

5.10 Information Disclosure

Disclosure of relevant project information will help affected communities understand the risks, impacts and opportunities of the Project. The implementing agency will publicly disclose the ESAMF and all Environmental and Social Assessment documentation, the management program and action plan(s) for public review and comment in appropriate locations in the Project area. The BPEO study though conducted separately will need be disclosed as part of the ESIA to satisfy IDA and GOM requirements.

The documentation will also be made available on the implementing agencies web site both in English and in local languages. Newspaper and other media outlets will alert the community to the availability of the documentation. The website will also enable the community opportunity to provide comment electronically.

All safeguards Documentation will also be made available in the World Bank Info shop and Maldives World Bank external website.

5.11 Grievance Mechanism

The implementing agencies, both the MEE and ICs, will establish a grievance mechanism to receive and facilitate resolution of the affected communities' concerns and about the implementing agency's environmental and social performance during project implementation.

The ESMP and its management program will establish a mechanism to address concerns raised promptly that is readily accessible to all segments of the affected communities, at no cost and without retribution.

5.12 Timeframe for planning and carrying out safeguards assessment

Timely planning and execution of environmental screening and follow up assessments/plans for sub-project investments would be crucial in achieving the overall project implementation and completion targets. Any delay in obtaining relevant environmental approvals/clearances would hold back commencement of sub-project activities thus causing project implementation to be delayed. Such delays can be costly in terms of project time as well as resources. Hence, it is extremely important that the PMU initiates sub-project specific screening and follow up assessments as soon as the concept designs become ready. All environmental assessments/plans should be completed by the time of tendering and the EMPs should be a part of the bidding document so that the contractor is made duly aware of his commitments towards environmental safeguards management under each sub-project.

As a guide, the following table provides typical timelines for completing the safeguards cycle for different types of safeguard instruments. This timeline is intended to guide the PMU in planning screening and safeguards assessment ahead and to determine a realistic timeframe to commence the tender process for the sub-project investments. Please note the table below does not include time taken for procurement of consultancy services to conduct the EAs.

The PMU will prepare and share a project specific timeline with IDA during project implementation.

Stages in the process	RWMC ESIA	IWMC ESIA	IWMC ESMP	Remarks
Environmental Screening	1 week	1 week	1 week	The need for follow on assessments will be determined by the screening outcome
Scoping and setting of TOR when applicable	2 weeks	1 week	1 week	
Report preparation	4 months	2 months	1 month	Length of time will be determined by the complexity of issues involved. What is considered here is an average based on the type of projects.
Report appraisal	2 weeks	1 week	1 week	
Public consultation	1 month	1 month	1 month	
Report Finalization	2weeks	2 weeks	1 week	
Clearance	Clearance will be provided within a week after review comments and public concerns have been adequately addressed in the report.			
Other GoM Clearences where applicable	3 - 4 weeks			
Tentative time for EA cycle (min – max)	8 months	5.25 months	3–4 months	
Scenario 2: **Sub-projects which trigger both OP 4.01 and EIA under national regulations.** ***NOTE: This will be most relevant to the ESIA for the RWMC***				
Provision of preliminary project information	1 week	1 week	-	

Scoping & determine ESMP and TOR preparation	1 month	2 weeks	-	WB will review TOR and provide consent/comment
IEE/EIA report preparation	NS*	NS*	-	One report to satisfy both local and WB requirements
Checking adequacy of IEE/EIA report	NS	NA	-	WB will review and submit comments
Provision of additional information if required	NS*	NA	-	
Public consultation	1 month	NA 1 month under OP 4.01	-	WB safeguard policies will require a period of 120 days public commenting period
Forwarding Comments to the PP	1 week	NA	-	
Responding to public comments	NS*		-	
Decision	1 month	3 weeks	-	WB clearance will be provided con-currently
Concurrence on the decision				
Appeal against rejection (If rejected)				
Final Decision				
Tentative time for EA cycle	12–15 months approx.	6–8 months approx.		

5.13 Clearance Procedures with IDA

All safeguards instruments listed below will be subject to IDA prior review and clearance by the IDA safeguards specialist

- The TOR for the BPEO study for the Regional Waste Management System
- The TOR for the ESIA for the RWMC
- All ESIAs for the IWMCs in Zone IV and V.
- A sample of 5 ESMPs for each project Atoll under Zone IV and V.
- All RAP/ARAP

5.14 Environmental and Social Compliance Monitoring and Reporting

Supervision of the ESMPs, along with other aspects of the project, will cover monitoring, evaluative review and reporting in order to achieve, among others, the following objectives:

- determine whether the project is being carried out in conformity with environmental and social safeguards and legal agreements;
- identify issues as they arise during implementation and recommend means to resolve them;
- recommend changes in project concept/design, as appropriate, as the project evolves or circumstances change; and identify the key risks to project sustainability and recommend appropriate risk management strategies to the Proponent.

An appropriate environmental and social supervision plan will be developed aiming to ensure the successful implementation of the ESMPs across the project.

Quarterly, the PMUs will collaborate with project proponents in the field and, will monitor the implementation of the respective environment and social mitigation measures outlined for all project interventions. Annually, the Project Implementation in collaboration with the environmental and social coordinator based in the PMUs will have responsibility of carrying out this monitoring by regularly visiting the project sites, and pursuing the following corrective measures as required.

Compliance monitoring comprises on-site inspection of construction activities to verify that measures identified in the ESMPs are included in the clauses for contractors are being implemented. This type of monitoring is similar to the normal technical supervision tasks ensuring that the Contractor is achieving the required standards and quality of work. Photo documentation of non-compliance as well as best practices is recommended as a means of recording implementation conditions efficiently.

A standard Environmental and Social Compliance Monitoring Checklist for Project Activities is presented in **Annex 8.**

Monitoring of compliance with ESMP specifications by the contractor is essential for proper environmental management and will be conducted primarily by the implementing agency. Ensuring compliance with environmental safeguards is an integral part of the monitoring program. Each respective ESMP will outline monitoring responsibilities and parameters. The environmental and social coordinator of the implementing agency will withhold the overarching responsibility for maintaining all documentation in line with the ESAMF and ensure timely reporting to IDA.

Regular IDA missions will include specialists to monitor the project's compliance with World Bank safeguard policies. The progress of environmental monitoring will be formally communicated to IDA through regular progress reports and updates as per the compliance monitoring agreement made during project implementation.

5.15 Safeguards Training

The Environmental and Social Coordinator will be trained by the Environmental Specialist and Social Specialist of the IDA project team on the ESAMF implementation, safeguards and procedural requirements of IDA

Training will be provided for the Island Councils 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 as well as IWMC operations.

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 MEE 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 Island Councils, who have been pre-trained on the project and ESMPs. 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.

Training on safeguards with regard to operations will be provided to the designated authority officials who will in due course manage the operation of the RWMC.

6 Chapter 6: Institutional Arrangements for Implementation of the Project

6.1 Overall Project Institutional Arrangements

Project implementation will entail the creation of project management unit (PMU) at the WMD within the MEE. The institutional responsibilities and arrangements for project implementation would be established for the participating implementation agencies, as follows:

Project Management Unit

- The PMU's main role will be to ensure operational compliance as per the World Bank polices as defined in the Project Appraisal Document, Financing Agreement and Operations Manual and Government policies as applicable.
- The PMU will be led by a Project Director and will include a team of specialized staff responsible for project management, financial management, procurement, environmental safeguards, social safeguards, monitoring and evaluation, civil works design review and contract management, as well as support staff such a secretary, fiduciary support staff and a driver.
- The PMU will also recruit specialized consultants necessary for specific technical assistance for overall implementation of activities.
- The PMU will liaise closely and also ensure overall coordination of all Project entities to ensure necessary data and information are shared and collated for reporting to Project Board and the World Bank. (*Ref Appraisal stage PAD, 2016*)

6.2 Institutional Arrangement for Implementation of the EAMF

The PMU to be established within the WMD of the MEE will need to second/hire environmental and social specialists to focus on the tasks and responsibilities outlined in the ESAMF in the role of an Environmental and Social Coordinator (EHSC).

The Environmental and Social Coordinator at the PMU; will be responsible for the implementation of all steps presented in the environmental and social management framework of the ESAMF. The facilitation of the preparation of environmental and social instruments, such as ESMPs, requesting for clearances from relevant authorities such as the EPA where applicable, and monitoring/reporting on compliance of due diligence mechanisms set forth in the ESAMF and relevant trainings. He/she will be responsible for the implementation of environmental and social management plans and grievance mechanism; liaison with other agencies, contractors and engineering supervisors at the island level; monitoring and evaluation; and training. For all safeguards assessments required, the PMU will outsource detail studies to consultants and manage them. The PMU's Environmental and Social Coordinator will be responsible for ensuring the delivery of such outsourced tasks. He/she will be responsible for the preparation of quarterly compliance summaries and formally communicate to IDA on environmental and social safeguards matters. The EHSC will be responsible for managing the Environmental and Social Officers assigned to the Atolls in Zone IV and V.

The MEE has good capacity in terms of technical aspects as well as management and implementation of safeguards drawing from both the MEMP experience and a host of other Bank and donor funded projects within the ministry. The PMU which will be established within the WMD of the MEE has seconded an environmental specialists to focus on the tasks and responsibilities outlined in the ESAMF in the role of an Environmental and Social Coordinator (ESC) who has sufficient experience working in the EPA and on Donor funded operations.

Environmental and Social Officers at Atolls IV and V; will be responsible for ensuring Island level activities as per the ESAMF are well managed and report to the EHSC based in the PMU. They will

assist in collecting data and the timely completion of environmental and social instruments, such as ESMPs and EISAs, in collaboration with Island Councils and take proactive efforts during monitoring/reporting on compliance of due diligence mechanisms set forth in the ESAMF as well as conduct trainings as instructed by the EHSC of the PMU who will provide them with training as required. As these officers will be based in the Atolls they will be required to conduct regular monitoring visits and facilitate good communication between the ICs and the PMU on safeguards issues and provide guidance to the ICs. In addition they will also conduct awareness and training programs among the contractor staff and labors on ESMP implementation.

The Role of the EPA; the EPA will work closely with the PMU, providing timely clearance and guidance on technical requirements for respective safeguard assessments by issuing specific TORs, conducting timely review of safeguard documents that will require there clearance and also ensure the needs for operational monitoring are well incorporated in to the project. As the main regulator with regard to environmental management, once the sub-projects go in to the operational phase the EPA has the responsibility of conducting monitoring to ensure that IWMCs and the RWMCs operate as per the applicable guidelines and ESMPs prepared. The EPA staff would be supported along with capacity building via the project including equipment and vehicles, which would be used for monitoring compliance with regard to waste regulations and the project activities accordingly. The PMU safeguards team will laisse closely with the EPA, who will have a supporting role in implementation as well as the sustainability of project outcomes.

6.3 The Roles and Responsibilities of IDA

The IDA project task team, specifically the environmental and social safeguards specialists, will provide close supervision and necessary implementation support in the initial stages of the project in conducting screening, preparation of ESIAs and ESMPs;

- Undertake prior review of all safeguards instruments listed below
    - The TOR for the BPEO study for the Regional Waste Management System
    - The TOR for the ESIA for the RWMC
    - All ESIAs for the IWMCs in Zone IV and V.
    - A sample of 5 ESMPs for each project Atoll under Zone IV and V.
    - All RAP/ARAP

- Ensure regular missions to review overall safeguards performance and provide further implementation support
- Share knowledge on technologies and best practices
- Provide training support on Bank's safeguard policies and requirements of the project.

6.4 Rough Cost Estimates of Safeguards Instruments

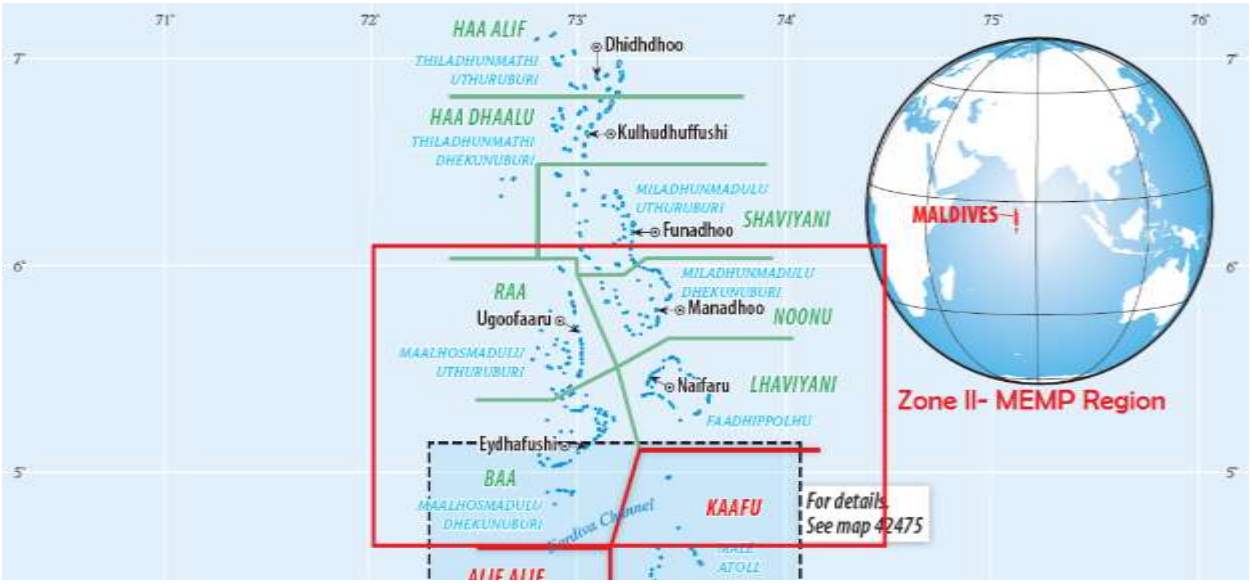
It is difficult to provide accurate cost estimates for the preparation of safeguards instruments due to the dynamic nature of the environmental consultancy market within the Maldives. Drawing from the MEMP project experience and current indicative costs the following table provides a rough estimation of costs for safeguard management and ESAMF implementation. In terms of costs, competition and an increase in the number of players in the consultancy market within the country has led to drops in preparation costs since 2016 when done by local consultants. However for projects that require expertise that is specialized, such as the ESIA for a RWMC will require international expertise to be brought in, an estimated minimum cost, drawing from the MEMP experience is presented below. All safeguards instruments have been inbuilt in to the project modality and will be financed via the project and detailed project cost tables will include the necessary costs accordingly.

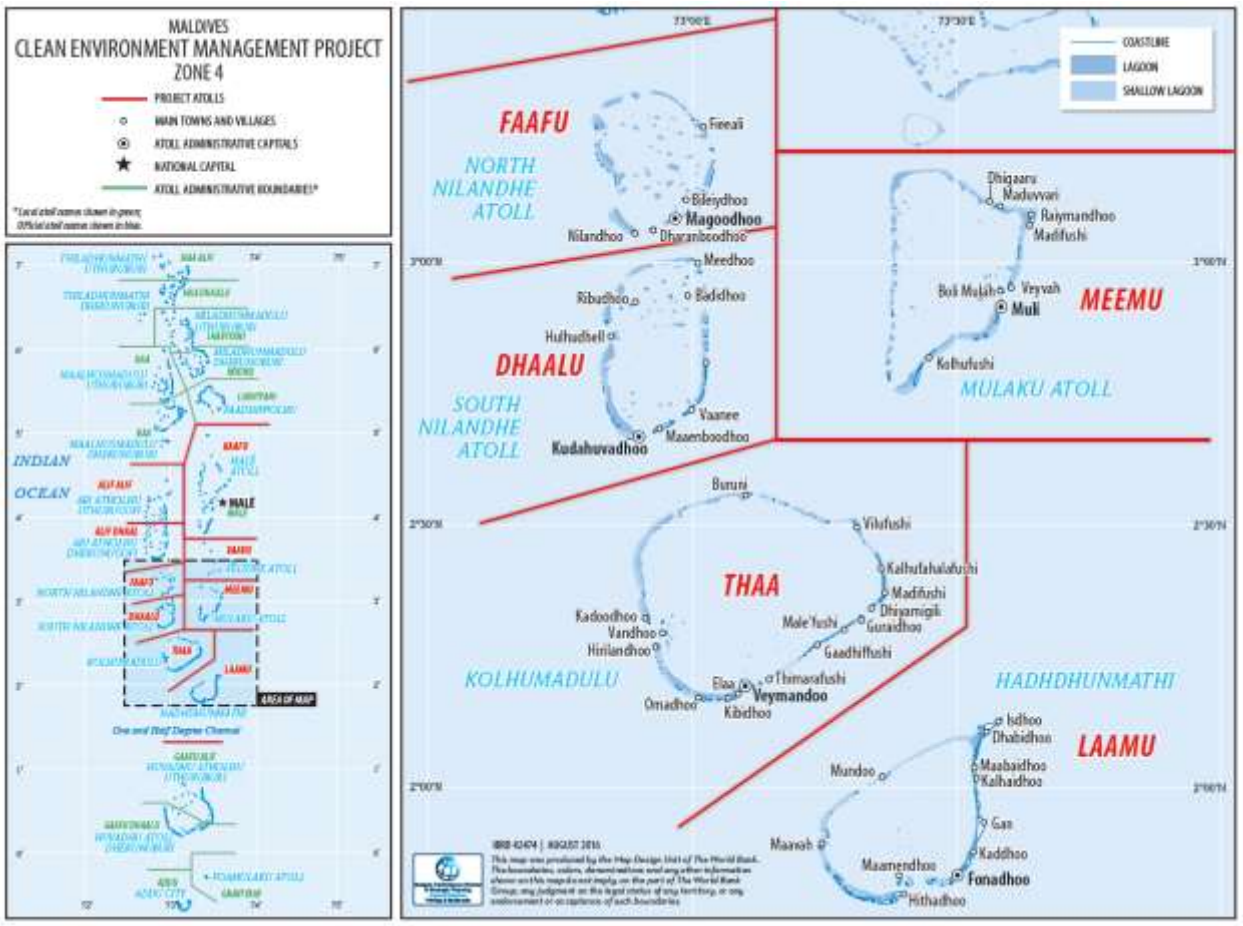
The associated cost to implement ESMPs as well as training for project staff, contractors etc. have been integrated into the project budget. The project will ensure that all works contracts will include the ESMP, and the cost of implementing the EMP will be identified as an item in the Bill of Quantities.

Activity	Quantity	Unit Rate in US$	Total in US$
Environmental Staff o ESO PMU o Field level ESOs	 1 8	 2500/Month 1000/Month	 150,000 480,000
Sub-total			630,000
Training and awareness programs (short-term and long-term) o Training programs on Environmental and Social safeguards, monitoring for project staff, for PMU ESO and Field ESOs o Ongoing training for contractors and ICs as a lump sum, including for RWMC contractor	 1 1	 100,000 200,000	 100,000 200,000
Safeguards Assessments o Recruitment of consultants to prepare stand-alone ESIAs o Recruitment of consultants to prepare stand-alone ESMPs o Recruitment of consultants to prepare ESIA for RWMC	 10 33 1	 2500 1500 100,000	 25,000 49,500 100,000
Environmental monitoring that includes sampling and laboratory testing by EPA for ESIAs/ESMPs			100,000
Environmental screening and monitoring by project staff (will be part of transport and O/H budget of the MCEP)			150,000
Costs associated with mitigation measures	***Included in the construction costs***		
Contingencies			100,000
Sub-total			1,304,500

ANNEXES

Annex 1: Map of Zones, II, IV and V





Annex 2: Map of Protected Areas in the Maldives

Annex 3: EPA Waste Management Center Site Screening Form and Translated Version

Environmental Protection Agency

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	ބަލަންޖެހޭ ކަމަށް ބަލާ ( ))
(ހ) ކުނި ގެންދާ ތަނަށް ދާ ދުވަސްތަކުގެ ތެރެއިން ކިތަންމެ ދުވަހަކަށް ތަނުގެ ބޮޑުކަމާ ގުޅޭ ކަންތައްތަކުގެ ތެރެއިން ބަލަންޖެހޭ ކަންތައްތަކުގެ ތެރެއިން ( ))	
(ށ) ކުނި ގެންދާ ތަނަށް ދާ ދުވަސްތަކުގެ ތެރެއިން ކިތަންމެ ދުވަހަކަށް ތަނުގެ ބޮޑުކަމާ ގުޅޭ ކަންތައްތަކުގެ ތެރެއިން ބަލަންޖެހޭ ކަންތައްތަކުގެ ތެރެއިން ( ))	

5	ތަކެތި ހުއްދަ ދިނުމާ ގުޅޭ		
	(ހ) ކާނާ ހެދުމާ ގުޅޭ ތަކެތި ހުއްދަ ދިނުމަށް ހުށަހަޅާ ފޯމުގައި ކަންކަން ފުރިހަމަ ކުރަން ބޭނުންވާ ތަކެތި ހުރިހާ ތަކެއް ހުށަހަޅާފައި ވާ ގޮތް ބަލައި ހޯދާ ކަށަވަރު ކުރުން		
	(ށ) ކާނާ ހެދުމާ ގުޅޭ ތަކެތި ހުއްދަ ދިނުމަށް ހުށަހަޅާ ފޯމުގައި ކަންކަން ފުރިހަމަ ކުރަން ބޭނުންވާ ތަކެތި ހުރިހާ ތަކެއް ހުށަހަޅާފައި ވާ ގޮތް ބަލައި ހޯދާ ކަށަވަރު ކުރުން		
6	ހުއްދަ ދިނުމަށް ބަލަހައްޓަންޖެހޭ ކަންކަން ފާހަގަ ކުރުމާ ގުޅޭ		
	(ހ) ކާނާ ހެދުމާ ގުޅޭ ތަކެތި ހުއްދަ ދިނުމަށް ހުށަހަޅާ ފޯމުގައި ހުށަހަޅާ ތަކެތި ހުރިހާ ތަކެއް ހުށަހަޅާފައި ވާ ގޮތް ބަލައި ހޯދާ ކަށަވަރު ކުރުން		
	(ށ) ހުއްދަ ދީފައި ވާ ތަކެތި ބަލައި ހޯދާ ކަށަވަރު ކުރުމަށް ބަލަހައްޓަންޖެހޭ ކަންކަން ހުރިހާ ތަކެއް ހުށަހަޅާ ގޮތް ބަލައި ހޯދާ ކަށަވަރު ކުރުން		
	(ނ) ހުއްދަ ދީފައި ވާ ތަކެތި ބަލައި ހޯދާ ކަށަވަރު ކުރުމަށް ބަލަހައްޓަންޖެހޭ ކަންކަން ހުރިހާ ތަކެއް ހުށަހަޅާ ގޮތް ބަލައި ހޯދާ ކަށަވަރު ކުރުން		
	(ރ) ހުއްދަ ދީފައި ވާ ތަކެތި ބަލައި ހޯދާ ކަށަވަރު ކުރުމަށް ބަލަހައްޓަންޖެހޭ ކަންކަން ހުރިހާ ތަކެއް ހުށަހަޅާ ގޮތް ބަލައި ހޯދާ ކަށަވަރު ކުރުން		
	(ބ) ހުއްދަ ދީފައި ވާ ތަކެތި ބަލައި ހޯދާ ކަށަވަރު ކުރުމަށް ބަލަހައްޓަންޖެހޭ ކަންކަން ހުރިހާ ތަކެއް ހުށަހަޅާ ގޮތް ބަލައި ހޯދާ ކަށަވަރު ކުރުން		
	(ޅ) ހުއްދަ ދީފައި ވާ ތަކެތި ބަލައި ހޯދާ ކަށަވަރު ކުރުމަށް ބަލަހައްޓަންޖެހޭ ކަންކަން ހުރިހާ ތަކެއް ހުށަހަޅާ ގޮތް ބަލައި ހޯދާ ކަށަވަރު ކުރުން		
7	ވިޔަސް ތަކެތި ހުއްދަ ދިނުމާ ގުޅޭ ކަންކަން ފާހަގަ ކުރުމާ ގުޅޭ		
	(ހ) ކާނާ ހެދުމާ ގުޅޭ ހުށަހަޅާ ތަކެތި ހުއްދަ ދިނުމަށް ބަލަހައްޓަންޖެހޭ ކަންކަން ހުރިހާ ތަކެއް ހުށަހަޅާ ގޮތް ބަލައި ހޯދާ ކަށަވަރު ކުރުން		
	(ށ) ވިޔަސް ތަކެތި ހުއްދަ ދިނުމަށް ބަލަހައްޓަންޖެހޭ ކަންކަން ހުރިހާ ތަކެއް ހުށަހަޅާ ގޮތް ބަލައި ހޯދާ ކަށަވަރު ކުރުން		
8	ކާނާ ހެދޭ ތަކެތީގެ ގާތް ފާހަގަ ކުރުން		
	(ހ) ކާނާ ހެދުމާ ގުޅޭ ތަކެތި ގާތް ފާހަގަ ކުރުން		
	(ށ) ކާނާ ހެދުމާ ގުޅޭ ތަކެތި ގާތް ފާހަގަ ކުރުން		
	(ނ) ކާނާ ހެދުމާ ގުޅޭ ތަކެތި ގާތް ފާހަގަ ކުރުން		
	(ރ) ކާނާ ހެދުމާ ގުޅޭ ތަކެތި ގާތް ފާހަގަ ކުރުން		
	(ބ) ކާނާ ހެދުމާ ގުޅޭ ތަކެތި ގާތް ފާހަގަ ކުރުން		
	(1) ތަކެތި ގާތް ފާހަގަ ކުރުން		
	(2) ތަކެތި ގާތް ފާހަގަ ކުރުމަށް ބޭނުންވާ ތަކެތި ހުއްދަ ދިނުން		
9	ކާނާ ހެދުމާ ގުޅޭ ތަކެތި ބަލައި ހޯދާ ކަށަވަރު ކުރުން		

(ހ) މި ސަރަހައްދަކީ ކުރިންވެސް ކަނޑައަޅާފައި އޮތް ސަރަހައްދެއް		
(ށ) މި ސަރަހައްދަކީ ދަނޑުވެރިކަމަށް ބޭނުންކުރާ ސަރަހައްދެއް		
(ނ) މިސަރަހައްދަކީ އެހެން ކަމަކަށް ބޭނުންކުރާ ސަރަހައްދެއް. (އެކަމެއް ބަޔާންކުރޭ:		
10 ސަރުކާރުން ވަކިބޭނުމަކަށް ޚާއްޞަކޮށްފައިވާ ސަރަހައްދެއް ތޯއި		
(ހ) މި ސަރަހައްދަކީ ގޯތި ދިނުމަށް ސަރުކާރުން ކަނޑައަޅާފައިވާ ސަރަހައްދެއް		
(ށ) މި ސަރަހައްދަކީ ސިނާއީ މަސައްކަތް ކުރުމަށް ސަރުކާރުން ކަނޑައަޅާފައިވާ ސަރަހައްދެއް		
(ނ) ސަރުކާރުންވެސް މިސަރަހައްދު އެހެންބޭނުމަކަށް ކަނޑައަޅާފައި، އެއީ ކޮންބޭނުމަކަށް................................		

ފޯމްގެ މަޢުލޫމާތު ސައްޙަ ކަމާއި ފޯމުގައިވާ ހުރިހާ މަޢުލޫމާތެއް ތެދު ކަމަށް ތަރައްޤީކުރާ ފަރާތުން، ކައުންސިލުން އަދި ވަޒާރާތުން ޔަގީންކޮށް ސޮއިކުރުމަށް ފޯމް ހުށަހަޅަންވާނީ ތަރައްޤީކުރާ ފަރާތުން ސަރަހައްދު ބެލުމަށް ފަހު ފޯމް ފުރިހަމަކޮށް ތަފްސީލާއެކު ހުށަހެޅުމަށް.

ތަފްސީލް	ނަން	މަޤާމު	ސޮއި	ތާރީޚު
ތަރައްޤީކުރާ ފަރާތުން ސޮއިކުރި				
މިނިސްޓްރީ އޮފް ހައުސިންގ އެންޑް އިންފްރާސްޓްރަކްޗަރ އިން ސޮއިކުރި				
އެންވަޔަރަންމަންޓަލް ޕްރޮޓެކްޝަން އޭޖެންސީ				

މިފޯމު އާ ސަރަހައްދަކަށް (އެއްވެސް ބޭނުމަކަށް ބޭނުންކުރާ ސަރަހައްދަކީ ދިރުހެނަ ބޯޅަތަކާއި ފަދަ) ތަރައްޤީކުރާ ފަރާތް ތިބޭނަމަ ކަނޑައަޅާފައިވާ ސަރަހައްދު ކަމަށް ދެނެގަނެވޭ ވަކިބޭނުމަކަށް ކަނޑައަޅާފައިވާ މި ސަރަހައްދުގައި ހުރި ތަރައްޤީކުރާ ފަރާތުގެ ފަރާތުން ބަލައިގަނެ ފޮނުވަންވާނެއެވެ. އަދި މިފޯމާއެކު ކަނޑައަޅާފައިވާ ސަރަހައްދުގެ ކަރުދާސް ފޮނުވަންވާނެއެވެ.

Waste Management Site Selection and Screening form

1. **General Information**

Island Name:
Atoll:
Population of the island:
Size of the island (in Sq km/ Hectares):

Mark the location on the map or land use plan for the proposed waste management centers specifying details of the first and second choice in a preferred order.

First choice ☐
Second choice ☐

Evaluation criteria for site selection.

2. **Land size and Population**

a. Is the land comparatively sufficient compared with the population of the island?

Population	Size of the Proposed IWMC site (sq km)
Below 500	500
500-750	625
750-1000	700
1000-1500	750
1500-2000	825
2000-2500	950
2500-3000	1000

3. Is there an existing harbor on the island and what is the estimated capacity to operate land vehicles?		
	Complete	**Incomplete**
a. Accessibility for Vessels such as Landing crafts, barges, and dhoni to access the harbor		
b. Is there a proper road for land vehicles to travel from the proposed site to the port?		
4. **Groundwater protection**		
a. Is there a 30 meters distance between the proposed site and any wetlands that are nearby?		
b. Is there a 30 meters distance between the proposed site and any ground water wells that are nearby?		
5. Formation of the island and wind direction		
a. Is the proposed site above sea level during high tides?		
b. Were the monsoons and wind movement considered while allocating the waste management site?		
c. Is the surface of the proposed site leveled?		
d. Is the land for the proposed site up to the seawall or does it extend beyond it?		
e. Is there a 15 meters distance from the shoreline up to the land during high tides?		

f. Will there be any impact to the shoreline if the IWMC comes to an operation at the proposed site?		
6. The distance between the proposed IWMC to the inhabited area.		
a. Is there a distance of 30 meters within the nearest household and site?		
b. Is there a distance of 40 meters from the waste management site to any identified places for public gathering area?		
7. Available space within the proposed site		
a. Is the proposed site a vacant area? And what is the size of the proposed area? …. km		
b. Are there any trees that need to removed? Palm trees…. Other….		
c. If yes, does it require any compensation?		
d. If so who is going to pay the compensation ?		
e. Who would take the responsibility to remove the trees and clear up the site? i. Community ii. On contract basis?		
8. Current usage of the proposed site		
a. Previously used as waste facility		
b. Used for agriculture		
c. Used for other purposes.		
9. Was the proposed site previously reserved for any other purpose by the government?		
a. Is the proposed site allocated for housing projects by the government?		
b. Is the site allocated for …… purpose?		
c. Is the proposed site allocated for other purpose by the government? list		

The proposed site for the IWMC was decided following the advice of the Island Council and WDC upon public consultation. Therefore the following entities have no objection to the construction of a waste management center in the proposed location.

Approval from the Island Council
Approval from the MIninstry of Housing and Infrastructure
Approval from the Environmental Protection Agency

Annex 4- EPA EIA Screening Form and Translated Version

Ministry of Environment and Energy

Environmental Protection Agency

[illegible]

Environmental Protection Agency
Green Building, 3rd Floor, HandhuvareeHingun
Male', Rep. of Maldives, 20392
Tel: [+960] 333 5949 [+960] 3335951
Fax: [+960] 333 5953
Email: secretariat@epa.gov.mv
Website: www.epa.gov.mv

National Emblem

Ministry of Environment and Energy Environmental Protection Agency

DEVELOPMENT PROPOSAL SCREENING FORM

Form No: _____

(Office Use)

A Development Proposal Screening Decision will be issues after the receipt of this Development Proposal Screening Form.

The form is divided in 2 parts, please complete all parts.

Part 1: Proponents Information

Name of person submitting form: .....

On behalf of (company, other person, self): .....

Address: .....

Telephone Number: ..... ID Card Number: .....

Fax Number: ..... Date: Year..... Month ..... Day .....

Email: ..... Signature: .....

Part 2: Project Description

Project Title: .....

Type of Development: .....

Location of Project: .....

Duration of Project: .....

Government Agencies responsible for Authorization: .....

.....

Brief description of the project activities not exceeding 3 A4 size papers in chronological order (include information about equipment and machinery to be used): .....

.....

Details of existing environment of the project location and the changes that will be brought to the environment by the project, not less than 5 A4 size papers: .....

……

- Please use additional sheets where appropriate

As the proponent of this project, we hereby declare that to the best of our knowledge the information provided here are accurate and complete.

Name: ……

Date: Year ……. Month …….. Day ……

Signature: …….

Annex 5- Guidelines for IWMC Establishment

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 poof 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/mm2 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.

	Maximum	**Minimum**
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 galvinised 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.
Potential positive impacts during construction phase include increased employment opportunity in the construction sector. Positive socio-economic impacts are also envisaged during operational phase including creation of new employment opportunities in relation to operation of the RWMC, IWMC and waste transport vessels.

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 Involevment

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:

i. **Organic matter**: leaves, branches, uncooked food waste, fruit, coconut husks, even tree trunks – anything that is NOT made by people. ii. **Fish products**: fish heads, skeletons, skins, dead fish (smelly stuff) if there are a lot, otherwise you might put them with organic matter.

iii. **Hazardous waste**: batteries, asbestos roof panels, used engine oil, old lights (with mercury in them).

iv. **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. o 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 difficultly 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)

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 Katheebs 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 boats, 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 advise 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 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.

Annex-6: Guidelines for Environmental Closure of Small Open Dump Sites

The following guidelines are developed in line with recommendations made via the Guidelines for Design and Operation of Municipal Solid Waste Landfills in Tropical Climates prepared by the International Solid Waste Association in 2013 and have been amended to suite the project context.

1. Environmental Closure Methods

In the context of the Maldives and current solid waste management practices the following two principle 3 methods should be adopted to environmentally close the current waste management locations. Field evaluations have shown that these sites contain small open dump sites, where inorganic waste material such plastics, glass metal have been mixed with garden waste and soil.

1. Closing by covering the waste (in-place method)
2. Closing by removing the waste from the site (evacuation method)

However in the context of the Maldives the

Which option to use should be explored via the feasibility studies to be conducted for each island, taking into consideration the sustainability and affordability of waste management options in the local context, all the while remaining cognizant of trying to affect real improvement in relation to the actual and potential environmental effects of the dump site?

When choosing a closure/upgrading method it should be borne in mind, that it is not always the most technically advanced solution that is the most appropriate. Depending on the situation, simple improvements of operational aspects (such as applying cover soil and eliminating open burning) can often result in marked site performance and greatly reduced environmental impacts. The key principle should always be to keep things simple and sustainable in a local context, while maximizing actual improvement in environmental performance.

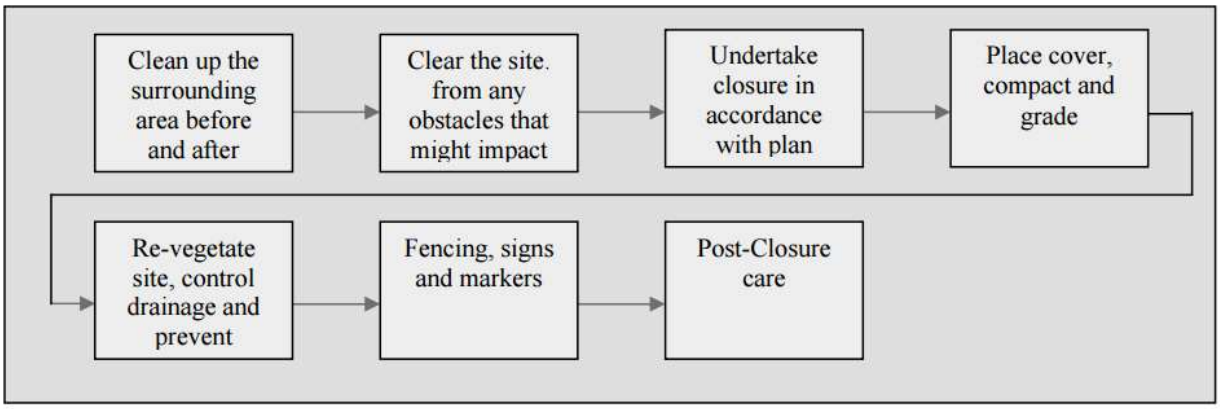
1.1. In-Place Closure

This method is the most commonly used option. The solid waste is left at the site and covered with a layer of local soil and re-vegetated. The function of the cover layer is to:

- Reduce waste exposure to wind and vectors
- Prevent people and animals from scavenging
- Control odor
- Minimize the risk of fires
- Stop people from using the site
- Control infiltration of rainwater / surface water
- Control migration of landfill gas
- Serve as growth medium for vegetation
- Support suitable post-closure activities

The ability of the cover layer to limit infiltration of water into the dump is an essential environmental protection measure. This is achieved through a suitable combination of cover soil type, thickness, slope and vegetation. In other than very arid conditions a clay cover layer is best suited as it minimizes leachate production, and controls landfill gas migration and odor. The durability of the cap layer and the degree of resistance that the cover offers to infiltration are important design considerations. What constitutes a suitable cap design is site specific and depends on the climate, locally available soil materials and plant types, the extent of protection necessary for the local aquifer and surface water

systems etc. Typical operational steps for in-place closing of an open dump are shown in the figure below.



When deciding on a suitable final contour for the closed dump, consideration should to be given to the management of surface water and erosion in the Post- closure period. Post closure care may be defined as requirements placed upon solid waste management facilities after closure to ensure environmental impacts are controlled and public health and safety are adequately maintained, for a specified number of years after closure (typically 20 years may be considered and appropriate period of time for Post-closure care of an open dump).

1.1.1. Basic Principles of In-Place Closure

The following steps need to be adhered to during the closure process:

- The dumpsite should be cleaned up and demarcated in a manner that will prohibit public access in order to avoid risk to the public. Recyclables should be separated to be managed appropriately.
- After closing the site to public access, the facility and surrounding area should be cleaned up so that any waste piles or piles of metallic materials, burnable materials, debris, and windblown paper are consolidated and placed in a final disposal cell for final covering.
- Particular attention should be given to any environmentally sensitive areas where waste may have been piled too steeply, may have been placed in or next to wetlands or beaches, or where wastes have been placed in drainage ways or in areas that impede surface water drainage.
- Site closure should help moderate the environmental impact of such improper disposal.
- As appropriate, waste materials may need to be moved or relocated to higher portions of the site, or the waste may be placed in appropriate areas to help sloping of the closed site.
- It is important to promote surface water drainage from landfill areas in order to keep surface water from filtering into and through the garbage, thus creating a hazard of ground water and surface water degradation.
    - A primary concern of site closure is the slope of filled portions of the site to promote surface water runoff without causing ponding or severe erosion of the final cover.
- The slope or grade of the land and the length strongly affects soil erosion of the slope.
    - Final slopes of filled portions of the landfill site should be at least 2 percent in grade and should not exceed 8 percent in grade.
    - Slopes of up to 12 percent may be used where the slope length is short and run off is not concentrated or increased by adjacent slopes.
- Terraces, waterways, diversions or other measures should be used as appropriate to minimize soil erosion. The USDA Universal Soil Loss Equation may be used to predict soil loss and the life of the cover.

1.1.2. Application of a Final Cover in In-Place Closure

- After the open landfilled areas have been sloped and all waste buried, compacted, and covered, an inert waste landfill site should be covered with at least 20-25 inches of clay-rich soil and 36 inches for municipal solid waste landfills that contain organic matter.
- In the Maldives due to the lack of abundant clay-rich soil, more dense sandy soil may be used.
- This final cover of soil should be placed in layers.
    - The first or deepest being about 12 inches for inert waste landfills or 18 inches for municipal solid waste landfills, which should be carefully compacted in six-inch lifts to minimize surface water infiltration. Compaction testing of this "barrier layer" may be required to ensure the soil material be properly placed.
    - An additional 12-18 inch of soil material should be placed over the compacted clay layer to help protect it from damage due to erosion, plant roots, vehicular traffic, freezing and thawing, etc. This "buffer layer" also provides a rooting depth for the final vegetative cover.
    - Based on site conditions, additional layers may be desirable. At least six inches of topsoil or suitable plant growth material such as compost, should be spread over the site.
    - Where possible Soil nutrient testing of the topsoil is suggested. Soil pH, nitrogen, potassium, phosphorous, conductivity, bulk density, and organic matter are suggested parameters.
    - Based on this analysis, appropriate organic matter may be added to the topsoil to increase fertility.

1.1.3. Site Revegetation and Long Term Management

- The site should be revegetated when practicable to a mixture of native grass or shrub species as recommended by the local environmental protection agency.
- Tree plantings may be placed around the landfill site, however, unless special precautions are taken, trees should not be planted on top of the landfill and should not be planted in positions which will cause excessive soil drifting on the landfill.
- Tree plantings help improve the aesthetics of the landfill site and may improve the site for long term use as wildlife habitat, scenic areas, etc.
- As appropriate, the landfill site may need additional covering applied, additional erosion control structures installed, and/or reseeding of the vegetative cover.
- In the post-closure period there may be regulatory requirements to establish a monitoring programme to assess risks over the long term. The basic principles are as follows, to:
    - Maintain the Integrity of the Cover layer through regular maintenance to address:
        - Settlement, cap subsidence, slope instability and vegetation cover
        - Storm water run-off / run-on drainage controls, and drain and cap erosion
    - Operate, Monitor and Maintain
        - Leachate management system (if any)
        - Landfill gas controls and wells (if any)
        - Groundwater wells; stream sampling (if any)

1.2. Evacuation Method-Removing Waste

- With this method the solid waste in the open dump is excavated and disposed off-site (typically to a sanitary landfill, or a waste incineration plant). As no sanitary landfills are currently located in the Maldives the final disposal option will be incineration at the Regional Waste Management Center in the North in Vandhoo Island in the Raa Atoll.

- Where possible, from the large amounts of accumulated cans, bottles, metal and plastic waste found in the dumpsites of inhabited islands the option of sourcing them to recyclers or companies that partake in resource recovery should be explored.
- For all such material that can be incinerated as per the National Incineration guidelines, the MEE along with WAMCO should facilitate with the IWMC and organize for the material to be transported accordingly to the incineration plant at Vandhoo.
  In the event that transportation to the Vandhoo facility will not be financially viable a second option is, once a site for the Regional Waste Management Center for Zone IV has been established, an onsite storage facility should be constructed and all material that can be incinerated should be transported via barge to this location and stored. The material can be sourced for initial testing and commissioning of the incinerator.
- All material that cannot be incinerated nor has a recyclable/resource value should be sorted should be either incorporated in to the existing open dump site prior to In-Place Closure.
- In the case of the small-medium scale open dump piles that are mixed with soil and other organic matter, unless properly sorted, incineration will not be an option. Thus for these In-Place Closure should be adopted.

Annex-7: Terms of Reference for ESIA for Potential RWMC

A. INTRODUCTION

B. DEGREE OF DETAIL

In preparing the ESIA, it is the applicant's responsibility to address the impacts of the proposal to the degree necessary to enable the relevant government ministries to be informed of all relevant impacts of the proposal. The level and nature of investigations should be relative to the likely extent and scale of the impacts. It is suggested that the applicant/consultant contact the relevant government agencies to clarify the nature and level of investigations.

C. CONTENTS

The ESIA must address the issues set out below and should generally follow the format as suggested in **Reporting** (below).

Introduction - Describe the RWMC project to be assessed and outline the need for the project.

Background Information - Briefly describe the major components of the proposed project. Provide a brief history and justification of the project for the providing and describe how the proposed development will improve on the current arrangements for waste management in the Project area. Provide details of the proponent, and institutional arrangements for implementation and operations of the proposed development, and environmental and social issues of similar large scale projects in other Provinces within the Maldives.

Study Area - Describe the location of the project site and indicate the area around the site that will be considered as part of the *study area* for the ESIA. Define a radius of influence around the sites that will circumscribe a suitable air shed for the conduct of air dispersion modelling.

Scope of Work - The ESIA will include but not necessarily be limited to the following tasks:

Task 1. Description of the Proposed Project - Describe the RWMC (incinerator & ash disposal cells) and associated infrastructure (harbour, fuel storage, power supply etc.) to be installed including location, plant layout and its position in relation to surrounding land uses using maps and drawings where appropriate. Maps should also show the setting and precise location in relation to the relevant aspects of the project area, in particular:

- the location and boundaries of current or proposed land tenures that the project area will be subject to,
- the location and boundaries of the project footprint, including easement widths and access requirements,
- the location of any proposed buffers surrounding the working areas (for construction and operation),
- the location of natural features such as wetlands etc.

Describe the operations of the RWMC including waste catchment area to be serviced by the facility, and waste type, volumes and composition to be received at the facility. Indicate the project life span.

Identify the emission releases likely to be of concern and the environmental aspects of the project area which may potentially be impacted by the proposal.

Describe the type of incinerator plant to be installed including manufacturer's specifications, performance characteristics and operational flow diagrams.

Provide details of the ash disposal cells including capacity, dimensions, design specifications and phased development plans.

Provide requirements for new infrastructure to service the project such as water supply and sewerage infrastructure.

Justify the final elevation of structures (including as ash disposal cells) with reference to the height above the mean high tide, highest annual tides and risk of flood inundations during seasonal high tide regimes.

Task 2. Description of the Environment - Assemble, evaluate and present baseline data on the relevant environmental characteristics of the study area, focused on the marine, terrestrial and air environment. Aspects of the environment should be described to the extent necessary for assessment of the

environmental impacts of the proposed development. The extent and quality of the available data, should be characterized indicating significant information deficiencies and any uncertainties associated with the prediction of impacts.
This section should provide details of the environment in the vicinity of the proposed development site. Data collection methodology used to describe the existing environment should be detailed. All survey locations, sampling points, reef transects, vegetation transects, manta tows and soil sampling sites must be referenced with Geographic Positioning System (GPS). All marine water samples shall be taken at a depth of 1m below the mean sea level or mid water depth for shallow areas. Baseline data collection must focus on key issues needing to be examined for the ESIA. Consideration of likely monitoring requirements should be borne in mind during survey planning, so that the data collected is suitable for use as a baseline for impacts monitoring.
All available data from previous studies, if available should be presented. Information required includes the following:

1) Physical environment:
Describe the geomorphology, meteorology (rainfall, wind, waves and tides), sea currents, surface hydrology, long shore sediment transportation patterns, climatic and oceanographic conditions in the area, and bathymetry of possible dredge areas.
An indication of the quality and quantity of water resources in the vicinity of the project site should be given including spatial and temporal monitoring to accurately characterize baseline groundwater characteristics and present water uses. If the project is likely to use or affect local sources of groundwater, provide a description of groundwater resources in the area in terms of:

- geology
- aquifer type - such as confined, unconfined
- depth to and thickness of the aquifers
- depth to water level and seasonal changes in levels
- interaction with surface water ○ sources of recharge
- current access (bores) to groundwater resources ○
- likely quantitative groundwater yield.

Provide at least four beach profiles at different locations giving GPS positions to establish baseline statistics.
Describe noise sources contributing to ambient noise levels (day/night) at the nearest and adjacent inhabited islandsand ambient noise levels (day/night) on the nearest and adjacent uninhabited[4]. Sensitive noise receptors adjacent to all project components should be identified and typical background noise estimated based on surveys at representative sites. A justification for an ambient noise baseline (dbA) at the nearest and adjacent inhabited islands should be provided.

Describe the topography and climate of the air shed. Parameters should include air temperature, wind speed and direction, atmospheric stability, mixing depth and other parameters necessary for input to the models. Describe the existing air quality within the air shed and at the nearest and adjacent inhabited islands and on the nearest and adjacent uninhabited islands.

2) Biological environment:
A brief description of the terrestrial environment. Vegetation mapping should adequately describe, at an appropriate scale, the vegetation communities for the project site. The methodology used for fauna surveys should be specified and include details of the use of the area by migratory fauna, in particular any areas used for breeding or significant congregations. The ESIA should indicate how well any affected communities are represented and protected elsewhere in the bio-region where the project occurs.

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A brief description of the aquatic environment, including lagoon, reef system and wetlands. The aquatic flora and fauna including fish species, mammals, reptiles, amphibians, crustaceans and aquatic invertebrates occurring in the area affected by the proposal should be described.
Areas of special sensitivity including, wetlands, wildlife breeding or roosting areas, significant habitat, rare and threatened plants, animals, communities, marine species and species of commercial importance, and marine turtle nesting beaches, feeding, resting or calving areas should be mapped.

3) Socio-cultural environment:
Describe the natural features and landscapes of the project site[5]which may have a cultural significance (day and night).
Describe the visual amenity from the nearest and adjacent uninhabited islands
Describe any structures on the project site which may have cultural or religious significance.

Task 3. Legislative and Regulatory Considerations - Outline the project's consistency with the existing national, state, regional and local planning that apply to the project include reference to relevant statutory and non-statutory plans, planning policies, guidelines, strategies and agreements as appropriate. Outline the pertinent policies, regulations and standards governing project location, land use, environmental quality, and public health and safety.

Task 4. Determination of Potential Impacts – Identify the major issues of environmental and social concern and indicate their relative importance to the design of the project[4]. Distinguish construction and post-construction phase impacts, significant positive and negative impacts, and direct and indirect impacts. Identify impacts that are cumulative, unavoidable or irreversible. Special attention should be paid to:
Site preparation, construction and commissioning:
Site clearing impacts including the area to be cleared (m^2), how waste from land clearing would be managed, measures that would be taken to comply with the ***Regulation on Cutting Down, Uprooting, Digging Out and Export of Trees and Palms from One Island to Another r***including locations for relocating trees, source of obtaining new plants to comply with planting two or more trees for each mature tree cut down, compensation plan if any trees owned by the local community needs to be cut down.
Harbour construction impacts including details of placement of quay wall, breakwaters and any related coastal modifications associated with the harbour development, bathymetry of proposed harbour dredge areas; volume of sediments to be excavated in area to be dredged; type of dredging equipment to be used and the manner of deployment including handling, transportation, and disposal of dredged material, the finished depth of the channel and harbour area, how wastes and emissions will be managed. Justify the location and the design for the harbour with respect to the seasonal transport of sediments and other coastal hydrodynamic processes at the development site.
RWMC construction impacts including a full description of the relevant parts and nature of the works, an indicative construction timetable, including expected commissioning and start-up dates and hours of operation, and a description of major work programs for the construction phase, including an outline of construction methodologies. If fill material is required, the quantity and sourcing of borrow materials, and transport and storage, construction site management, noise, fugitive dust, solid waste disposal, traffic and employment.
Commissioning impacts – including a description of the regional waste management facility commissioning process.

Incinerator operation:
Describe solid waste management activities during operations, with particular reference to waste collection, transport, sorting, incinerator loading, and disposal of incinerator ash.
Characteristics of any hazardous materials resulting from or involved in the project, indicating appropriate management strategies (e.g. handling, storage, treatment, disposal).

Provide an inventory of projected annual emissions for each relevant greenhouse gas, with total emissions expressed in 'CO2 equivalent' terms.

Air Quality:

Characterize the nature of emissions to air likely to be produced during the incineration process including flue gas composition, volumes, expulsion height, ejection velocity and temperature.
Describe the pollution control equipment, techniques and the features of the incinerator designed to suppress or minimize emissions to air.

Detail air dispersion modelling outcomes which estimate the effect of the expected emissions from the proposed incinerator on ambient air quality within the air shed with particular reference to the nearest and adjacent inhabited islands and nearest and adjacent uninhabited islands with potential future use for resort development. The air dispersion modelling exercise will evaluate the extent and concentration of following pollutants which are typical constituents of solid waste combustion: Sulphur dioxide, nitrogen oxides (as nitrogen dioxide), TSP, PM10, dioxins, and furans. Air emissions should be stated in respect stack and ground level concentrations, using a recognized atmospheric dispersion model.

The predicted ground level concentrations in nearby areas should be provided. These predictions should be made for both normal and expected maximum emission conditions and the worst case meteorological conditions should be identified and modelled where necessary. Ground level predictions should be made at any residential, industrial and agricultural developments believed to be sensitive to the effects of predicted emissions. The techniques used to obtain the predictions should be referenced, and key assumptions and data sets explained.
Where possible, estimates of emissions should be based on actual measurements from samples taken from similar facilities, preferably full-scale facilities operating elsewhere or otherwise from experimental or demonstration-scale facilities. Where this is not possible, use published emission factors and/or data supplied by manufacturers of process and control equipment.

Discuss the outcomes of the air dispersion modelling with reference to risk to human health and World Bank *Environmental, Health, and Safety Guidelines- General and Solid Waste Operations* An analysis of air impacts should include the predicted estimated ground level concentrations generated by the proposed development assessed against typical ground levels concentrations on the islands.

Water Resources:

Provide details of potential impacts on the quality of ground waters , Particular reference must be made to the chemical and physical properties of wastewater including leachate from ash disposal, the potential of wastewater to contaminate ground water resources, and impact on current and future potential groundwater usage from the proposed development.
Describe the pollution control equipment and design features of the proposed development for prevention and minimisation of contamination of groundwater resources.

Natural Environment:

The proximity of the facility to any sensitive areas should be described.Describe measures to be taken to avoid and minimize potential adverse impacts of the proposal on sensitive terrestrial and aquatic environments.
Describe potential issues relevant to sensitive areas, or areas which may have low resilience to environmental changearising from the construction, operation of the project including clearing, salvaging or removal of vegetation. Areas of special sensitivity include wetlands, wildlife breeding or roosting areas, and habitat of threatened plants, animals and communities. The capacity of the environment to assimilate discharges/emissions should be assessed. Short-term and long-term effects should be considered with comment on whether the impacts are reversible or irreversible. The discussion should cover all likely direct and indirect environmental harm due to the project on flora and fauna particularly sensitive areas.

If construction and operation of the project are likely to cause adverse impacts on sensitive areas or areas which may have low resilience to environmental change describe environmental offsets that would counterbalance the impact on these values.

Noise Amenity:
Describe the impacts of noise generated during the construction and operation of the proposed facility on nearest and adjacent inhabited islands and nearest and adjacent uninhabited islands with potential future use for resort development. An analysis of noise impacts should include the estimated noise levels generated by the proposed development assessed against typical background levels on the islands, and the impact of noise at all potentially sensitive receivers compared with the *World Bank General Environmental, Health, and Safety (EHS) Guidelines*

If noise is likely to cause an adverse impact propose measures to minimize or eliminate these effects, including details of any screening, lining, enclosing or bunding of facilities, or timing schedules for construction and operations.

Socio-cultural:
Describe the impacts of the proposed development on the natural features and landscapes of the project site which may have cultural significance and which may impact on nearest and adjacent islands with potential future use for resort development. Use sketches, diagrams, elevation drawings to portray the near views and far views of the completed structures and their surroundings from visually sensitive locations.
Describe measures to be taken to avoid and minimize potential adverse impacts of the proposal on visual amenity. Justify the land clearing activities with particular reference to potential for minimizing intrusion of the visual amenity of the proposed development activities.
Describe the impact of the proposed development on any structures which may have cultural or religious significance. Describe measures to be taken to avoid, manage or mitigate potential impacts on these structures during construction and operation of the proposed development.

Task 5. Analysis of Alternatives – Indicate project alternatives and examine alternative ways of doing things (in terms of process) and compare and contrast the possible locations for the development site (list alternatives sites) with particular reference to the "do nothing" option which represents current conditions, and Options as described in the Best practical Environmental Options Final Report. This section must include a comparison of the technologies and methods for management and control of contaminants which may potentially impact on the environment including alternatives for ash disposal.

Task 6. Develop an Environmental Management Plan(mitigation /monitoring)-The Project's environmental management plan (EMP) should consists of the set of mitigation, monitoring, and institutional measures to be taken during implementation and operation to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels. The plan also includes the actions needed to implement these measures. More specifically, the EMP includes the following components:
Mitigation
The EMP should identify feasible and cost-effective measures that may reduce potentially significant adverse environmental impacts to acceptable levels. The plan should include offset measures if mitigation measures are not feasible, cost-effective, or sufficient. Specifically the Plan should:

- identify and summarizes all anticipated significant adverse environmental impacts
- (air, groundwater and physical cultural resources (as applicable);
- describe each mitigation measure, including the type of impact to which it relates and the conditions under which it is required (e.g., continuously or in the event of contingencies), together with designs, equipment descriptions, and operating procedures, including:
- general operating procedures for managing and mitigation risks to the environment from general facility operations including waste collection, transport, incinerator loading, hazardous

waste handling, fuel transfer and storage, litter management disposal of incinerator ash and residues.

- manufacturer's operational guidelines specifically outlining safety and emission control procedures as well as recommended maintenance practices.
- general operating procedures for implementing back-up measures that will act in the event of failure of primary measures to minimize the likelihood of adverse air impacts.
- general operating procedures for implementing backup measures that will act in the event of uncontrolled release to waters due to system or catastrophic failure, or from unforeseen unpredicted weather conditions (abnormal rainfall).
- estimate any potential environmental impacts of these measures; and
- provide linkage with any other mitigation plans required for the project.

Monitoring

Provide (a) a specific description, and technical details, of monitoring measures, including the parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions; and (b) monitoring and reporting procedures to (i) ensure early detection of conditions that necessitate particular mitigation measures, and (ii) furnish information on the progress and results of mitigation. Specifically the plan should address physical groundwater quality, air emissions; and physical cultural resources (as applicable).

Capacity Development and Training

Specifically, the ESMP should provide a specific description of institutional arrangements-who is responsible for carrying out the mitigatory and monitoring measures (e.g., for operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training). To strengthen environmental management capability in the agencies responsible for implementation, most ESMPs cover one or more of the following additional topics: (a) technical assistance programs, (b) procurement of equipment and supplies, and (c) organizational changes.

Implementation Schedule and Cost Estimates

For all three aspects (mitigation, monitoring, and capacity development), the ESMP should provide (a) an implementation schedule for measures that must be carried out as part of the project, showing phasing and coordination with overall project implementation plans; and (b) the capital and recurrent cost estimates and sources of funds for implementing the ESMP. These figures are also integrated into the total project cost tables.

Task 8. Consultation – The public consultation process should provide opportunities for community involvement and education. It may include interviews with individuals, public communication activities, interest group meetings, production of regular summary information and updates (i.e. newsletters), and other consultation mechanisms to encourage and facilitate active public consultation. Public consultation processes (community engagement) for all parts of the ESIA should be integrated. Sufficient information about the development and the consultation process should be provided to the community at an early stage and in accessible and culturally appropriate ways. Information about the development should inform the community about the benefits, disadvantages, trade-offs, potential issues and implications as required, enabling them to formulate their views.

Information about the consultation processes conducted and their results should be provided including:

- the methodology adopted, a list of the stakeholders consulted during the program and how their involvement was facilitated,
- the processes conducted to date and the future consultation strategies and programs including those during the operational phase of the project,
- indicate how consultation involvement and outcomes were integrated into the ESIA,
- recommendations on how the project might address concerns raised during public consultation.

D. REPORTING

The ESIA report will be concise and limited to significant environmental issues. The main text will focus on findings, conclusions and recommended actions supported by summaries of the data collected. The ESIA report will be organized according to the outline below.

- Executive Summary
- Introduction to Assignment
- Description of Proposed Project
- Methodology Used

- Policy, Legal and Administrative Framework
- Description of the Environment/Social (Baseline Assessment)
- Significant Environmental and Social Impacts (Impact Assessment)
- Analysis of Project Alternatives
- Environmental and Social Management Plans (mitigation and monitoring)

Annex-8: Environmental and Social Monitoring Checklist for Project Activities

Title of project :

Proponent :

Contractor's Name :

Monitoring Date :

Monitor's Name & Designation :

Issue	Proposed mitigation measures (from the ESMP)	Implementing Responsibility	Compliance Yes/No	Reason for non-compliance	Follow up Action

Photo-documentation of Issue Identified Above

Issue # (from description above)	Date of photograph	Photograph depicting issue

Annex 9: Terms of Reference for Social Aspects

ToR for Social Action Plan, Socio-Economic Baseline Studies; Social Impact Assessment; and Preparation of a Resettlement Action Plan

INTRODUCTION AND OBJECTIVES

Description 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.

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, technoeconomic), 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 of fixed, within or outside of ROW
(vi) Loss of access to public services (roads, water supply, irrigation, schools, medical facilities, and 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 The ESAMF.

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 sections:

(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.

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 and 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.

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.

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.

Annex-9: Generic Environmental and Social Management Plan (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. The project IWMPs should be reviewed and used as the basis for baseline information. Field level verification should be conducted prior to the preparation of the ESMPs:

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 & nonstructural) 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
Preconstruction / 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.

Annex 10: Environmental Management in Construction Sites

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 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 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.

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.

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 minimize 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 minimized 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.

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.

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.

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.

Annex 11: Consultation Notes

Dhaalu Atoll MCEP Public Consultation Summary

Date: 17 November 2016

Time: 14:00 – 16:30

Venue: Dhaalu Atoll Education Centre, Dh. Kudahuvadhoo

1. Introduction

The ESAMF consultation workshop in Dhaalu Atoll was based on an information session, a Q&A session and a working group session. A total of 18 participants from the 6 islands in the atoll attended the workshop, including councillors and representatives of Women's Development Committees (WDC). This workshop was delivered by the following facilitators:

1. Ahmed Nizam, Specialist Coordinator, CCAP project.
2. Ahmed Hassaan Zuhair, Environment Analyst, Environment Department.
3. Essa Hamdhaan Rasheed, Finance Officer, IRENA/ADFD SSWE Project.

2. Remarks by the President of Atoll Council

The president of the Atoll Council addressed the participants and the organisers of the workshop. He encouraged the participants to actively participate in the workshop and discuss the issues each island face in terms of waste management and suggest appropriate measures to resolve such issues. He also highlighted the importance of active participation by WDC in these discussions, as in most islands within dhaalu atoll WDC play an active role in waste management.

3. Overview of the Project

An overview of the MCEP project was given by Nizam. He introduced the different components of the project and explained how a regional waste management system is supposed to function. He also talked about the experiences and lessons learnt from MEMP project. He highlighted some key legislations pertaining to waste management. The role of island council in terms of managing the IWMC proposed through the project was also discussed.

4. Environmental and Social Impacts of the Project

A presentation was delivered by Hassaan on the Environmental and Social impacts of the project. He highlighted the likely environmental and social impacts envisaged during the construction and operational phases of the IWMC and RWMC. He also talked about the World Bank's safeguards policy.

5. Questions by the participants.

Time was allocated for questions at the end of each presentation. Following are some of the key questions raised by the participants and the answers provided by the facilitators.

a) Is the waste management concept adopted in AA. Ukulhas acceptable?
AA. Ukulhas has a very good waste collection system. The roads are very clean with no traces of littering. As a measure to increase awareness of the community, they have placed boards with key waste management messages. The only waste that they cannot manage at present in the IWMC are metal waste. The only issue in Ukulhas is the absence of a RWMC to remove untreatable waste from the island. They take MVR 150 from each household as a collection fee for transporting household waste to the IWMC.

b) Since the project involves establishing IWMCs in 43 islands, the market for composting will be very competitive and individual islands may struggle to generate a profit from it.
It is important not to restrict the concept of composting to financial gains. We have to also consider the positive impacts composting bring to the island community in terms of resolving the current waste management issues, as 70% of the waste profile in the islands of the Maldives are made up of organic compounds. Even if the compost is not sold, it can be distributed to households or simply used to enrich soil fertility.

c) It will be difficult to manage waste in densely populated islands compared to small islands. Are all IWMCs of the same size?
The size of the IWMC depends on the population.

d) The operation of the IWMCs will be transferred to Island Councils after the completion of the project. Are transport vehicles included in the scope of the project?
All necessary vehicles, vessels and equipments will be included in the project scope.

e) What is the distance of buffer zone that is required to be maintained between IWMCs and human settlements?
According to guidelines set by EPA, a distance of 50 meters have to be maintained between IWMC and the nearest house.

f) How is finance provided to WAMCO?
Through the government.

g) How and who will operated IWMCs?
Council will take the responsibility of managing and operating IWMCs.

h) Will resort waste be incorporated within the RWMC?
Ministry is working with Tourism Ministry to change the requirement that each resort must have an incinerator. After the RWMC is established, tourist resorts will not be required to have their own incinerators. Island Councils can join resorts and do compositing together. But this is not possible for other types of waste.

i) Can a collection vessel be provided by the project immediately?
If there is no IWMC in the island, then the first step is to develop the IWMC. The IWMP that will be prepared in consultation with the community and the council will address such type of issues.

j) Can RWMC be constructed prior to developing the IWMCs, because there is an IWMC established through the red-crescent? It was promised even through the red-crescent project that an RWMC will be developed to remove untreatable waste from the island.

IWMCs and the RWMC will be developed in parallel, after completing the required studies and feasibility analyses.

6. Working Group Sessions

The participants were divided in to 6 groups based on their respective islands. Four questions were put forward for discussion. Ten minutes were assigned for the participants to discuss within their respective groups. A representative from each group then presented on the findings.

a) List up to five waste management problems currently present in the island?
b) Suggest measures to resolve the issues identified in (a)?
c) Does the project address the problems identified in (a), recommendation proposed in (b)?
d) What is the current waste management practice in the island?

GROUP 1: Kudahuvadhoo

a) List up to five waste management problems currently present in the island?
- Waste not being segregated.
- Lack of awareness.
- Existing infrastructure not in use.
- Unable to remove inorganic waste from the island.
- Lack of waste management equipments.

b) Suggest measures to resolve the issues identified in (a)?
- Encourage households to segregate waste through the initiative of the council.
- Make the public aware that if waste is managed properly it can be a valuable financial resource.
- Develop the IWMC with the required infrastructure and equipments.
- Develop a mechanism to transport untreatable waste to the RWMC.
- Get glass cutters and metal crushers.

c) Does the project address the problems identified in (a), recommendation proposed in (b)?
Yes

d) What is the current waste management practice in the island?
There are approximately 480 households in Kudahuvadhoo. There is no proper IWMC. Combustibles are open burnt on a designated site. Food waste is being disposed to the beach. An individual from the island is providing collection services with a charge of MVR 125 per month.

GROUP 2: Bandidhoo

a) List up to five waste management problems currently present in the island?
- Site being close to the residential area. Site is now full with accumulated waste.
- No mechanism established to remove untreatable / inorganic waste from the island.
- Severe erosion noted in the IWMC area.
- Current IWMC is too small to properly undertake waste management activities.
- No proper system in place for waste disposal.
- Lack of public awareness on waste related issues.
- Political discrepancies makes it difficult to harmonise community.

b) Suggest measures to resolve the issues identified in (a)?
- Establishing a good waste management system with the required infrastructure and equipments.

- Conducting programs to increase public awareness.
- Implementing the waste management regulation.

c) Does the project address the problems identified in (a), recommendation proposed in (b)?
Yes

d) What is the current waste management practice in the island?
There are approximately 125 households in Bandidhoo. IWMC is very close to residential area and is now full with accumulated waste. Sever erosion noted in the IWMC area.

GROUP 3: Meedhoo

a) List up to five waste management problems currently present in the island?
- Segregation not being practiced at household level.
- Lack of a proper IWMC.
- There is no one designated to look after or manage the IWMC.
- Lack of a proper waste disposal mechanism.
- Lack of initiative from the community and the council in waste management.

b) Suggest measures to resolve the issues identified in (a)?
- Council to introduce a system to segregate waste at household level.
- Introduce a comprehensive system to separately treat for each type of waste collected in the IWMC.
- Recruit staffs for waste management and introduce a waste collection fee.
- Get a vehicle for collecting waste from households.
- Community and the Council to give priority to waste management.

c) Does the project address the problems identified in (a), recommendation proposed in (b)?
Yes

d) What is the current waste management practice in the island?
There are approximately 154 households in the island. At present, there is no proper IWMC. The council has designated specific times for waste dumping. Open burning is the method currently being practiced.

GROUP 4: Maaenboodhoo

a) List up to five waste management problems currently present in the island?
- No IWMC.
- Lack of a proper collection system.
- Lack of public awareness on waste management issues.
- No mechanism currently in place for waste disposal.
- Lack of adequate finances to establish a proper waste management mechanism.

b) Suggest measures to resolve the issues identified in (a)?
- Establishing a proper IWMC with the required infrastructure and equipments.
- Develop a feasible waste collection system.
- Conduct programs to increase public awareness.
- Acquire proper equipments to manage waste at island level.

- Seek for the required funding from the government budget.

c) Does the project address the problems identified in (a), recommendation proposed in (b)?
Yes

d) What is the current waste management practice in the island?
There are 2 areas designated for waste dumping. WDC is managing the waste in the island.

GROUP 5: Hulhudheli

a) List up to five waste management problems currently present in the island?
- Not being able to dispose metal, plastic and glass waste.
- Waste dump yard being full with accumulated waste.
- Lack of equipments and infrastructure.
- Do not have bins to establish a collection system.
- Do not have vehicle to transport waste to dump yard / IWMC.

b) Suggest measures to resolve the issues identified in (a)?
- Get the required equipments to disposal metal, plastic and glass waste.
- Upgrading the existing IWMC.
- Get vehicles and bins.

c) Does the project address the problems identified in (a), recommendation proposed in (b)?
Yes

d) What is the current waste management practice in the island?
There is an IWMC developed by red-crescent, but there is no infrastructure or equipments to manage waste in the IWMC. So this area is mostly used as a dump yard. WDC is managing the communal areas. Some level of segregating is being practiced.

GROUP 6: Rinbudhoo

a) List up to five waste management problems currently present in the island?
- No mechanism currently in place for disposing inorganic waste.
- Although a good IWMP has been prepared by the council, they lack the resources to implement this plan.
- Lack of the required infrastructure and equipments to manage waste in an environmental friendly and sustainable manner.
- Lack of a proper IWMC.

b) Suggest measures to resolve the issues identified in (a)?
- Get the equipments needed for disposing inorganic waste.
- Establish a mechanism to transport the waste that cannot be treated at island level.
- Conduct programs to increase the awareness of the community towards waste management issues.
- Place bins in different areas of the islands.

c) Does the project address the problems identified in (a), recommendation proposed in (b)?
Yes

d) What is the current waste management practice in the island?
Bins are placed in communal areas for waste collection.

7. Conclusion

The workshop resulted in a meaning discussion about different components of the project and the ESAMF. Women of Dhaalu Atoll play an active role in waste management at the island level. In most of the islands an IWMC exists, but is non-functional. It is prevalent for the project take the necessary upgrading works of these IWMCs and to provide training to the Council on compositing and sustainable waste management.

Maldives Clean Environment Project

Disclosure Consultation for Zone IV

Participants Registration 17-11-2016

Location : Dhaalu Atoll (6 Islands)

Name	Signature	Island	office	magaam	Gender	Contact no	Email
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Thaa Atoll MCEP Public Consultation Summary

Date: 18 November 2016

Time: 14:00 – 16:00

Venue: Thaa Atoll Conference Hall, Th. Veymandoo

8. Introduction

The ESAMF consultation workshop in Thaa Atoll was based on an information session, a Q&A session and a working group session. A total of 39 participants from the 13 islands in the atoll attended the workshop, including councillors and representatives of Women's Development Committees (WDC). This workshop was delivered by the following facilitators:

4. Ahmed Nizam, Specialist Coordinator, CCAP project.
5. Ahmed Hassaan Zuhair, Environment Analyst, Environment Department.
6. Essa Hamdhaan Rasheed, Finance Officer, IRENA/ADFD SSWE Project.

9. Remarks by the President of Atoll Council

The president of the Atoll Council addressed the participants and the organisers of the workshop. He requested the participants to utilise the two hours designated for the workshop to gather as much information as possible regarding sustainable waste management practices. He encouraged the participants to go back to their respective communities and spread the knowledge acquired through this workshop.

10. Overview of the Project

An overview of the MCEP project was given by Nizam. He introduced the different components of the project and explained how a regional waste management system is supposed to function. He also talked about the experiences and lessons learnt from MEMP project. He highlighted some key legislations pertaining to waste management. The role of island council in terms of managing the IWMC proposed through the project was also discussed.

11. Environmental and Social Impacts of the Project

A presentation was delivered by Hassaan on the Environmental and Social impacts of the project. He highlighted the likely environmental and social impacts envisaged during the construction and operational phases of the IWMC and RWMC. He also talked about the World Bank's safeguards policy.

12. Questions by the participants.

Time was allocated for questions at the end of each presentation. Following are some of the key questions raised by the participants and the answers provided by the facilitators.

k) There are many uninhabited islands in Thaa Atoll with ample land area. The land area of uninhabited islands within the atoll is collectively 80 hectares. Also considering that Thaa Atoll is at the centre of Zone IV & V it is important to select an island from Thaa Atoll for the development of the RWMC. Is there a specific criteria used to finalise the location of the RWMC?

   There is a criteria used to select an appropriate location for establishing the RWMC. Accessibility, environmental parameters and financial viability will be evaluated prior to deciding on a specific location. An uninhabited island is most likely to get selected as most communities are against the idea of developing a RWMC close to residential areas. But there are some advantages of basing the RWMC in an inhabited island, as this would encompass economic benefits to the island community such as creating jobs.

l) The existing IWMCs and dump yards are already full with accumulated waste. This waste needs to be dealt with before undertaking IWMC upgrading works.

   The existing piles of accumulated waste will be cleared before commencing the IWMC development works.

m) When can an island be decided for RWMC and when can the work start?

   We are currently working to formalize the project by submitting the required documents to World Bank. We are hopeful of initiating the project within next year.

n) The waste management system adopted in AA. Ukulhas also has some issues. Veymandoo Council has prepared an IWMP, but is unable to implement the plan due to lack of a collection vessel. Can MEE assist in providing duty exemption for such a vehicle?

   The waste management issue in Ukulhas is also not entirely resolved. Open burning is practiced to some extent since a RWMC has not been established in that region. But they have a good system for composting. Open burning will not be practiced in IWMCs under this project.

   MEE can definitely provide assistance to Island Councils to get duty exemptions for waste transport vessels. Recently MEE facilitated duty exemption for Maalhos Council for a vehicle that they have bought from the money of the residents. Such initiatives by Councils and communities would always be encouraged and welcomed.

o) How can construction waste be disposed?

   Construction waste cannot be burnt, but can be used for backfilling of building and as a temporary measure to prevent coastal erosion.

13. Working Group Session

The participants were divided in to 6 groups based on their respective islands. Four questions were put forward for discussion. Ten minutes were assigned for the participants to discuss within their respective groups. A representative from each group then presented on the findings.

e) List up to five waste management problems currently present in the island?
f) Suggest measures to resolve the issues identified in (a)?
g) Does the project address the problems identified in (a), recommendation proposed in (b)?

h) What is the current waste management practice in the island?

Islands	Problems	Solutions	Current Waste Management Practice	Views on Project
Burnuni	• Lack of equipments. • Lack of staffs. • Limited budget. • Lack of awareness. • IWMC being full with accumulated waste.	• Establish the required infrastructure and equipments. • Designate staffs to manage the IWMC. • Introduce a collection fee to generate revenue for island waste management. Get a separate budget code for waste management. • Upgrading the IWMC with required infrastructure and equipments. • Conduct programs to increase community awareness. • Establish a system to remove waste from the island.	An IWMC has been established through the assistance of red crescent, but this centre is not in a good condition to undertake waste management practices. A regulation to manage waste at the island level has been prepared and submitted to Local Government Authority for approval. A collection fee of MVR 100 per month is proposed to be taken from the households under this regulation and considers introducing a collection fee for guest houses. The IWMP has been prepared and submitted to EPA. Household segregation is practiced to some extent. However, littering can still be seen. Residents bring used nappies to the IWMC which are disposed through open burning. Regular cleaning of the IWMC is done by the Council in collaboration with the WDC. Green waste produced in each house is burnt daily in the backyard on designated times.	Beneficial
Madifushi	• Lack of a waste transport vehicle. • Do not have adequate finances to undertake waste management works. • Lack of a proper IWMC • No established system to remove waste from the island. • No proper system in place for treating hazardous and medical waste.	• Need financial assistance to resolve all the issues highlighted.	Madifushi has a good waste management system, where waste is segregated at household level. The council receives ample support from the community and WDC to manage the island waste. There are two areas designated for waste dumping. Organic waste including green waste and food waste are collected in one area and burnt. Nappies are also burnt in this area. Glass, plastic and construction waste are collected in a separated area and stockpiled.	Beneficial

Dhiyamingili	• No proper IWMC. • Land scarcity to develop a good IWMC. • Lack of a waste collection vessel. • No method established for managing glass, metals and plastic. • Lack of expertise in waste management.	• Establish an IWMC with waste management equipments. • Seek for financial assistance to purchase a collection vessel. • Land reclamation to facilitate construction of an IWMC. • Training people in waste management discipline.	Staffs have been allocated for managing the dump yard. Residents bring waste to the dump yard on specific days and times designated by the council. Metal waste is disposed separately. The dump yard is cleaned every six months with the assistance of boat yard. An island waste management regulation has been prepared and implemented. Fines are being imposed under this regulation. Combustible waste are burnt.	Beneficial
Guraidhoo	• Lack of adequate finances to manage waste. • Lack of public awareness on waste management issues both nationally and locally. • No proper waste management system in place. • Lack of expertise in waste management.	• Conduct island level waste awareness campaigns with assistance from experts. • Council to take initiative and provide full support to the project team in developing a proper IWMC. • Implement a national waste management plan inclusive of all the regions and islands in Maldives. • Capacity building in waste management discipline.	Organic waste and inorganic waste are collected in separate areas. Organic waste is burnt, while inorganic waste is stockpiled.	Beneficial
Gaadhiffushi	• Lack of waste management equipments. • Financial constraints. • Lack of expertise in waste management. • Lack of public awareness on waste management issues. • Land scarcity to properly manage waste.	• Government should allocate a separate budget for councils to undertake waste management practices. • Seek for training opportunities with the assistance of the government. • Conduct island level awareness campaigns. • Land reclamation to establish a proper IWMC.	There is no mechanism in place for the waste management. Waste is being dumped all over the island. Preparation of an IWMP is progressing.	Beneficial

Thimarafushi	• No proper IWMC. • No designated dumping area. • Waste dumped all over the island. • Waste is dumped without segregation.	• Establishing a proper IWMC is the most pressing need.	No work is being done at the island level to manage waste and due to this, waste piles are accumulated in many parts of the island. There is an expatriate worker who provides collection services for a fee, but is not employed by the council. The council has not established a collection system and do not take the responsibility of waste management.	Beneficial
Kandoodhoo	• Lack of awareness on waste management issues. • Lack of equipment for waste segregation. • Financial constraints. • No mechanism in place for waste disposal.	• Conducting public awareness programs. • The government needs to allocate finances to council for waste management in the yearly budget.	There is an IWMC constructed by UNDP in 2005. The Council has contracted an individual party to provide collection services to households. The collection fee is MVR 100 per month per household, which is given to the contractor. In addition to this the Council provides MVR 2000 to the contractor each month to manage the IWMC. There is support from the community for this collection. 59 households from a total of 88 participates in this collection system. Waste is currently being carried to the IWMC by using a hand driven cart leased by the Council. 99% of the island do agriculture.	Beneficial
Vandhoo	• No proper IWMC • Lack of public awareness on waste management issues. • Waste dump yard being next to residential area and the school. • Lack of a proper mechanism for waste management.	• Develop a proper IWMC with the required equipments and infrastructure. • Conduct public awareness programs on waste management. • Relocate the IWMC to an area away from houses and school. • Establish a good waste management system.	Bins are placed in residential areas to collect waste from households. The dump yard is currently full of accumulated waste.	Beneficial

	• No island waste management regulation being prepared.			
Hirilandhoo	• Land scarcity to develop an IWMC. • A large quantity of waste being generated from fibre works and fish processing. • No proper IWMC. • No proper collection system. • Financial constraints.	• Land reclamation. • Include a clause in the land lease agreements of fibre workers and fish processors to make them responsible for the waste that they generate. • Establish a proper IWMC with required equipments and infrastructure. • Introduce a mechanism to segregate waste before transporting to IWMC.	Two areas are designated for waste dumping. Waste accumulated in these areas sometimes enter the lagoon. Open burning is practiced every week in the dump yards. Fish waste is removed from the island via the jetty. At present there are 10 fibre works stations. Waste produced from these stations are accumulated behind the stations. And these dumped waste from fibre work stations gets drained into the sea or ground water and may be very harmful.Littering is prohibited in some areas, which are marked through sign boards.	Beneficial
Veymandoo	• No proper IWMC. • Lack of public awareness on waste management issues. • Waste not being segregated. • No mechanism in place for removing waste from the island. • Financial constraints.	• Upgrading the current IWMC with proper equipments needed for waste management. • Make the public aware of the importance of sustainable waste management. • Place bins for collecting different types of waste. • Establish a mechanism to regularly remove inorganic waste from the island. • Request the government to provide adequate finances for undertaking waste management responsibilities.	The council has designated a place for waste disposal. However, the community do not adhere to the rules set by the council and keeps dumping waste in different parts of the island. Waste segregation is not practiced at household level. The council plans to introduce a collection service and set MVR 100 as the collection fee.	Beneficial
Kinbidhoo	• Waste being carried to the dump yard without segregation.	• Conduct programs to increase public awareness on waste management issues.	The council has contracted an indicial party to manage the IWMC for a fee of MVR 5000 per month. 1/6th of the residents gives a fee to an individual for transporting waste to the IWMC. The remaining take waste to the	Beneficial

	• Waste is not being carried to the designated areas. • No mechanism to remove accumulated waste from the island. • Financial constraints. • Lack of proper equipments to manage waste at island level. • No proper IWMC.	• Introduce a comprehensive system to manage the dump yard. • The government needs to provide a mechanism to remove accumulate waste from the island. • Government needs to provide additional funding to island councils to undertake waste management responsibilities. • Get the required equipments with the assistance from the government.	IWMC on their own. Waste segregation is not commonly practiced. Open burning is the disposal method being employed in the IWMC. Metal wastes are segregated and stockpiled in the IWMC.	
Omadhoo	• Financial constraints. • Lack of proper equipments to undertake waste management works. • No area designated for waste management. • Lack of expertise in waste management. • Lack of public awareness on the benefits of sustainable waste management.	• Prepare a comprehensive IWMP and an island waste management regulation. • Conduct training programs and awareness programs. • Request the government to provide adequate funding and equipments to manage island waste.	An IWMP has been prepared and approved by EPA. Council staffs visits households regularly to provide information on waste management. The council is currently working towards designating an area for waste management. An island waste management regulation has been prepared and published in government gazette. From January 2017 an individual party will be contracted to undertake waste management responsibilities on behalf of council.	Beneficial
Villufushi	• There is a very good public infrastructure built by the Government and British Redcross after the 2004 Tsunami, but it is not properly maintained. • Waste management is being carried out by Fenaka Corporation but the relationship with the island council is not good. And it	• Resolve the issues between Fenaka and the Island council • Start maintaining the public infrastructure which has been established before.	An IWMC has been established by the British Red-cross. This centre is located very close to the power station. Hence, open burning is not practiced since there is risk of fire. Glass, plastic bottles and metals are managed in the IWMC. The council is trying to adopt a zero burning method, which has been emphasised both in the IWMP and the island waste management regulation.	Beneficial

	affects the proper management of waste in the island.		Currently waste is managed by Fenaka corporation. The council has conflicts with Fenaka corporation who is not providing the support required to establish a proper waste management system. At present 4 staffs from Fenaka corporation and 4 staffs from the council undertake waste management activities. For collection and transporting waste to the IWMC, the council has come to an agreement with Fenaka corporation to use their vehicle initially until the council can purchase their own vehicle.	

14. Conclusion

The workshop resulted in a meaning discussion about different components of the project and the ESAMF. Most of the questions raised by the participants were related to selecting a location for the regional waste management facility. Since the atoll is located in the middle of Zone IV and V and has many uninhibited islands suitable to develop the RWMC proposed under this project, many participants requested the location of the regional facility to be in Thaa Atoll. During the working group session, participants gave information about the current waste management practices adopted in their respective islands and highlighted the problems that they may face while implementing the project.

Maldives Clean Environment Project

Disclosure Consultation for Zone IV

Participants Registration

Location : Thaa Atoll (13 Isl

18-11-2016

#	Name	Institution	Designation	Gender	Contact no	Signature
1	Hassan Zareeru	Buruni council	Councillor	M	9749955	
2	Ismail Usman	Buruni council	Director	M	7781470	
3	Haleemath Samaa Shaama	A.th.m committee	A.th.m member	F	9961571	
4	Ibrahim Shafiu	Vilifushi council	Councillor	M	7977727	
5	Saifullah Adam Shiham	Vilifushi council	A.project officer	M	9866892	
6	Ismail Hilmee	Madifushi council	Vice Concillor	M	7747750	
7	Mohamed Shinan	Madifushi council	E.D.Officer	M	7926566	
8	Maryam Nasira	A.th.m committee	Raeesaa	F		
9	Naahidh Abbas	Dhiyamigili council	Councillor	M	9844467	
10	Hasan Habeeb	Dhiyamigili council	Finance officer	M	9906162	
11	Ibrahim Ali	Guraidhoo council	Conucillor	M	7537808	
12	Ibrahim Ubaidh	Guraidhoo council	Admin officer	M	9871747	
13	Hawwa Manike	A.th.m committee	A.th.m member	F	7881368	
14	Idhrees Ali	Kandoodhoo	Vice councillor	M	7995958	
15	Ibrahim Riyaz	Kandoodhoo	Municipal service offic	M	9955047	
16	Aishath Ahmed	A.th.m committee	Raeesaa	F	9899822	
	Mohamed Giyaz	Vandhoo council	Councillor	M	7998075	
17	Fathmath Shiyaza	Vandhoo council	Admin offcer	F	7747727	
18	Khadheeja Mohamed	A.th.m committee	A.th.m Raeesaa	F	7844223	
19	Mausoom Mohamed	Hirilandhoo	Councillor	M	9662622	
20	Ahmed Haisham	Hirilandhoo	Planning officer	M	9678889	
21	Shaheedha Moosa	A.th.m comittee	Raeesaa	F	7613445	
22	Ziyaaul Haggu	Gadhiffushi	Councillor	M	7428970	
23	Mohamed Shareef	Gadhiffushi	A. palning officer	M	7539641	
24	Hawwa Zahira	A.th.m committee	A.th.m. member	F	7746917	
25	Ahmed Ihsan	Thimarafushi	Councillor	M	9900050	
26	Nashid Ibrahim	Thimarafushi	A.planning office	M	7847734	
27	Maryam Moosa	A.th.m committee	Raeesa	F	7833673	
28	Ahmed Amir	Veymandoo	Vice Councillor	M	7905078	
29	Hamid moosa	veymandoo	A.municipal service of	M	9875997	
30	Zeenath Shuaiba	A.th.m	Committee member	F		
31	Mohamed Riyaz	Kinbidhoo	Councillor	M	9792140	
32	Ahmed Mohamed	Kinbidhoo	Project officer	M	7877822	
33	Fauziyya Abdullah	A.th.m committee	A.th.m member	F	9971767	

18-11-2016

34	Jaawid Hassan	Omadhoo	Councillor	M	9198220	
35	Husain Zaheen	Omadhoo	A.municipal officer	M	9828531	
36	Aminath Shifaza	A.th.m committee	A.th.m member	F	9859360	
37	Adhil Ibrahim	Atoll council	Vice Councillor	M	7777023	
38	Ahmed Shareef	Atoll council	Director general	M	9969609	
39	Ali Zahir	Atoll council	A.economic dev. offic	M	9555123	
40	Mohamed Manik	Atoll Hospital	S. communty h. office	M	9715077	
41	Khadheeja Usman	Atoll Hospital	S. communty h. office	F	7946100	

Atoll Council	2
Island Councils	2 from each Island
WDC	1 from each Island

Meemu Atoll MCEP Public Consultation Summary

Date: 19 November 2016

Time: 9:00 – 11:00

Venue: Meemu Atoll Education Centre, M. Muli

15. Introduction

The ESAMF consultation workshop in Meemu Atoll was based on an information session, a Q&A session and a working group session. A total of 24 participants from the 8 islands in the atoll attended the workshop, including councillors and representatives of Women's Development Committees (WDC). This workshop was delivered by the following facilitators:

7. Ahmed Nizam, Specialist Coordinator, CCAP project.
8. Ahmed Hassaan Zuhair, Environment Analyst, Environment Department.
9. Essa Hamdhaan Rasheed, Finance Officer, IRENA/ADFD SSWE Project.

16. Remarks by the President of Atoll Council

The vice-president of the Atoll Council opened the session and welcomed the participants. He thanked the participants for travelling and attending the session on a short notice and in bad weather condition. He highlighted the importance of this workshop to obtain knowledge about environmental friendly and sustainable waste management practices.

17. Overview of the Project

An overview of the MCEP project was given by Nizam. He introduced the different components of the project and explained how a regional waste management system is supposed to function. He also talked about the experiences and lessons learnt from MEMP project. He highlighted some key legislations pertaining to waste management. The role of island council in terms of managing the IWMC proposed through the project was also discussed.

18. Environmental and Social Impacts of the Project

A presentation was delivered by Hassaan on the Environmental and Social impacts of the project. He highlighted the likely environmental and social impacts envisaged during the construction and operational phases of the IWMC and RWMC. He also talked about the World Bank's safeguards policy.

19. Questions by the participants.

Time was allocated for questions at the end of each presentation. Following are some of the key questions raised by the participants and the answers provided by the facilitators.

p) In Maduvari, food waste is currently being dumped in to the sea. Is there an alternative to this? (This question was raised by the a member of the WDC)

As 70% of the waste generated in islands with in Maldives are comprised of organic waste, if composting can be done at the island level a large part of waste produced in the island can be managed. Compost can be sold or simply used to enrich soil fertility of the island.

q) Does the Council have to collect waste and send to RWMC? (Naalaafushi)

The project will establish the required infrastructure, including upgrading the IWMCs and develop a regional facility to treat waste that cannot be treated at the island level. However, waste management will be undertaken by the island council and WAMCO. The council will be responsible for managing the IWMC, including undertaking composting, establishing a collection system and designating an appropriate collection fee that will in turn generate revenue required to operate the IWMC. The transfer of inorganic waste from the IWMC to the RWMC will be done by WAMCO. All the activities in RWMC will be operated and managed by WAMCO.

r) Can the project develop Atoll Waste Management Centres instead an RWMC, because regional facilities are not managed properly like Thilafushi? (Muli)

In Thilafushi waste in not managed, but being disposed through unsustainable and environmentally damaging ways. The regional facility proposed under this project will not use Thilafushi model, but will adopt the system used in Raa Vandhoo, where modern and most economically and environmentally feasible technologies will be installed to manage waste, such as incineration and waste to energy. Managing waste atoll wise is not economically feasible. In addition to this, a large amount of waste needs to be fed into the incineration plants normally used in regional facilities, and the required amount of waste for such a system will not be produced in small atolls like Faafu and Dhaalu.

s) Waste dumping in Mulaku is not organised, there is littering everywhere. Waste dump yard is full with accumulated waste. How can we implement the waste management regulation without proper infrastructure? It will also be difficult to fine people under this condition and considering that we are a small community everyone basically knows everyone, and will result in social conflict if we impose a fine. (Mulaku)

After the establishment of the waste management system in Zone IV and V, it will be easy to implement the regulation, as every IWMC will be upgraded with the required equipments and training will be provided to councils on how to do composting. Expecting to start the project within the first half of 2017.

t) Resorts can provide assistance to island councils to manage waste within the atoll in terms of transporting waste to Thilafushi. Due to the distance between this atoll and other atolls in the region, it will be difficult to rely on a regional centre (Muli).

When the proposed RWMC is established resorts in this region will take their waste to this facility instead of Thilafushi. This system includes all inhabited islands, resorts and industrial islands within this zone.

u) We recommend you to visit all the islands before initiating the project, because waste management issues present in every island is different both environmentally and socially. The resorts in this region do not take any social responsibility and do not provide any assistance to the island communities in waste management or other matters. All dump yards in Veyvah are currently full and waste like nappies are being burnt (Veyvah).

NOTE: this was more of a comment, rather than a question.

20. Open Discussion

Based on the experience from Dhaalu and Thaa atoll consultations, in consultation with World Bank's Social Safeguards Specialist, it was decided that an open discussion will be a better way to maximise the input from the participants. The participants were asked to put forward suggestions on how they perceive their roles to be in relation to the project, and also to comment on the difficulties and challenges they might face in implementing the various components of the project. Each island was also asked to give a brief overview of the waste management practices currently being practiced in the island. Following is a summary of this session.

a) Kolhufushi

Kolhufushi has two locations for dumping waste, but waste is not managed properly in these areas. Some people also dump waste into the lagoon. Current waste management practices employed in the island are unsafe and detrimental to the environment. Kolhufushi needs to start waste management works from scratches, as the island currently lacks an established and organised waste collection and disposal system.

In other similar types of projects, a plan is developed by the central government without properly evaluating the current situation, and visit the island only in the implementation phase. This creates conflict as some of the methods proposed in such plans do not become acceptable to the island communities. It is important to conduct community consultations with all stakeholder groups at the inception stage of this project to avoid such complications.

b) Naalaafushi

There is an IWMC established by red-cross, but since there were no means to remove the waste from the island, the IWMC got full with accumulated waste within just a few weeks. Now waste is being dumped into the old dumping area and burnt every day.

c) Muli

Muli has an IWMP and has developed a collection system with the required support from the community. MVR 125 is charged from each household for this service. Waste is being managed under this system now for 2 months.

d) Maduvari

Maduvari has an organised waste collection system in place, but waste is being disposed in an unsafe manner. All the waste are burnt and the smoke goes everywhere. The community is cooperative in waste collection, but needs to find an alternative to manage waste.

e) Dhiggaru

In Dhiggaru waste is being managed in the worst possible way. No IWMC is currently in place and waste is being dumped near the coastal area. It is an embarrassment to the island that no proper mechanism has been established to manage waste in an organised manner. Women who usually handle the waste use to burn the piles of waste accumulated with in the island, as there are no other alternatives. The island has high hopes for the proposed project and the community has been in need of a project like MCEP. It is a request of the island council for the team to visit Dhiggaru and get a firsthand view of the situation that they are facing.

f) Mulaku

Red-cross started the work of developing an IWMC but it never came to fruition. Waste is currently being dumped in two areas. Waste collected near the shore sometimes enter the lagoon due to wind and inundation. There will be excellent support from the community for implementing the island waste management component proposed under this project. However, it will be difficult to transport the waste to an IWMC using a hand-driven barrow. The island needs an appropriate waste transport vehicle to establish a good collection system.

g) Raimandhoo

Waste is being taken to the collection areas designated by the council. But once these areas become full, there is no way of removing the accumulated waste from the island.

h) Atoll Council

We understand that bringing such a project to the table is difficult in itself, but the real challenge will be to deliver the project in an effective and sustainable way. So maintaining communications between island councils and the central government is important. To facilitate, this we need to identify focal points from each island to communicate with the project team on a regular basis.

Atoll Council also noted that sometimes Meemu Atoll gets the least priority in development projects and requested the project team to give equal priority to the islands of Meemu while selecting the first batch of islands for developing IWMCs.

21. Conclusion

The workshop resulted in a meaning discussion about different components of the project and the ESAMF. Emphasis was given to deliver information regarding the responsibilities of the councils and the island communities in implementing the project. It is imperative to develop a comprehensive communications

system to facilitate the implementation of the project. The open discussion was useful to get a preview of the current waste management situation of the islands in Meemu Atoll. Some of the difficulties that the islands may face in implementing the project were also identified through these discussions.

Maldives Clean Environment Project

Disclosure Consultation for Zone IV

Participants Registration 19-11-2016

Location : Meemu Atoll (8 Islands)

Name	Institution	Designation	Gender	Contact no	Signature
Ibrahim Rameez	Maduvvari Council	Presidant	M	7887161	
Mukhthar Mohamed	Maduvvari Council	Council Member	M	9733312	
Shameema Hussain Fulhu	Maduvvari WDC	Member	F	7716605	
Ahmed Saeed	Naalaafushi Council	Council Member	M	7754715	
Mohamed Naseem	Naalaafushi Council	Council Member	M	7922236	
Khadheeja Shahuma	Naalaafushi WDC	Member	F	7448884	
Mamdhooh Waheed	Veyvashu Council	Presidant	M	7906278	
Ahmed Areef	Veyvashu Council	Council Member	M	7741680	
Zameera Ahmed	Veyvashu WDC	Member	F	7704052	
Hussain Shaamil	Kolhufushi Council	Presidant	M	7974746	
Abdul Waahid (AB)	Kolhufushi Council	Council Member	M		
Nashfa Ismail	Kolhufushi WDC	Member	F	9180432	
Mohamed Rauf	Raiymandhoo Council	Vice Presidant	M	7726031	
Hussain Khaleel	Raiymandhoo Council	Council Member	M	7765865	
Ahmed Faarish	Mulee Council	Council Member	M	9879595	
Ibrahim Zaki	Mulee Council	Council Member	M	7610111	
Fathimath Zameela	Mulee WDC	Presidant	F	744'779	
Mohamed Ibrahim	Mulaku Council	Presidant	M	7940048	
Samiya Mohamed	Mulaku Council	Council Member	F	7673316	
Haashiya Moosa	Mulaku WDC	Member	F	7415852	
Abdul Rahman Wafir	Dhiggaru Council	Vice Presidant	M	7992872	
~~Ahmed Nishaan~~ Ali Afan	Dhiggaru Council	~~Council Member~~	M	9176736	
~~Aishath Reema~~	Dhiggaru WDC	Member	F	7736654	
Ahmed Hassan	M. Atoll Council	Vice Presidant	M	7764902	
Hassan Amjadh	M. Atoll Council	Council Member	M	7715111	

Atoll Council	2
Island Councils	2 from each Island
WDC	1 from each Island

Faafu Atoll MCEP Public Consultation Summary

Date: 19 November 2016

Time: 14:30 – 15:30

Venue: Quran Centre, F. Nilandhoo

22. Introduction

The ESAMF consultation workshop in Faafu Atoll was based on an information session and a Q&A session. A total of 15 participants from the 5 islands in the atoll attended the workshop, including councillors and representatives of Women's Development Committees (WDC). This workshop was delivered by the following facilitators:

1. Ahmed Nizam, Specialist Coordinator, CCAP project.
2. Ahmed Hassaan Zuhair, Environment Analyst, Environment Department.
3. Essa Hamdhaan Rasheed, Finance Officer, IRENA/ADFD SSWE Project.

23. Overview of the Project

An overview of the MCEP project was given by Nizam. He introduced the different components of the project and explained how a regional waste management system is supposed to function. He also talked about the experiences and lessons learnt from MEMP project. He highlighted some key legislations pertaining to waste management. The role of Island Council in terms of managing the IWMC proposed through the project was also discussed.

24. Environmental and Social Impacts of the Project

A presentation was delivered by Hassaan on the environmental and social impacts of the project. He highlighted the likely environmental and social impacts envisaged during the construction and operational phases of the IWMC and RWMC. He also talked about the World Bank's safeguards policy.

25. Questions by the participants.

Time was allocated for questions at the end of each presentation. Following are some of the key questions raised by the participants and the answers provided by the facilitators.

v) Most islands have already submitted IWMPs to EPA for approval. However, some of the programs and activities proposed under current plan will change due to the proposed project. So how can we implement the IWMPs?

After the project is formalised the existing IWMPs will be modified to reflect the requirements of the project. This would be done through stakeholder consultations. The Council can start

implementing the IWMPs once approval is received from EPA. There is no need for the Council to wait for the project to materialise and come up with a solution, as the project is designed for 4 years. There are several measures that the Council can take to manage waste in the interim.

w) Can waste management responsibilities at the island level be assigned to the WDC and NGOs instead of the Island Council?

According to the Decentralisation Act of the Maldives, the Councils are mandated to undertake waste management activities at the island level. The project will provide the required infrastructure, equipments and training needed to manage the island waste management component of the project. However, the operational phase of the project will be implemented by the Island Councils in collaboration with WAMCO. The project team do not have authority to assign waste management responsibilities to WDC and NGOs, but the Council can designate WDC or NGOs to manage waste on behalf of them, which would be reflected in the IWMPs prepared with the assistance of the project. IWMP preparation stage would involve stakeholder consultations that includes WDC and NGOs. So this can be proposed during IWMP preparation stage.

x) In Nilandhoo an IWMP has been prepared and approved by EPA. However, waste disposal is not being carried out in a sustainable and environmentally friendly manner. This has resulted in groundwater pollution. Nilandhoo has adopted the Thilafushi model, where metals and other inorganic waste not possible to be managed at the island level are being buried. Can the project entertain the removal of these buried wastes?

The existing IWMC will be cleared before the inception of the IWMC upgrading works. The scope of works in each island under the project will be designed to cater the specific needs of that island and can be addressed to such issues of the accumulated or buried wastes, but at this stage it is too early to go into the details of the specific tasks included in the project for individual islands and their issues.

y) Can a fee be provided for the disposal of wastes such as metals taken to RWMC that have economic value?

The Island Council needs to discuss with WAMCO regarding such an arrangement. In some islands in North Region a collection fee of MVR 100 per month is taken from each household. MVR 70 is utilised to manage the IWMC, while the remaining MVR 30 contributes to the regional waste management component, which also includes transporting waste to the RWMC.

z) How frequently is island waste going to be carried to RWMC?

Feasibility studies and region wide consultations will determine the frequency of transporting waste to RWMC. In North Region, waste is being carried to RWMC every 15 days. This will all depend on the studies which are yet to be carried out in this region.

aa) Due to lack of land availability there is only about 60ft between the IWMC and the residential area in Feeali. So it is not possible to adhere to EPA's requirement of maintaining at least 50

meters between IWMCs and residential or public areas. In such circumstances will the project consider land reclamation to establish or upgrade the IWMC?

Usually land will not be reclaimed to establish IWMCs as land reclamation leads to environmental degradation. EPA will give exemption in special circumstances in regard of the minimum distance that should be maintained between the IWMCs and residential or public areas. But if land reclamation is planned through the land use plan, it is possible to establish the IWMC in the reclaimed area. Moreover, only minor impacts are envisaged from the island waste management activities proposed through the project, as open burning will not be carried out and the impacts of smell and mosquito breeding can be minimised if proper methods are used for composting. The project will provide training to the Councils on composting.

bb) Will there be adequate land available for storing metal and glass waste in the IWMC, till the barge arrives?

The project will facilitate the required equipments for managing the island waste management component, such as metal compressors and glass crushers.

cc) Nilandhoo already has plans to buy an incinerator to manage island waste, as waste management is a pressing concern of the island community that needs immediate addressing. However, when the regional waste management system is established through the project, incineration or open burning will not be practiced in the islands. So wouldn't this entertain a huge financial loss to the council?

The project will take approximately four years to complete. So incineration can be a viable option that can be used to manage waste in the interim.

dd) Can the waste already accumulated in the IWMCs and dump yards be cleared through WAMCO?

Yes. Landing craft of WAMCO can be hired or the Council can even approach another party. This can also be done through the project, once the project has been formalised.

ee) Will the authority of managing IWMCs still be under the jurisdiction of the Island Councils when a proper waste management system has been established through the project?

It is difficult to comment on this as Government Policy may change. However, at present WAMCO do not have any plans to take this responsibility away from the Councils. Presently WAMCO is managing waste in cities.

ff) Will recycling be done in RWMC?

Yes. The 3R concept will be adopted as much as possible and waste will be managed in the most sustainable and environmentally friendly manner.

26. Conclusion

The team decided not to proceed with the open discussion session due to time constraints and bad weather. However, the workshop resulted in a meaningful discussion about different components of the project and the ESAMF. The role of the Councils in managing the island waste management component of the project was specifically emphasised and discussed in detail. The participants gave information about the current waste management practices adopted in their respective islands and highlighted the problems that they may face while implementing the project.

Maldives Clean Environment Project

Disclosure Consultation for Zone IV

Participants Registration

Location :Faafu Atoll (5 Islands)

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Annex-12 Environmental Health and Safety Guidelines

Introduction

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industryspecific examples of Good International Industry Practice (GIIP)[6]. When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors. For complex projects, use of multiple industry-sector guidelines may be necessary. A complete list of industry-sector guidelines can be found at: www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines

The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them.

The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which sitespecific variables, such as host country context, assimilative capacity of the environment, and other project factors, are taken into account. The applicability of specific technical recommendations should be based on the professional opinion of qualified and experienced persons. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. If less stringent levels or measures than those provided in these EHS Guidelines are appropriate, in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment. This justification should demonstrate that the choice for any alternate performance levels is protective of human health and the environment.

Applicability

The EHS Guidelines for Waste Management cover facilities or projects dedicated to the management of municipal solid waste and industrial waste, including waste collection and transport; waste receipt, unloading, processing, and storage; landfill disposal; physico-chemical and biological treatment; and incineration projects.[7] Industry-specific waste management activities applicable, for example, to medical waste, municipal sewage, cement kilns, and others are covered in the relevant industry-sector EHS Guidelines, as is the minimization and reuse of waste at the source. This document is organized according to the following sections:

Section 1.0 — Industry-Specific Impacts and Management
Section 2.0 — Performance Indicators and Monitoring
Section 3.0 — References and Additional Sources
Annex A — General Description of Industry Activities

1.0 Industry-Specific Impacts and Management

The following section provides a summary of the most significant EHS issues associated with Waste Management, which occur during the operational and decommissioning phases, along with recommendations for mitigating these impacts.

Recommendations for the management of EHS impacts common to most large industrial facilities during the construction phase are provided in the General EHS Guidelines, as are other operational phase issues, such as noise, common to many industrial activities.

1.1 Environment

Municipal solid waste (MSW) is typically managed separately from industrial hazardous and non-hazardous wastes; therefore, environmental impacts associated with management of MSW and industrial wastes are addressed separately below.

[6] Defined as the exercise of professional skill, diligence, prudence and foresight that would be reasonably expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally. The circumstances that skilled and experienced professionals may find when evaluating the range of pollution prevention and control techniques available to a project may include, but are not limited to, varying levels of environmental degradation and environmental assimilative capacity as well as varying levels of financial and technical feasibility.

[7] This document covers the most common commercial methods of waste management. It does not cover other activities such as the management of radioactive wastes, co-incineration at combustion plants, or deep well injection.

1.1.1 Municipal Solid Waste

Municipal solid waste (MSW) is generally defined as the wastes (other than sewage and air emissions) generated in and usually collected by a municipality. MSW is extremely variable in composition, depending on the income and lifestyle of the generators. As shown in Table 1, MSW includes household refuse, institutional wastes, street sweepings, commercial wastes, as well as construction and demolition debris. MSW may include paper and packaging materials; foodstuffs; vegetable matter such as yard debris; metal; rubber; textiles; and potentially hazardous materials such as batteries, electrical components, paint, bleach, and medicines. MSW may also contain varying amounts of industrial wastes from small industries, as well as dead animals and fecal matter. Environmental impacts and associated mitigation measures applicable to MSW collection and transport; waste receipt, unloading, processing, and storage; biological treatment; incineration; and landfilling are described below.

Table 1 - Sources and Types of Municipal Solid Waste

Source	Typical Waster Generators	Types of Solid Waste
Residential	Single and multifamily dwellings	Food waste, paper, cardboard, plastic, textiles, leather, yard waste, wood, glass, metal, ash, special waste (e.g., bulky items, consumer electronics, white goods, batteries, oil, tires) and household hazardous waste
Industrial	Light and heavy manufacturing, fabrication, construction sites, power and chemical plants	Housekeeping waste, packaging, food waste, construction and demolition materials, hazardous waste, ash, special waste
Commercial	Stores, hotels, restaurants, markets, office buildings	Paper, cardboard, plastic, wood, food waste, glass, metal, special waste, hazardous waste
Institutional	Schools, hospitals, prisons, government centers	Same as commercial
Construction and Demolition	New construction sites, road repair, renovation sites, demolition of buildings	Wood, steel, concrete, dirt, etc.
Municipal Services	Street cleaning, landscaping, parks, beaches, other recreational areas, water and wastewater treatment plants	Street sweepings; landscape and tree trimmings; general waste from parks, beaches and other recreational areas; sludge from water and wastewater treatment plants
Process	Heavy and light manufacturing, refineries, chemical plants, power plants, mineral extraction and processing	Industrial process waste, scrap materials, off-specification products, slag, tailings

Source: World Bank (2005)

Waste Collection and Transport

Litter and clandestine dumping

The causes of littering and clandestine dumping in urban areas occur because of inadequate availability of litter bins along walkways, inadequate public awareness of their responsibilities as urban dwellers, and inadequate refuse collection service. Littering occurs everywhere and often into drains, while clandestine dumping is commonly on vacant lots, public spaces, or along waterways. Accumulated waste may attract disease vectors, contribute to clogging of drainage and sewerage networks, make waste readily accessible to neighborhood animals and birds, and pollute waterways.

Recommended management strategies to minimize litter and clandestine dumping include:

Encourage use of containers or bags for waste at the point of collection for each household and establishment;

Implement a regular collection schedule with sufficient frequency to avoid accumulation of garbage;

Use vehicles appropriate for the geographic conditions and waste types to maximize reliability of collection (e.g., compactor trucks may be appropriate for neighborhoods with wide streets and low-density trash, while smaller vehicles may be appropriate for neighborhoods with narrow streets and higher-density garbage);

Encourage separation of recyclable materials at the point of generation, so that the collection points do not become sorting points for informal sector waste pickers;

Cover collection and transfer vehicles along the entire route of transport to avoid windblown litter;

Clean vehicles used for waste hauling before transportation of any goods, including compost;

Encourage residents to put waste out at designated times and locations;

Where possible, blocking off access to dumping sites and fining illegal dumpers.

Air Emissions

Air emissions from MSW collection and transport include, dust and bio-aerosols, odors, and vehicle emissions.

Dust, Bio-aerosols, and Odors

Dust can include nuisance dust, hazardous dust (e.g., containing asbestos or silica), and bioaerosols (i.e., particles in the air consisting wholly or partially of microorganisms). Bioaerosols are of particular concern to the health of waste workers and have been show to be the source of reduced pulmonary function and increased respiratory disease for those in immediate proximity to waste sweeping and collection activities.[8] Recommended management strategies to minimize dust, bio-aerosols, and odors include:

Establishing frequent waste collection schedules;

Instituting a washing program for waste collection vehicles and for company-owned waste collection and transfer containers;

Promoting the use of bags to reduce the odors from soiling of waste collection and transport equipment.

Vehicle Emissions

Emissions from on-road vehicles may be regulated through national or regional programs. In the absence of these, specific measures to prevent, minimize, and control vehicle air emissions during waste collection and transport include the following:

Optimize waste collection routes to minimize distance traveled and overall fuel use and emissions

Implement transfer stations for small vehicles to consolidate waste into large vehicles for transportation to a treatment or disposal facility;

Waste collection and transport vehicle owners and operators should implement the equipment manufacturers' recommended engine maintenance, along with the mechanical maintenance for the safe operation of the vehicle, including proper tire pressure.;

Drivers should also be instructed on the benefits of driving practices which reduce both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits (working with garbage truck drivers can save as much as 25% on fuel use and reduce maintenance by 15%).

Additional fleet management recommendations are presented in the General EHS Guidelines.

Waste Receipt, Unloading, Processing, and Storage

Control of the incoming waste stream is necessary to ensure safe and effective processing, treatment, and disposal of the waste and the quality of end products (e.g., compost). While procedures may vary depending on the nature of the waste and necessary processing methods, recommended measures include:

Visually evaluate, weigh, and document incoming waste loads;

Reject or, if the facility is equipped to process the waste, segregate potentially hazardous materials or wastes identified, including infectious waste, and manage as a hazardous or infectious waste, as applicable;

Analyze suspected hazardous materials before acceptance so that they are segregated relative to compatibility and so that they can be adequately treated and disposed of;

If possible, isolate size reduction equipment (e.g., shredders or grinders) in an explosion-proof area with proper ventilation and pressure relief to reduce the impacts of potential explosions that could be caused by materials such as gas cylinders and ignitable liquids that may be present in MSW. Visual inspection of the incoming waste, along with sorting and removal procedures, can minimize this potential hazard;

Separate recoverable secondary materials for recycling and organic waste for composting to the extent practical.

Contaminated Runoff

Leachate from waste piles caused by exposure to precipitation and from residual liquids in the waste itself may contain organic matter, nutrients, metals, salts, pathogens, and hazardous chemicals. If allowed to migrate, leachate can contaminate soil, surface water, and groundwater potentially causing additional impacts such as eutrophication and acidification of surface water and contamination of water supplies.

Recommended contaminated runoff management strategies include:

When siting, consider the proximity of waste handling and storage areas to water supply wells for people and animals, irrigation canals, and surface water bodies that support aquatic life and the ability to prevent contaminated leachate and drainage from entering surface and ground water;

Use impermeable materials for roads, waste processing and storage areas, and vehicle washing areas, and install curbs to prevent runoff to permeable areas;

Collect runoff and leachate from areas used for waste storage, and treat runoff to meet applicable environmental standards before discharge to surface water or the municipal sewage system (e.g., screen to remove large material, install silt traps to remove particulates, and
remove separate-phase liquids with an oil/water separator). Discharge to the municipal sewage system (via pipe or tanker truck), where available, is preferred for runoff from waste storage and handling areas;

[8] Additional information is provided in Cointreau, S. (2006).

Re-use collected water in on-site disposal processes to the extent practical or store with collected leachate awaiting treatment.
In addition, management strategies for contaminated runoff from vehicles include:
Cover containers during transport,
Ensure vehicle equipment is designed to collect drainage and that it is held in a sump container until the vehicle reaches a safe discharge location.

Litter

The following measures are recommended to prevent, minimize, and control litter and solid waste during waste receipt, unloading, processing, and storage:
Provide adequate storage for waste not immediately treated or disposed of;
Implement good housekeeping procedures;
Consider use of enclosed/covered areas for waste tipping, shredding, compacting, etc.;
Install catch fences and netting to trap windblown litter.

Air Emissions

The following measures are recommended to prevent, minimize, and control vehicle emissions and emissions of dust, odors, and bioaerosols during waste receipt, unloading, processing, and storage:
Select vehicles and containers that minimize air emissions during waste loading and unloading;
Design drop-off points to minimize queuing of vehicles;
Sweep waste management areas and roads frequently and use water spray for dust control where needed;
Pre-treat wastes as needed (e.g., solidification, encapsulation, or wetting sufficient to reduce dust but without forming leachate);
Use enclosed waste handling and storage areas for malodorous wastes or wastes that generate hazardous dust (e.g., asbestos). Enclosed waste storage and handling areas are preferred for all wastes;
Use extraction system to remove dust from working areas, buildings, and storage vessels, and treat as needed to control particulate emissions (e.g., bag filter);
Remove, treat, or dispose of all biological/malodorous wastes in an expeditious manner;
Use odor-neutralizing sprays where necessary;
Use negative pressure in processing buildings and appropriate air filtration (e.g., biofilter) to remove odor,

Noise and Vibration

Principal sources of noise and vibration include truck traffic; loading equipment (e.g., cranes, wheeled loaders), stationary compactors, balers, grinders, and other treatment and conveyance systems.
Recommended noise management strategies include:
Construct a buffer zone between the facility and the external environment or locate facilities away from sensitive receptors;
Include noise and vibration considerations during design, including use of models to predict noise levels at specified noise-sensitive locations, using standardized sound power levels for construction plant;
Maintain site roads in good condition to reduce noise and vibration from vehicle movements;
Use acoustic screens around fixed/mobile plant and equipment;
Select equipment that has low noise emission levels;
Fit silencing equipment to plant, e.g. baffles/mufflers;
Use buildings to contain inherently noisy fixed plant equipment (e.g., locate waste shredder in the tipping hall, and enclose tipping hall on all sides) and consider use of sound-insulating materials in construction.

Biological Treatment

Biological treatment includes composting with other organic materials for the preparation of soil products[9] (i.e., aerobic treatment), and anaerobic digestion. To maximize the usability of end products, waste should not be accepted that contains organics that are contaminated by potentially hazardous chemicals (e.g., PCBs, chlordane and other pesticides, heavy metals and metalloids) and/or pathogenic substances and micro-organisms (e.g., prions, viruses, bacteria, and parasites) that will not be rendered harmless by the process or may constitute a health or environmental risk. This may include certain clinical waste and other related wastes of clinical origin, and diseased carcasses, or contaminants classified as hazardous or industrial wastes.[10]

[9] Compost is organic material that can be used as a soil amendment or as a medium to grow plants. Mature compost is a stable material with a content called humus that is dark brown or black and has a soil-like, earthy smell. It can be created by combining organic wastes (e.g., yard trimmings, food wastes, manures) in proper ratios into piles, rows, or vessels; adding bulking agents (e.g., wood chips) as necessary to accelerate the breakdown of organic materials; and allowing the finished material to fully stabilize and mature through a curing process (as defined by the US EPA (http://www.epa.gov/epaoswer/nonhw/composting/basic.htm)).

[10] Additional information on composting is provided in Chapter 7 (Composting) of the Decision Maker's Guide to Solid Waste Management, Volume II, EPA, 1995

Leachate and Runoff

Leachate and runoff from waste storage and processing areas may contain organic material (biochemical oxygen demand (BOD)), phenols, nitrates, phosphorous, dissolved metals, and other contaminants. If treated wood is processed, wood preservative chemicals, such as creosote and chromated copper arsenate, and their degradation products may be present. Municipal waste may contain human and animal fecal matter and blood which have a wide range of disease microorganisms. Some household chemicals can possess hazardous properties; examples include pesticides, solvents, paints, batteries, used oils, pharmaceuticals, etc.

The following measures are recommended to prevent, minimize, and control leachate generation and discharge from biological treatment operations:

Install a drainage layer underneath the processing area to provide adequate leachate drainage from composting organics. This may consist of a bed of coarse material such as wood chips, or alternatively the processing platform may permanently incorporate a drainage layer designed to withstand the loading, working and removal of material. For small-scale compost facilities or in dry areas, an adsorbent material can be incorporated in the compost and at the base of the pile;

The material processing or storage areas of the facility should have a leachate barrier system that forms a secure barrier between the groundwater, soil, and substrata and the composting or stored organics, as well as systems for collecting and treating leachate;

Design and maintain the slope and orientation of windrows and/or leachate drains such that free drainage of leachate to a collection drain is facilitated and ponding of leachate is avoided; shape the piles and windrows to maximize run-off and hence reduce infiltration;

Store leachate in a lined earthen basin or in aboveground storage tanks;

For anaerobic digestion, maximize recycling of wastewater to the reactor;

Measure total organic carbon (TOC), chemical oxygen demand (COD), nitrogen (N), phosphorus (P) and chlorine (Cl) levels in the inlet and outlet flows from an anaerobic digester. When a better control of the process is required, or a better quality of the waste output, monitoring of additional parameters may be necessary;

Operate an anaerobic digester under thermophilic digestion conditions, in order to increase the pathogen destruction, biogas production rate (hence higher energy recovery) and the retention time

Maintain ideal composting conditions such as[11]:

Carbon: nitrogen (C:N) ratio between 25:1 and 35:1 o

Moisture content of 50 to 60 percent of total weight during treatment (and less than 50 percent for marketing following screening)

Balance between particle size and void space to promote rapid decomposition. Void space should be sufficient to achieve a 10 to 15 percent oxygen level within the pile in aerobic systems

Optimum temperature levels which can range between 32 and 60 degrees Celsius. Pathogen destruction can be achieved by attaining and maintaining a temperature of 55 degrees Celsius for three days in a vessel composting system or 15 days in a windrow system

pH of between 6 and 8.

Air Emissions

Releases to the air can include direct stack emissions and fugitive emissions associated with biological processes, as well as emissions from burning of biogas. Direct air emissions can include bioaerosols, particulate matter/dust, ammonia, amines, volatile organic compounds (VOCs), sulfides, odors, etc. The following measures are recommended to prevent, minimize, and control air emissions from biological treatment:

Use mist spray to keep down dusts, especially during and prior to loading or other handling procedures.

Use windrow turning equipment that is specially designed to minimize air emissions, as opposed to wheeled loaders or conveyor loaders that drop wastes into piles.

For highly odorous wastes, use closed feed bunkers constructed with a vehicle sluice; for less odor-intensive wastes, use automated and rapid action doors (opening times of the doors being kept to a minimum) in combination with an appropriate exhaust air collection device resulting in an under pressure in the treatment hall.

Enclose leachate drains to reduce the emission of odors.

Minimize the amount of water added to compost (e.g., by covering compost material) to avoid anaerobic conditions that can cause hydrogen sulfide odors if the compost mixture contains sulfur-containing materials.

Biomass and biogas combustion emissions depend on the type of biomass material and combustion method and can include particulate matter, nitrogen oxide (NO_X), sulfur oxide (SO_X), carbon monoxide (CO), hydrogen sulfide (H_2S), and VOCs. When using biomass or biogas as a fuel source for power generation, reference should be made to the General EHS Guidelines for emissions guideline values and the selection of appropriate emissions prevention and control techniques.

Fire

(http://www.epa.gov/garbage/dmg2.htm)

[11] US EPA (1995)

Biodegradable wastes can be combustible and aerobic degradation can produce sufficient heat to cause spontaneous combustion in certain circumstances. Wastes can, in some instances, also contain ashes and other readily ignitable materials that burst into flame under wind conditions, or when contacting flammables. In landfills, methane is generated by anaerobic digestion and can potentially ignite if it encounters an ignition source within or external to the landfill. Methane in landfill gas can become trapped in underground cavities, and even move along geologic discontinuities, to pose a risk of explosion.
Recommended fire prevention and control strategies include:
For composting, avoid conditions that can lead to spontaneous combustion (e.g., moisture between 25 – 45 percent and temperatures above about 93ºC. This can be achieved for example by keeping windrows less than about 3m high and turning them when the temperature exceeds 60ºC);
Collect biogas for use or treatment (e.g. energy recovery or flaring);
Provide a fire alarm system, including temperature sensors in the waste being treated;
Design the facility for access by firefighting equipment, including clear aisles among windrows and access to an adequate water supply.

MSW Incineration Facilities

Air Emissions

Air emissions from incineration depend on the specific waste composition and the presence and effectiveness of air pollution control systems. Polluting emissions may include carbon dioxide (CO_2), CO, NO_X, sulfur dioxide (SO_2), particulate matter, ammonia, amines, acids (HCL, HF), VOCs, dioxins/furans, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals (Hg), and sulfides, etc., depending on the waste content and combustion conditions.
The following measures are recommended to prevent, minimize, and control air emissions:
Conduct waste segregation and/or presorting to avoid incineration of wastes that contain metals and metalloids that may volatilize during combustion and be difficult to control through air emission technology (e.g., mercury and arsenic);
Follow applicable national requirements and internationally recognized standards for incinerator design and operating conditions, mainly rapid quenching of the flue gas after leaving all combustion chambers and before entering any dry particulate matter air pollution control device but also combustion temperature, residence time, and turbulence.[7] Standards for stationary incinerators which include temperature and afterburner exit gas quenching (i.e. rapid temperature reduction) requirements are preferred in order to nearly eliminate dioxins and furans;
Introduce wastes into the incinerator only after the optimum temperature is reached in the final combustion chamber.
The waste charging system should be interlocked with the temperature monitoring and control system to prevent waste additions if the operating temperature falls below the required limits;

Minimize the uncontrolled ingress of air into the combustion chamber via waste loading or other routes;
Optimize furnace and boiler geometry, combustion air injection, and, if used, NO_X control devices using flow modeling;
Optimize and control combustion conditions by the control of air (oxygen) supply, distribution and temperature, including gas and oxidant mixing; the control of combustion temperature level and distribution; and the control of raw gas residence time;
Implement maintenance and other procedures to minimize planned and unplanned shutdowns;
Avoid operating conditions in excess of those that are required for efficient destruction of the waste;
Use auxiliary burner(s) for start-up and shut-down and for maintaining the required operational combustion temperatures (according to the waste concerned) at all times when unburned waste is in the combustion chamber.
Use a boiler to transfer the flue-gas energy for the production of electricity and/or supply of steam/heat, if practical;
Use primary (combustion-related) NO_X control measures and/or selective catalytic reduction (SCR) or selective noncatalytic reduction (SNCR) systems, depending on the emissions levels required;
Use flue gas treatment system for control of acid gases, particulate matter, and other air pollutants;
Minimize formation of dioxins and furans by ensuring that particulate control systems do not operate in the 200 to 400 degrees Celsius temperature range; identifying and controlling incoming waste composition; using primary (combustion-related) controls; using designs and operation

[7] For example, according to Article 6 of EU Council Directive 2000/76, the gas resulting from the incineration process should be raised, after the last injection of combustion air to a temperature of 850 degrees Celsius (1,100 degrees Celsius for hazardous wastes with a content greater than 1% of halogenated organics) for a period of two seconds. Additional details on operating conditions are provided in this reference. Other sources of emissions standards include the U.S. EPA regulations for air emissions from stationary sources at 40 CFR Part 60.

conditions that limit the formation of dioxins, furans, and their precursors; and using flue gas controls;
Consider the application of waste-to-energy or anaerobic digestion technologies to help off-set emissions associated with fossil fuel based power generation.[12]

Ash and Other Residuals

Combustion of solid wastes generates ash and other material remaining after incineration. Solid wastes may also be generated from treatment of wastewater from flue gas treatment (FGT).
The following measures are recommended to prevent, minimize, and control solid waste from incineration:
Design the furnace to, as far as possible, physically retain the waste within the combustion chamber (e.g. narrow grate bar spacing for grates, rotary or static kilns for appreciably liquid wastes), and use a waste throughput rate that provides sufficient agitation and residence time of the waste in the furnace at sufficiently high temperatures, including any ash burn-out areas, in order to achieve a total organic carbon (TOC) value in the ash residues of below 3 wt percent and typically between 1 and 2 wt percent.
Manage bottom ash separately from fly ash and other flue gas treatment residues to avoid contamination of the bottom ash for its potential recovery;
Separate remaining ferrous and non-ferrous metals from bottom ash as far as practicably and economically viable, for their recovery;
Treat bottom ash on or off-site (e.g., by screening and crushing) to the extent that is required to meet the specifications set for its use or at the receiving treatment or disposal site (e.g., to achieve a leaching level for metals and salts that is in compliance with the local environmental conditions at the place of use);
Bottom ash and residuals should be managed based on their classification as hazardous or non-hazardous materials. Hazardous ash should be managed and disposed of as hazardous waste. Non-hazardous ash may
be disposed of in an MSW landfill or considered for recycling in construction materials.[13]

Water Effluents

Cooling systems generate cooling tower blowdown, which is addressed in the General EHS Guidelines. In addition, flue gas treatment generates wastewaters requiring treatment and disposal.
To prevent, minimize, and control water effluents, wastewater from flue gas treatment should be treated as necessary, e.g., using filtration coagulation, precipitation, and filtration to remove heavy metals, and neutralization.

Noise

Principal sources include exhaust fans and resulting in noise from the outlet of the stack; cooling system (for evaporation cooling and especially for air cooling); and turbine generators.
Measures to address noise impacts are addressed in the General EHS Guidelines. Additional recommended measures to prevent, minimize, and control noise from incineration include use of silencers on air coolers and chimneys, as necessary.

Landfilling

A sanitary landfill is a carefully engineered, structurally stable formation of segregated waste cells separated by soil cover material, with base and side slopes designed to minimize infiltration and facilitate collection of leachate. Landfills are sited, designed and operated to isolate the wastes from the surrounding environment, particularly groundwater. Even after closure, landfills required long-term care, including maintenance of the cap system, collection and treatment of leachate, collection and flaring or utilization of landfill gas, and monitoring of groundwater so that the waste remains isolated. Thus, the EHS impacts of eventual decommissioning or closure and longterm operation and maintenance of a landfill need to be considered in the system design. Specific closure procedures should focus on the preservation of the long-term integrity and security of the site, preferably with a minimum of maintenance.
Landfill operators, working in coordination with local regulatory authorities, should explore and implement opportunities to minimize the landfill disposal of municipal wastes which contain metals, such as mercury, which may be released due to crushing of waste materials. Segregation and presorting of these materials should be performed to the extent feasible.

Landfill Siting

[12] The possibility of applying waste-to-energy technologies depends on a number of issues which may include the project design specifications established by local government as well as laws applicable to the generation and sale electricity. Also, it should be noted that recycling options may often save more energy than what is generated by incineration of mixed solid waste in a wasteto-energy facility.
[13] EPA (http://www.epa.gov)

The location of the landfill should take into account potential impacts associated with releases of polluting substances including the following:[14]

Proximity to residential, recreation, agricultural, natural protected areas, or wildlife habitat and areas prone to scavenging wildlife, as well as other potentially incompatible land uses:

Residential development should be typically further than 250 meters from the perimeter of the proposed landfill cell development to minimize the potential for migration of underground gaseous emissions

Visual impacts should be minimized by evaluating locational alternatives

Siting should be further than 3 km of a turbojet airport and 1.6 km of a piston-type airport or as permitted by the aviation authority fully considering potential threats to air safety due to attraction and presence of birds

Proximity and use of groundwater and surface water resources;

Private or public drinking, irrigation, or livestock water supply wells located downgradient of the landfill boundaries should be further than 500 meters from the site perimeter, unless alternative water supply sources are readily and economically available and their development is acceptable to regulatory authorities and local communities

Areas within the landfill boundaries should be located outside of the 10-year groundwater recharge area for existing or pending water supply development.

Perennial stream should not be located within 300 meters downgradient of the proposed landfill cell development, unless diversion, culverting or channeling is economically and environmentally feasible to protect the stream from potential contamination.

Site geology and hydrogeology; o Landfills should be located in gently sloped topography, amenable to development using the cell (bund) method), with slopes which minimize the need for earthmoving to obtain the correct leachate drainage slope of about 2%

Groundwater's seasonally high table level (i.e., 10 year high) should be at least 1.5 meters below the proposed base of any excavation or site preparation to enable landfill cell development

Suitable soil cover material should be available on-site to meet the needs for intermediate (minimum of 30 cm depth) and final cover (minimum of 60 cm depth), as well as bund construction (for the cell method of landfill operation). Preferably, the site would have adequate soil to also meet required cover needs

(usually a minimum of 15 cm depth of soil)[15]

Potential threats to landfill site integrity from natural hazards such as floods, landslides, and earthquakes:

Landfills should be sited outside of a floodplain subject to 10-year floods and, if within areas subject to a 100year flood, amenable to an economic design which would eliminate the potential for washout

There should be no significant seismic risk within the region of the landfill which could cause destruction of berms, drains or other civil works, or require unnecessarily costly engineering measures; otherwise, side slopes should be adjusted accordingly to prevent failure in the event of seismic activity

No fault lines or significantly fractured geologic structure should be present within 500 meters of the perimeter of the proposed landfill cell development which would allow unpredictable movement of gas or leachate

There should be no underlying limestone, carbonate, fissured or other porous rock formations which would be incompetent as barriers to leachate and gas migration, where the formations are more than 1.5 meter in thickness and present as the uppermost geologic unit above sensitive groundwaters.

Leachate Generation

Landfill leachate contains dissolved constituents derived from the interstitial waters of the disposed waste as well as its degradation products. It also may contain some suspended solids, including pathogens. If not collected and treated, leachate can migrate from the landfill and contaminate soil, groundwater, and surface water. Leachate and site monitoring are used to confirm that the engineered landfill systems effectively isolate the waste, both during operation of the landfill

For purposes of siting, assume that at least 1 cubic meter of daily, intermediate, and final compacted soil cover is needed for every 6 cubic meters of compacted refuse.

and after closure. Leachate from a MSW landfill typically is very high in nitrogen (as ammonium), chloride, and potassium, as well as dissolved biological oxygen demand and chemical oxygen demand organics.

[14] Additional detail on siting is provided in Cointraeu (2004) and European Union Council Directive (1999).

[15] Daily cover needs can be alternatively met by using removable tarps, other relatively inert materials (i.e., compost residuals), or by removing the previously laid daily soil cover at the start of each day for reuse at the end of the same day.

The following measures are recommended to prevent, minimize, and control leachate generation from MSW landfills:

Site landfills in areas with stable geology and avoid siting near particularly vulnerable or sensitive ecosystems and groundwater and surface water resources;

Design and operate the landfill in accordance with applicable national requirements and internationally recognized standards to minimize leachate generation, including the use of low-permeability landfill liners[16] to prevent migration of leachate as well as landfill gas, a leachate drainage and collection system, and landfill cover (daily, intermediate, and final) to minimize infiltration;[13]

Treat leachate onsite and/or discharge to municipal wastewater system. Potential treatment methods include aerated lagoons, activated sludge, anaerobic digestion, artificial wetlands, re-circulation, membrane filtration, ozone treatment, peat beds, sand filters, and methane stripping;

Minimize the daily exposed working face and use perimeter drains and landfill cell compaction, slopes and daily cover materials to reduce infiltration of rainfall into the deposited waste;

Prevent run-on of precipitation into the active area of the landfill (e.g., by use of berms or other diversions); systems should be designed to handle the peak discharge from a 25-year storm;

Collect and control run-off from the active area of the landfill; the system should be designed to handle the discharge from a 24-hour, 25-year storm. Runoff is typically treated together with leachate from the site.

Groundwater and Leachate Monitoring

Recommended measures for groundwater and leachate monitoring include the following:

Measure and record the quantity and quality of leachate generated. Changes in leachate quantity or quality not attributable to weather or other factors may indicate changes in the liner, leachate collection, or landfill cover systems;

Install groundwater monitoring wells outside the landfill perimeter at locations and depths sufficient to evaluate whether leachate is migrating from the landfill into the uppermost groundwater unit. This groundwater monitoring network should usually include, at a minimum, one monitoring well located in the upgradient groundwater flow direction from the landfill and two monitoring wells located in the down gradient direction. The groundwater monitoring system should be consistent with applicable national regulations and internationally recognized standards.[17]

Regularly sample the monitoring wells and analyze for constituents, selected based on:

The types, quantities, and concentrations of constituents in wastes managed in the landfill

The mobility, stability, and persistence of waste constituents their reaction products in the unsaturated zone beneath the waste management area

The detectability of indicator parameters, waste constituents, and reaction products in ground water;

The constituent concentrations in the groundwater background.

Landfill Gas Emissions

MSW contains significant portions of organic materials that produce a variety of gaseous products when dumped, compacted, and covered in landfills. Oxygen in a landfill is quickly depleted, resulting in anaerobic bacterial decomposition of the organic materials and the production of primarily carbon dioxide and methane. Carbon dioxide is soluble in water and tends to dissolve in the leachate. Methane, which is less soluble in water and lighter than air, tends to migrate out of the landfill, resulting in landfill gas that is typically about 60 percent methane and 40 percent CO_2, with trace amounts of other gases. Some MSW landfills are designed to maximize anaerobic degradation and production of landfill gas, which can be burned for

[16] Liner systems for MSW landfills can consist of a combination of geological barrier with an overlying bottom liner and leachate drainage layer. Permeability and thickness requirements may range from a hydraulic conductivity of 1 x 10^{-7} centimeters/second for a 0.6-meter layer of compacted soil overlaid by a 30-mil flexible membrane liner (60-mil if made from high density polyethylene (HDPE))
(see U.S. EPA Regulations at 40 CFR Part 258) to a 1 meter thickness and hydraulic conductivity of 1 x 10^{-9} meters/second for the combined geological barrier and liner system with a 0.5 meter drainage layer (see European Union Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste). [13] For additional detailed design criteria refer to Basel Convention Guidelines on
Specially Engineered Landfill, Basel Convention Series/SBC No. 02/03; U.S. EPA Regulations at 40 CFR Part 258; and European Union Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste.

[17] See, for example, U.S. EPA regulations at 40 CFR Part 258 Subpart E.

energy. In addition, operation of landfills can generate dust and odors. Landfill gas is not generated, or in lesser quantities, if the waste material is primarily inert, such as construction debris.

Recommended methods to control and monitor landfill gas emissions include the following:

Include landfill gas collection system designed and operated in accordance with applicable national requirements and recognized international standards including recovery and pre-use processing or thermal destruction through an efficient flaring facility.[18] Prevent condensation from accumulating in extraction systems by arranging the pipe work to fall to a removal point such as a knock out-pot.

Use landfill gas as fuel if practical, or treat before discharge (e.g., by using enclosed flare or thermal oxidation if methane content is less than about 3 percent by volume).

Use gas blowers (boosters) of sufficient capacity for the predicted gas yield and constructed of materials appropriate for landfill gas duty; blowers should be protected by flame arrestors at both gas inlet and outlet.

Install and regularly sample boreholes surrounding the landfill to monitor for migration of landfill gas.

Carbon financing may also be considered, including opportunities implemented through the host-country Joint Implementation of the United Nations Network Convention on Climate Change.

Recommended methods to control dust and odor emissions include the following:

Compact and cover waste promptly after discharge from the vehicle delivering the waste

Minimize open tipping face area

Dispose of odorous sludge in covered trenches

Restrict acceptance of loads known to be particularly odorous

Restrict tipping activities during periods of adverse weather (e.g., wind toward sensitive receptors)

Seal sump covers

Aerate leachate storage areas

highly efficient combustion of landfill gas ranges from 0.6-1.0 seconds at 850 degrees Celsius to 0.3 seconds at 1000 degrees Celsius in enclosed flares. Open flares operate at lower combustion temperatures. Additional information on the technical specifications for efficient flaring systems is provided in European Agency, United Kingdom, and Scottish Environment Protection Agency (2002) and World Bank – ESMAP (2003).

[18] Flare design depends on the type of flare system which may include open flares or enclosed flares. Retention time and temperature necessary to achieve

Litter

Wind, vehicles, and vermin can disperse MSW, potentially attracting vermin, contributing to transmission of diseases, and adversely affecting wildlife and neighboring communities.

The following measures are recommended to prevent, minimize, and control dispersal of litter:

Avoid siting of facilities in particularly exposed, windy areas

Provide perimeter planting, landscaping, or fences to reduce wind;

Pin waste by use of dozers and landfill compactors immediately after discharge from the vehicles delivering the waste;

Use soil or artificial cover materials so that deposited waste is held in place. More frequent application of cover may be required during high winds or in exposed areas;

Use scaring techniques or natural predators to control scavenging birds;

Provide an emergency tipping area/foul weather cell for lightweight wastes such as paper;

Construct temporary banks and bunds immediately adjacent to the tipping area, install strategically placed mobile catch fences close to the tipping area or on the nearest downwind crest, and/or fully enclose of the tipping area within a mobile litter net system;

Install wind fencing upwind of the tipping area to reduce the wind strength as it crosses the facility;

Temporarily close the facility to specific or all waste or vehicle types when weather conditions are particularly adverse.

Closure and Post-Closure

Landfill facility operators should plan for the closure and postclosure care of the facility. Such planning should take place as early as possible in the project cycle so that potential closure and post-closure issues are incorporated in the financial and technical planning. Closure and post-closure planning activities should include the following elements:[19]

Development of a closure plan which specifies the necessary environmental objectives and controls (including technical specifications), future landuse (as defined in consultation with local communities and government agencies), closure schedule, financial resources, and monitoring arrangements;

[19] For additional details on closure and post-closure planning, refer to the EPA's Guide for Industrial Waste Management (http://www.epa.gov/epaoswer/nonhw/industd/guide.htm)

Evaluation, selection, and application of closure methods consistent with post-closure use and which should include the placement of a final cover to prevent further impacts to human health and the environment;
Application of final cover components that are consistent with post closure use and local climatic conditions. The final cover should provide long term environmental protection by preventing direct or indirect contact of living organisms with the waste materials and their constituents; minimize infiltration of precipitation into the waste and the subsequent generation of leachate; control landfill gas migration; and minimize long term maintenance needs.
Financial instruments in place to cover the costs of closure and post-closure care and monitoring.

1.1.2 Industrial Hazardous Waste

Hazardous wastes may be so defined because they share the properties of a hazardous material (e.g. ignitability, corrosivity, reactivity, or toxicity), or other physical, chemical, or biological characteristics which may pose a potential risk to human health or the environment if improperly managed. Wastes may also be defined as "hazardous" by local regulations or international conventions, based on the origin of the waste and its inclusion in hazardous waste lists.

Waste Collection and Transport

Transportation of industrial hazardous waste is a specialized activity requiring appropriate equipment and suitably trained staff. Recommended measures to prevent spills and releases during waste transport and to facilitate emergency response if an accident should occur are provided in the General EHS Guidelines. Additional recommendations specifically applicable to hazardous waste collection and transport operations include:
Follow applicable national regulations and internationally accepted standards for packaging, labeling, and transport of hazardous materials and wastes;[20]
Use tanks and containers specially designed and manufactured to incorporate features appropriate for the wastes they are intended to carry;
If drums or other containers are used to transport waste, containers should be in good condition and compatible with the waste and are adequately secured in the transport vehicle;
Adequately label all transport tanks and containers to identify the contents, hazards, and actions required in various emergency situations.

Waste Receipt, Unloading, Processing, and Storage

Because of the potential inherent hazards of the waste, it is especially important for industrial hazardous waste management facilities to understand and control the nature of the waste that is accepted for storage, treatment, or disposal. Failure to adequately identify and classify incoming waste could result in inadequate treatment or disposal or unintended reactions that could release hazardous substances or cause fires or explosions. Therefore, recommended measures to control waste receipts and general measures to mitigate risks at industrial hazardous waste management facilities include:
Establish and maintain a close relationship with the waste generator to understand the process generating the waste and to monitor any changes in the process or waste characteristics;
Sufficient personnel with the requisite qualifications should be available and on duty at all times. All personnel should undergo specific job training;
Obtain a thorough understanding of the incoming waste. Such knowledge needs to take into account the waste characteristics and variability, the origin of the waste, the treatment and disposal under consideration, the nature of the waste residuals, if any, that may be generated during treatment, and potential risks associated with waste treatment and disposal;
Implement a pre-acceptance procedure that includes, as applicable, tests of the incoming waste and documentation of the waste source (e.g., the processes producing the waste, including the variability of the process), and identifying the appropriate treatment/disposal;
Implement an acceptance procedure that includes, as applicable, procedures that limit the acceptance of waste to only that which can be effectively managed including effective disposal or recovery of residuals from waste treatment. Only accept waste if the necessary storage, treatment capacity, and disposition of any treatment residuals (e.g. acceptance criteria of the output by another treatment or disposal facility) are assured. The reception facility should include a laboratory to analyze incoming waste samples at the speed required by facility operations to determine if the waste is acceptable;
In the case of treatment, analyze the waste out according to the relevant parameters important for the receiving facility (e.g. landfill or incinerator).

Spills and Releases

[20] See, for example, UN Recommendations on the Transport of Dangerous Goods (Orange Book); U.S. Department of Transportation Regulations at 49 CFR Subtitle B Chapter 1.

Overfills, vehicle accidents, and tank and piping failures can lead to releases during waste storage and handling. Mitigation measures, including physical protection, overfill protection, tank integrity, and secondary containment for tanks are addressed in the General EHS Guidelines. Additional recommended measures include:

Segregate hazardous wastes and materials from nonhazardous wastes and materials;

Separate incompatible wastes, such as certain alkaline and acidic wastes that would release toxic gases if mixed; keep records of testing; store waste in separate drums or vessels based on their hazard classification;

Lock out valves controlling material and waste transfer when not in use;

Waste containers should be suitably labeled to include details of their contents and that their locations are recorded in a tracking system;

Transfer or decant only one type of material at any one time;

Conduct regular training and exercises for site staff regarding emergency procedures;

Provide sufficient firewater containment to prevent uncontrolled discharge of water off site in the event of a fire.

Fires and Explosions

Industrial hazardous wastes can be flammable and reactive; therefore, special precautions are needed when handling these wastes to prevent accidents. Recommended measures to prevent and prepare for fires and explosions are presented in the General EHS Guidelines. Additional recommended measures include:

Fire fighting equipment appropriate to the type of waste received at the site should be available;

Minimize the storage of flammable liquids on site (e.g. fuel, flammable wastes);

Use of a nitrogen atmosphere for organic waste liquid with a low flashpoint stored in tanks;

Perform crushing and shredding operations under full encapsulation and under an inert or exhausted atmosphere for drums and containers containing flammable or highly volatile substances;

Provide an emergency tipping area for waste loads identified to be on fire or otherwise deemed to be an immediate risk;

Prepare and annually review a fire risk assessment.

Air Emissions

Air emissions may include releases of particulate matter and VOCs from storage vessels and waste processing equipment. Hazardous waste incineration facilities should minimize leaks from hazardous waste transfer equipment (e.g. pumps, piping, etc) through the implementation of leak detection and repair program.[18] Additional guidance on VOC emissions prevention and control is addressed in the General EHS Guidelines. Guidance on emissions prevention and control is also addressed above under the MSW section.

Water Effluents

Storage and processing operations may generate wash water and runoff from waste management areas. General measures for runoff control are addressed under MSW above and in the General EHS Guidelines. In addition, the following methods are recommended for prevention, minimization, and control of water effluents:

Collect and treat wash water and runoff from waste storage and handling areas as potentially hazardous, unless analytical tests determine otherwise;

Segregate runoff from areas storing incompatible wastes.

Biological and Physico-Chemical Treatment

Biological and physico-chemical treatment processes destroy, separate, concentrate, or contain waste materials to minimize potential environmental, health, and safety hazards and to facilitate environmentally sound management of the wastes. These treatments are usually applied to aqueous solutions or sludge. Many of the treatment processes are effective only for specific waste types, and can be compromised by constituents from other waste streams; therefore, waste acceptance procedures discussed above are especially important. Many of the processes in this sector incorporate sophisticated equipment technology requiring highly-trained staff.

General recommended procedures for biological treatment are addressed under MSW, above. General recommended procedures to prevent, minimize, and control potential environmental impacts from chemical treatment include:

Design and operate facilities in accordance with applicable national requirements and internationally accepted standards;[21]

[18] Additional information on VOC emissions prevention programs is provided in 40 CFR Part 264, Subparts BB and CC (http://www.access.gpo.gov/nara/cfr/waisidx_99/40cfr264_99.html)

[21] See, for example, Basel Convention Technical Guidelines on Hazardous Waste Physico-Chemical Treatment and Biological Treatment, Basel Convention Series/SBC No. 02/09; U.S. EPA regulations at 40 CFP Part 264.

Prepare a quality control plan, which may include a definition of personnel rolls, responsibilities, and qualifications, inspection procedures, and documentation etc.;
Clearly define the objectives and the expected reaction chemistry for each treatment process;
Assess each new set of reactions and proposed mixes of wastes and reagents in a laboratory-scale test prior to waste treatment;
Specifically design and operate the reactor vessel so that it is fit for its intended purpose;
Monitor the reaction so that it is under control and proceeding towards the anticipated result.

Air Emissions

Air emissions associated with storage and transfer operations are discussed above. Additional recommended measures to prevent, minimize, and control air emissions include:
Enclose treatment and reaction vessels so that they are vented to the air via an appropriate scrubbing or other air emission abatement system;
Install gas detectors (e.g. suitable for detecting HCN, H_2S, and NO_X) and implement safety measures to prevent releases of potentially toxic gases;
Link the air space above filtration and dewatering processes to the main air pollution abatement system of the plant, if such a system is in place.

Water Effluents

Waste water from biological and chemical processes includes runoff and leachate (addressed above), pollution control residuals, and waste residuals (e.g., separated aqueous fractions of wastes). General measures for runoff control are addressed under MSW above and in the General EHS Guidelines. Recommended measures to prevent, minimize, and control water effluents include:
Add flocculation agents to the sludge and waste water to be treated to accelerate the sedimentation process and to facilitate the further separation of solids or, where practical, use evaporation (which avoids the use of flocculation agents);
Preventing the mixing of wastes or other streams that contain metals and complexing agents.

Waste Residuals

Biological and chemical treatments typically generate solid waste residuals that must be disposed of. Recommended measures to prevent, minimize, and control solid wastes include:
Restrict the acceptance of wastes to be treated by solidification/immobilization to those not containing high levels of VOCs, odorous components, solid cyanides, oxidizing agents, chelating agents, high TOC wastes, and compressed gas cylinders.
Minimize the solubility of metals and reduce the leaching of toxic soluble salts by a suitable combination of water washing, evaporation, re-crystallization, and acid extraction when immobilization is used to treat solid waste containing hazardous compounds prior to landfilling.
Based on the waste residual's physical and chemical characteristics, solidify, vitrify, melt, or fuse wastes as required/necessary prior to landfill disposal.
Test the leachability of inorganic compounds (e.g., by using the standardized European Committee for Standardization (CEN) or U.S. EPA leaching procedures) for waste to be landfilled.

Hazardous Waste Incineration

Incineration involves several integrated process operations, including feed control and preparation, combustion, and management of combustion products (e.g., flue gases and ash).
Incineration reduces the volume and weight of waste and destroys nearly all of the organic compounds in the waste, but also generates air emissions and waste residues that must be appropriately managed.
To minimize potential environmental, health, and safety impacts, the following general measures should be considered:
Design and operate incinerators in accordance with applicable national requirements and internationally accepted standards.[22] These standards typically require destruction efficiencies of 99.99 percent to 99.9999 percent, depending on the hazard characteristics of the waste;
Implement stringent waste selection procedures so that only wastes that can be effectively managed are accepted;[23]
Continuously monitor incinerator parameters including waste feed rate, total hydrocarbons, temperature (measured at the end of the residence zone), and CO and oxygen (measured a the stack);

[22] See, for example, Basel Convention Technical Guidelines on Incineration on Land, Basel Convention Series/SBC No. 02/04; European Commission Integrated Pollution Prevention and Control Reference Document on the Best Available Techniques for Waste Incineration, August 2006; and U.S. EPA Regulations at 40 CFR Chapter I Subpart O.

[23] Mercury should be excluded from the waste feed to the maximum extent possible.

Install an automatic system to prevent feeding of hazardous waste to the incinerator when operating conditions deviate from the acceptable range (e.g., during startup and shutdown or upset conditions).

Air Emissions

Air emissions depend on the waste-feed composition and may include NO_X, SO_2, CO_2, metals, acids, and products of incomplete combustion, most notably polychlorinated dibenzo-pdioxins and -furans (PCDDs and PCDFs).

Recommended measures to prevent, minimize, and control air emissions include:

Continuously monitor CO and O_2 to evaluate proper combustion conditions;

Closely track chlorine content of the waste feed and the feed rates of these and other potential pollutants;;

Periodically monitor concentrations of PCDDs, PCDFs, other combustion products, and heavy metals in flue gas; • Reduce the generation and emission of PCDDs and PCDFs, if/when chlorine containing wastes are incinerated, by ensuring rapid cooling of flue gas as well as good turbulence of the combustion gas, high temperature, adequate oxygen content, and adequate residence time. De-NOX systems can also reduce PCDD and PCDF emissions;

Additional emission controls (e.g., activated carbon) should be installed if necessary;

Treat combustion gases to remove metals and acid gases (e.g., by wet scrubbers);

Control fugitive emissions from the combustion zone (e.g., by sealing the combustion zone or maintaining the combustion zone pressure below atmospheric pressure);

Minimize fugitive emissions of ash (e.g., use of closed systems to handle fine dry material and use of closed containers for transfer to the disposal site).

Consider the application of waste-to-energy technologies to help conserve resources and off-set emissions associated with fossil fuel based power generation.[24]

Water Effluents

Many air pollution control devices use water for gas cleaning, and generate wastewater that contains the pollutants removed from the flue gas. Recommended measures to prevent, minimize, and control water effluents include:

Periodically monitor concentrations of PCDDs and PCDFs if/when chlorine containing wastes are incinerated, and other combustion products and heavy metals in wastewater;

Minimize discharge of process wastewater to the extent possible while maintaining required air emission control;

Treat wastewater before discharge (e.g., using settling, precipitation of metals, and neutralization).

Ash and Residues

Incinerator bottom ash contains metal oxides and halides, which can have significant water solubility (halides) and can potentially constitute a hazardous waste. Fly ash can absorb water-soluble incomplete combustion products from the flue gas. Thus, contaminants may readily leach from untreated incinerator waste residuals.

Recommended measures to prevent, minimize, and control solid wastes include:

Treat ash and other solid residue from incineration of industrial hazardous wastes as hazardous unless it can be demonstrated that they are not hazardous;

Periodically monitor concentrations of PCDDs, PCDFs, other combustion products, and heavy metals in pollution control residues, and ash or slag;

Reduce the potential for leaching from ash residues (e.g., by solidification or vitrification) prior to final disposition.

Landfilling

Hazardous constituents in landfilled industrial hazardous wastes can potentially migrate from the landfill as leachate or in the gas phase. Therefore, design and operation criteria are particularly important for landfills that accept industrial hazardous waste so that the waste remains contained during the operating life of the landfill, including after closure of the landfill.

General recommended measures to prevent, minimize, and control potential environmental impacts from landfilling of industrial hazardous wastes include:

Design and operate the landfill in accordance with applicable national requirements and internationally accepted standards;[25]

Divide the landfill into different cells to separate wastes with different properties;

Maintain records of the wastes received, including sources, analytical results, and quantity;

[24] As previously noted, the possibility of applying waste-to-energy technologies depends on a number of issues which may include the project design specifications established by local government as well as laws applicable to the generation and sale electricity.

[25] See, for example, Basel Convention Guidelines on Specially Engineered Landfill, Basel Convention Series/SBC No. 02/03; and U.S. EPA Regulations at 40 CFR Chapter I Subpart N.

Record on a map the location and dimensions of each landfill cell and the approximate location of each hazardous waste type within the landfill cell.

Leachate Generation

Storm water controls are addressed under MSW landfills, above, and in the General EHS Guidelines. In addition, recommended measures to prevent, minimize, and control leachate generation include:

Install a liner system, preferably consisting of two or more liners with a leachate collection system above and between the liners, to prevent migration of wastes out of the landfill to the adjacent subsurface soil or ground water or surface water at anytime during the active life of the landfill and after closure, as long as the wastes remain hazardous.

The liners should be:

Constructed of low-permeability materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients, physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;

Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift;

Installed to cover all surrounding earth likely to be in contact with the waste or leachate.

Install a leachate collection and removal system immediately above the upper liner to collect and remove leachate from the landfill so that leachate depth over the liner does not exceed 30 cm. The leachate collection and removal system should be:

Constructed of materials that are chemically resistant to the waste managed in the landfill and the leachate expected to be generated and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and by any equipment used at the landfill;

Designed and operated to function without clogging through the scheduled closure of the landfill.

In a two-liner system, install a leak detection system between the liners. This leak detection system should be capable of detecting, collecting, and removing leaks of hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to waste or leachate;

At final closure of the landfill or upon closure of any cell, cover the landfill or cell with a final cover designed and constructed to:

Provide long-term minimization of migration of liquids through the closed landfill;

Function with minimum maintenance; o Promote drainage and minimize erosion or abrasion of the cover;

Accommodate settling and subsidence so that the cover's integrity is maintained; and

Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils.

Groundwater and Leachate Monitoring

Groundwater monitoring is addressed under MSW landfills, above. In addition, recommended measures for leachate and site inspections and monitoring include:

During construction, inspect the liners for uniformity, damage, and imperfections.

Inspect the landfill regularly (e.g., after storms and weekly during operation and quarterly after closure) to detect evidence of any of deterioration, malfunctions, or improper operation of run-on and run-off control systems, such as erosion of the final cover; proper functioning of wind dispersal control systems, where present; and the presence of leachate in and proper functioning of leachate collection and removal systems.

Landfill Gas

If biodegradable wastes are disposed of, landfill gas can be generated and should be controlled and monitored, as described for MSW landfills, above.

Closure and Post-Closure

Landfill facility operators should plan for the closure and postclosure care of the facility as described previously (see Municipal Solid Waste – Landfills).

1.1.3 Industrial Non-Hazardous Waste

Solid industrial non-hazardous wastes are defined through national legislation as they originate from industrial sources but do not meet the definition of hazardous waste with regards to their specific origin within the industrial process or its characteristics. Examples of non-hazardous industrial wastes include any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial operations; inert construction / demolition materials; refuse, such as metal scrap and empty containers; and residual waste from industrial operations, such as boiler slag, clinker, and fly ash.

Waste Collection and Transport

Transportation of industrial non-hazardous waste requires appropriate equipment and suitably trained staff, and mitigation measures described above for hazardous waste can be generally applicable to industrial non-hazardous waste. Additional recommended measures to prevent,

minimize, and control potential environmental risks associated with waste collection and transport include:

Vehicles and other equipment used for collection industrial non-hazardous wastes should not be used for collection of MSW without prior cleaning to remove waste residues.

Vehicles and other equipment used for collection industrial non-hazardous wastes should not be used for distribution of goods (e.g., mulch).

Waste Receipt, Unloading, Processing, and Storage

As with MSW and industrial hazardous waste, facilities managing industrial non-hazardous waste should understand and control the nature of the waste that is accepted for storage, treatment, or disposal so that the waste can be managed safely and effectively. Waste acceptance and analysis procedures should be implemented considering the nature and expected variability of the incoming waste streams, and generally should be similar to measures suggested for industrial hazardous waste management facilities, described above.

Biological and Physico-Chemical Treatment

Treatment of non-hazardous industrial waste can help to reduce the volume and toxicity of waste prior to disposal. Treatment can also make a waste amenable for reuse or recycling. Consequently, a facility managing non-hazardous industrial waste might elect to apply treatment. For example, treatment might be incorporated to address small quantity VOC emissions from a waste management unit, or a facility might elect to treat a waste so that a less stringent waste management system design could be used. Treatment and post-treatment waste management methods can be selected to minimize environmental impact, keeping in mind that treatment residuals, such as sludge, are wastes themselves that will need to be managed. In general, recommended mitigation measures are similar to those for industrial hazardous waste treatment facilities, discussed above.

Incineration

Incineration might be considered for industrial non-hazardous wastes, including solids, and especially liquids, with heat value that can be recovered during incineration. Recommended mitigation measures for industrial hazardous waste incineration facilities, discussed above, should be considered and adopted for industrial non-hazardous incineration facilities as appropriate, based on the nature of the incoming waste stream.

Landfilling

Industrial non-hazardous waste landfills, like other landfill facilities, depend on waste containment, including leachate collection and treatment (and where appropriate, gas management) to control potential hazards associated with the waste. Industrial non-hazardous waste landfills might accept only one type of waste (i.e., monofills), or a variety of wastes. The nature of the incoming wastes will determine whether the design and controls are more similar to MSW or industrial hazardous waste landfills. In addition to measures discussed for MSW and industrial hazardous waste landfills, the following measures are recommended to prevent, minimize, and control potential environmental impacts associated with industrial nonhazardous waste landfills.

Comply with applicable national and local requirements and internationally accepted standards for industrial non-hazardous waste landfills, including provisions for monitoring; [26]

Do not dispose of putrescible wastes, unless the facility is equipped to manage these types of wastes, with landfill gas collection and treatment systems and degradation products will not interact with the other industrial wastes in a manner that would increase their toxicity or mobility;

Do not dispose of liquids, explosive wastes, radioactive or nuclear materials, or medical wastes together with non-hazardous industrial wastes or by landfilling;

Design the landfill systems, including selection of liner and cover materials, so that industrial wastes and degradation products are contained;

Monitor groundwater and surface water quality in the vicinity of the facility in a manner similar to that recommended for industrial hazardous waste management facilities;

Develop and follow a written schedule for inspecting monitoring equipment, safety and emergency equipment, and operating and structural equipment (such as dikes and sump pumps) that are important to preventing, detecting, or responding to potential environmental or human health hazards;

Implement a training program so that facility personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment, and emergency systems.

1.2 Occupational Health and Safety

Occupational health and safety impacts during the construction and decommissioning of waste management facilities are common to other large industrial projects and

[26] See, for example, Basel Convention Guidelines on Specially Engineered Landfill, Basel Convention Series/SBC No. 02/03; U.S. EPA regulations at 40 CFR Part 257; and 30 Texas Administrative Code Chapter 335.

are addressed in the General EHS Guidelines. The most significant occupational health and safety impacts typically associated with workers at waste management facilities occur during the operational phase and include:
Accidents and injuries
Chemical exposure
Exposure to pathogens and vectors

Accidents and Injuries

Physical hazards encountered at waste management facilities are similar to those at other large industrial projects and are addressed in the General EHS Guidelines. Solid waste workers are particularly prone to accidents involving trucks and other moving equipment, so traffic management systems and traffic controllers are recommended. Accidents include slides from unstable disposal piles, cave-ins of disposal site surfaces, fires, explosions, being caught in processing equipment, and being run over by mobile equipment. Other injuries occur from heavy lifting, contact with sharps, chemical burns, and infectious agents. Smoke, dusts, and bioaerosols can lead to injuries to eyes, ears, and respiratory systems.[27]
Mitigation measures for accidents and injuries are partially addressed in the General EHS Guidelines. In addition, the following procedures are recommended to prevent, minimize, and control accidents and injuries at waste management facilities:
In landfills, conduct compaction of wastes in thin layers using heavy equipment and place regular cover material over each compacted layer of waste, so that any underground fires within a waste cell are not able to spread throughout the landfill and lead to significant cave-ins;
Ventilate landfill gas so that underground fires and explosions do not occur;
Use maximum side slopes of 3:1 in non-seismic areas and lower slopes (e.g., 5:1) in seismic areas, with regular drainage of water so that saturated conditions do not develop and lead to slope subsidence;
Provide workers with appropriate protective clothing, gloves, respiratory face masks and slip-resistant shoes for waste transport workers and hard-soled safety shoes for all workers to avoid puncture wounds to the feet. For workers near loud equipment, include noise protection. For workers near heavy mobile equipment, buckets, cranes, and at the discharge location for collection trucks, include provision of hard hats;
Provide all landfill equipment with enclosed air conditioned cabs and roll-over protection;
Provide refuse collection vehicles and landfill equipment with audible reversing alarms and visible reversing lights;
Improve the storage of solid wastes at the source so that the loads to be collected are well contained and not too heavy;
Locate exhaust pipes on waste collection vehicles so that exhaust does not discharge into the breathing zone of workers on the riding steps;
Design collection routes to minimize, or possibly eliminate, crossing traffic that is going in the opposite direction;
Provide two-hand constant-pressure controls for collection vehicles with compaction mechanisms;
Restrict access to disposal sites such that only safetytrained personnel with protective gear are permitted to high-risk areas;
Segregate people from operating trucks in recycling and transfer stations;
Use automated systems to sort and transfer waste to the extent practical in order to minimize contact with the waste;
Provide workers with communications tools, such as radios. Special signaling codes have been developed for communications on landfill sites;
Minimize sorting from the ground by providing conveyor belts and/or tables that facilitate sorting;
Establish engineering and materials norms for special facility and stationary equipment design requirements that minimize exposure to hazards (e.g., ventilation, air conditioning, enclosed conveyor belts, low loading and sorting heights, non-skid flooring, safety rails on stairs and walkways, spill protection and containment, noise control, dust suppression, gas alarm systems, fire alarm and control systems, and evacuation facilities).

Chemical Exposure

Chemical hazards encountered at waste management facilities are similar to those at other large industrial facilities, such as toxic and asphyxiating gases, and are addressed in the General EHS Guidelines. However, the full composition of wastes and their potential hazards is often unknown. Even municipal solid waste (MSW) often contains hazardous chemicals, such as heavy metals from discarded batteries, lighting fixtures, paints, and inks.
The following procedures are recommended to prevent, minimize, and control chemical exposure at waste management projects:
Control and characterize incoming waste (see waste receipt, unloading, processing and storage);
Provide adequate personnel facilities, including washing areas and areas to change clothes before and after work;

[27] Refer to Cointreau. S. (2006) for additional information.

Ventilate enclosed processing areas (e.g., dust in waste size reduction areas, VOCs driven off by high temperatures during composting);
Monitor breathing zone air quality in work areas at processing, transfer and disposal facilities. Direct-reading instruments that measure methane and oxygen deficiency are of primary importance; these include combustible gas indicators, flame ionization detectors, and oxygen meters. At waste treatment/disposal facilities, volatile organics should also be analyzed in the biodegradation gases being collected and/or vented. In waste handling, sorting, and composting facilities, monitoring for organic dust is needed;
Prohibit eating, smoking, and drinking except in designated areas;
Provide air filtered and air conditioned cabs for heavy mobile equipment used at landfills as necessary.

Dust

Waste processing can generate nuisance and hazardous dust, including organic dust. Dust control measures discussed in Section 1.1 above, will also help to reduce worker exposure to dusts. General mitigation measures for dust are also addressed in the General EHS Guidelines.

Pathogens and Vectors

Workers can be exposed to pathogens contained in manure and animal excreta found in MSW from the disposal of sludge, carcasses, diapers, and yard trimmings containing domestic animal waste. Uncontrolled dumping of MSW attracts rats, flies, and other insects that can transmit diseases. Processing of MSW can also generate bioaerosols, suspensions of particles in the air consisting partially or wholly of microorganisms, such as bacteria, viruses, molds, and fungi. These microorganisms can remain suspended in the air for long periods of time, retaining viability or infectivity. Workers may also be exposed to endotoxins, which are produced within a microorganism and released upon destruction of the cell and which can be carried by airborne dust particles.
The following measures are recommended to prevent, minimize, and control pathogens and vectors:
Provide and require use of suitable personal protective clothing and equipment;
Provide worker immunization and health monitoring (e.g. for Hepatitis B and tetanus);
Maintain good housekeeping in waste processing and storage areas;
Use automatic (non-manual) waste handling methods if practical;
For landfills, promptly emplace, compact and cover of wastes in defined cells, especially for waste with the potential to attract vermin and flies, such as food wastes (especially animal by-products if accepted at the facility) and tannery wastes;
Clean and wash with disinfectant the cabins of heavy mobile equipment used at regular intervals;
For composting, maintain aerobic conditions and proper temperatures in the windrows. Isolate workers from sporedispersing components of the composting process such as mechanical turning (e.g., by using tractors or front-end loaders with enclosed air-conditioned or heated cabs). Aeration systems are preferred over manual turning;
Maintain adequate temperature and retention time in biological treatment systems to achieve pathogen destruction (e.g., 55ºC for at least 3 consecutive days in most compost situations and 55ºC for 15 days in windrows);
Grade the area properly to prevent ponding (to minimize insect breeding areas);
Use integrated pest-control approaches to control vermin levels, treating infested areas, such as exposed faces and flanks with insecticide, if necessary;
.
Provide and require use of dust masks or respirators under dry and dusty conditions (e.g., when compost is being turned). Charcoal-filled respirators also reduce odor perception;
Provide prompt medical attention for cuts and bruises. Cover open wounds to prevent contact with the incoming loads or feedstock;

Fully enclose the waste management site with fencing so that no livestock or wildlife is able to come in contact with the waste, which contains significant potential to enable the spread of livestock and zoonotic disease, as well as spillover disease to wildlife. Provide daily cover of wastes to minimize the attraction to birds, which can become infected with avian influenza and other bird diseases that can then be carried off-site.

1.3 Community Health and Safety

Community health and safety issues related to the construction of waste management projects may include emissions from the solid wastes and construction site issues which are addressed in the General EHS Guidelines..
Community health and safety impacts which occur during the operational and decommissioning phases of waste management facilities may include:
General occupational and environmental health issues associated with waste scavenging
Physical, chemical, and biological hazards
Litter
Noise
Dust and odors

General Occupational and Environmental Health Issues Associated with Waste Scavenging

The presence of informal sector workers laboring in municipal or mixed waste disposal sites in search of commercially valuable materials is a common place occurrence in developing countries. The causes and dynamics are the result of complex social, cultural, labor, and economic factors that are clearly outside of the scope of this guidance document. However, the following principles should be considered in managing the occupational, health, and safety risks of informal laborers:
Waste scavenging should not be allowed under any circumstances in hazardous and non-hazardous industrial waste management facilities;
Facilities dedicated to the management of MSW should work with government entities in the development of simple infrastructure that can allow for the sorting of waste, helping groups of scavengers form cooperatives or other forms of micro-enterprises, or formally contracting them to provide this function. The outright displacement of scavenging workers as an occupational health and safety management strategy, without the provision of viable alternatives, should be avoided;
Operators of existing facilities with scavenging workers should exercise commercially viable means of formalizing their work through the creation of management programs that include:
Allowing only registered adults on the site, excluding children and domestic animals. Striving to provide alternatives to access to childcare and education to children;
Providing protective gear, such as shoes. face masks, and gloves;
Arranging the disposal layout and provide sorting facilities to improve access to recyclables while reducing their contact with other operations, thus minimizing potential hazards;
Providing water supply for washing and areas for changing clothes;
Implementing education campaigns regarding sanitation, hygiene, and care of domestic animals;
Providing a worker health surveillance program including regular vaccination and health examinations.

Physical, Chemical, and Biological Hazards

Visitors and trespassers at waste management facilities may be subject to many of the hazards described for site workers. In particular, waste pickers, looking for recyclable materials and food scraps for animal feeding, often work informally at waste transfer and disposal sites, especially MSW facilities, typically living adjacent to the site in poor housing conditions, with minimal basic infrastructure for clean water and sanitation. Waste pickers may be encounter numerous risks, including contact with human fecal matter, paper that may have become saturated with toxic materials, bottles with chemical residues, metal containers with residue pesticides and solvents, needles and bandages (containing pathogenic organisms) from hospitals, and batteries containing heavy metals. Exhaust fumes of waste collection trucks traveling to and from disposal sites, dust from disposal operations, and open burning of waste all contribute to potential occupational health problems.[28]
Recommended measures to prevent, minimize, and control physical, chemical, and biological hazards to the community include:
• Restrict access to waste management facilities by implementing security procedures, such as:
Perimeter fencing of adequate height and suitable material, e.g. chain link, stock proof palisade;
Lockable site access gate and buildings; o Security cameras at key access points linked to recording equipment and remote access CCTV, where required;
Security alarms fitted to buildings and storage areas; o Review of site security measures annually or whenever a security breach is reported
Use of a site visitor register; o Immediate repair of fencing/access points if damaged;
and
Lighting of site during night time where necessary. As this may cause light nuisance to neighbors, the lighting installations should be selected to minimize ambient light pollution.

Litter

Uncollected garbage and litter spread beyond the waste management facility boundaries by wind, vermin, and vehicles can directly spread disease; attract rats, flies, and other vectors; and expose the community to hazardous substances. Scavenging birds, such as gulls and crows, commonly congregate on landfill sites accepting household waste. They disturb newly tipped and partially covered waste whilst searching for food, and lead to complaints from adjoining residents and landowners about food scraps, excreta and other waste dropped away from the landfill. Litter control is addressed in Section 1.1, above.

Noise

[28] Sandra Cointreau, The World Bank Group, Occupational and Environmental Health Issues of Solid Waste Management Special Emphasis on Middle- and Lower-Income Countries, Urban Papers UP-2, July 2006.

Noise is typically generated by waste processing and treatment equipment as well as vehicular traffic on the site and bringing waste and materials to and from the facility. Sources of noise and abatement measures are addressed in Section 1.1, above, and the General EHS Guideline. In addition, facility operators should coordinate hours of operation with adjacent land uses.

Dust and Odors

Dust and odors from waste management facilities can be a nuisance to the neighboring community. Organic dust can also carry disease-causing microorganisms. Dust and odor controls are addressed in Section 1.1 and in the General EHS Guidelines. In addition, the following measures are recommended to prevent, minimize, and control community exposure to dust and odors from waste management facilities:

Provide adequate buffer area, such as hills, trees, or fences, between processing areas and potential receptors.

Avoid siting facilities near densely populated neighborhoods and installations with potentially sensitive receptors, such as hospitals and schools. Site facilities downwind from potential receptors, if possible.

2.0 Performance Indicators and Industry Benchmarks

2.1 Environmental Performance

Emissions and Effluents

Tables 1 through 4 present examples of emissions and effluent standards for waste management facilities from the European Union and the United States for this sector.[29] These emissions and effluent values are assumed to be achievable under normal operating conditions in appropriately designed and operated facilities through the application of pollution prevention and control techniques discussed in the preceding sections of this document. These levels should be achieved at all times as described in the above-referenced standards. Deviation from these levels in consideration of specific, local project conditions should be justified in the environmental assessment.

Effluent guidelines are applicable for direct discharges of treated effluents to surface waters for general use. Site-specific discharge levels may be established based on the availability and conditions in the use of publicly operated sewage collection and treatment systems or, if discharged directly to surface waters, on the receiving water use classification as described in the General EHS Guideline. These levels should be achieved, without dilution, at least 95 percent of the time that the plant or unit is operating, to be calculated as a proportion of annual operating hours. Deviation from these levels in consideration of specific, local project conditions should be justified in the environmental assessment.

Environmental Monitoring

Environmental monitoring programs for this sector should be implemented to address all activities that have been identified to have potentially significant impacts on the environment, during normal operations and upset conditions. Environmental monitoring activities should be based on direct or indirect indicators of emissions, effluents, and resource use applicable to the particular project.

Monitoring frequency should be sufficient to provide representative data for the parameter being monitored. Monitoring should be conducted by trained individuals following monitoring and record-keeping procedures and using properly calibrated and maintained equipment. Monitoring data should be analyzed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken. Additional guidance on applicable sampling and analytical methods for emissions and effluents is provided in the General EHS Guidelines.

2.2 Occupational Health and Safety Performance

Occupational Health and Safety Guidelines

Occupational health and safety performance should be evaluated against internationally published exposure guidelines, of which examples include the Threshold Limit Value (TLV®) occupational exposure guidelines and Biological Exposure Indices (BEIs®) published by American Conference of

Governmental Industrial Hygienists (ACGIH), the United States

National Institute for Occupational Health and Safety (NIOSH),

Permissible Exposure Limits (PELs) published by the Occupational Safety and Health Administration of the United States (OSHA), Indicative Occupational Exposure Limit Values published by European Union member states, or other similar sources.

Accident and Fatality Rates

Projects should try to reduce the number of accidents among project workers (whether directly employed or subcontracted) to a rate of zero, especially accidents that could result in lost work time, different levels of disability, or even fatalities. Facility rates may be benchmarked against the performance of facilities in this sector in

[29] Sources should be consulted directly for the most updated information.

developed countries through consultation with published sources (e.g. US Bureau of Labor Statistics and UK Health and Safety Executive).

Occupational Health and Safety Monitoring

The working environment should be monitored for occupational hazards relevant to the specific project. Monitoring should be designed and implemented by credentialed professionals as part of an occupational health and safety monitoring program. Facilities should also maintain a record of occupational accidents and diseases and dangerous occurrences and accidents. Additional guidance on occupational health and safety monitoring programs is provided in the General EHS Guidelines

Table 1. Air Emission Standards for MSW Incinerators in the EU and US

Parameter	EU	USA[a]
Total Suspended Particulates	10 mg/m3 (24-hr average)	20 mg/dscm
Sulfur Dioxide (SO_2)	50 mg/m3 (24-hr average)	30 ppmv (or 80% reduction)[b]
Oxides of Nitrogen (NO_x)	200 – 400 mg/m3 (24-hr average)	150 ppmv (24-hr average)
Opacity	n/a	10%
Hydrochloric Acid (HCl)	10 mg/m3	25 ppmv (or 95% reduction)[b]
Dioxins and Furans	0.1 ng TEQ/m3 [6 – 8 hr average]	13 ng/dscm (total mass)
Cadmium	0.05 – 0.1 mg/m3 [0.5 – 8 hr average]	0.010 mg/dscm
Carbon Monoxide (CO)	50 – 150 mg/m3	50 – 150 ppmv[c]
Lead (Pb)	(See Total Metals below)	0.140 mg/dscm
Mercury (Hg)	0.05 – 0.1 mg/m3 [0.5 – 8 hr average]	0.050 mg/dscm (or 85% reduction)[b]
Total Metals	0.5 – 1 mg/m3 [0.5 – 8 hr average]	n/a
Hydrogen fluoride (HF)	1 mg/m3	n/a

Sources:
- EU Directive 2000/76/EC (applicable to MSW and Hazardous Waste Incinerators)
- US EPA Standards of Performance for Large Municipal Waste Combustors, 40 CFR Part 60 Subpart Eb.

Notes:
a All values corrected to 7% oxygen b Whichever is less stringent c Depending on the type of unit: modular starved air, and modular excess air—50 ppm (4hr average); mass burn waterwall, mass burn refractory, and circulating fluidized bed combustor—100 ppm (4-hr average); mass burn rotary waterwall—100 ppm (24-hr average); pulverized coal/refuse-derived fuel mixed fuel-fired combustor—150 ppm (4-hr average); refuse-derived fuel stoker, and spreader stoker coal/refuse-derived fuel mixed fuel-fired combustor—150 ppm (24-hr average). mg/m3 = milligrams per cubic meter; mg/dscm = milligrams per dry standard cubic meter; ppmv = parts per million by volume; TEQ = Toxicity Equivalent Units;

Table 2. Air Emission Standards for Hazardous Waste Incinerators in the EU and US		
Parameter	EU	US [a]
Particulate Matter	See Table 1	1.5 mg/dscm
Carbon Monoxide (CO) or Hydrocarbons (HC)	See Table 1	100 (CO) ppmv 10 (HC) ppmv
Total Chlorine (HCl, Cl_2)	See Table 1	21 ppmv
Mercury (Hg)	See Table 1	8.1 µg/dscm
Semi-Volatile Metals (Pb, Cd)	See Table 1	10 µg/dscm
Low Volatile Metals (As, Be, Cr)	See Table 1	23 µg/dscm
Dioxins and Furans	See Table 1	0.11 dry APCD or WHB 0.20 other sources (ng TEQ/dscm)
Destruction and Removal Efficiency	See Table 1	99.99% – 99.9999%
Source: US EPA National Emission Standards for Commercial and Industrial Solid Waste Incineration Units, 40 CFR Part 63 Subpart EEE. Notes: a All values corrected to 7% oxygen TEQ = toxicity equivalent; APCD = air pollution control device; WHB = waste heat boiler; mg/m3 = milligrams per cubic meter; mg/dscm = milligrams per dry standard cubic meter; ppmv = parts per million by volume;		

Table 3. Air Emission Standards for Industrial Non-Hazardous Waste Incinerators in the EU and US		
Parameter	EU	US[a]
Opacity	See Table 1	10%
Particulate Matter	See Table 1	70 mg/dscm
Carbon Monoxide (CO)	See Table 1	157 ppmv
Oxides of Nitrogen (NO_x)	See Table 1	388 ppmv
Sulfur Dioxide (SO_2)	See Table 1	20 ppmv
Hydrogen Chloride (HCl)	See Table 1	62 ppmv
Cadmium (Cd)	See Table 1	4 µg/dscm
Lead (Pb)	See Table 1	40 µg/dscm
Mercury (Hg)	See Table 1	470 µg/dscm
Dioxins and Furans	See Table 1	0.41 ng TEQ/dscm [b]
Source: US EPA National Emission Standards for Commercial and Industrial Solid Waste Incineration Units , 40 CFR Part 60 Subpart CCCC. Notes: a. All values corrected to 7% oxygen. Based on 3-run average (1-hr minimum sample time per run), except for opacity, which is based on 6-minute averages. mg/m3 = milligrams per cubic meter; mg/dscm = milligrams per dry standard cubic meter; ppmv = parts per million by volume; TEQ = toxicity equivalent.		

Table 4—Effluent Standards for Landfills in the US		
Parameter	Units	Guideline[c]

		Hazardous Waste Landfills		MSW Landfills	
		Daily Max	Monthly Avg.	Daily Max	Monthly Avg.
BOD_5		220	56	140	37
pH		6-9	6-9	6-9	6-9
Total Suspended Solids	mg/L	88	27	88	27
Ammonia (as N)	mg/L	10	4.9	10	4.9
Arsenic	mg/L	1.1	0.54		
Chromium	mg/L	1.1	0.46		
Zinc	mg/L	0.535	0.296	0.20	0.11
a-Terpineol	mg/L	0.042	0.019	0.033	0.016
Analine	mg/L	0.024	0.015		
Benzoic Acid	mg/L	0.119	0.073	0.12	0.071
Naphthalene	mg/L	0.059	0.022		
p-Cresol	mg/L	0.024	0.015	0.025	0.014
Phenol	mg/L	0.048	0.029	0.026	0.015
Pyridine	mg/L	0.072	0.025		

Source: U.S. EPA Effluent Guidelines for Centralized Waste Treatment, 40 CFR Part 437.

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Annex A: General Description of Industry Activities

Description and Definition of Wastes

Municipal Solid Waste

Municipal Solid Waste (MSW) typically includes household refuse, institutional wastes, street sweepings, commercial wastes, as well as construction and demolition debris. MSW is extremely variable in composition, depending on the income and lifestyle of the generators. MSW may include paper and packaging materials; foodstuffs; vegetable matter such as yard debris; metal; rubber; textiles; and potentially hazardous materials such as batteries, electrical components, paint, bleach, and medicines. In developing countries, MSW may also contain varying amounts of industrial wastes from small industries, as well as dead animals and fecal matter. In general, and the content of organic waste in developing countries (up to 70 – 80 percent) is higher than in industrialized countries, and the content of packaging waste is lower, making MSW in developing countries relatively dense and moist.

Industrial Waste

The waste categories generated within the industrial enterprises depend on the manufacturing processes and waste management practices. In some cases, sector-specific waste arising within industrial facilities is disposed of at the municipal landfill. These types of waste may consist of slag from iron works and steel mills, ashes, residues from flue gas cleaning, bark, wood, sawdust, cutting fluids, waste oil, organic waste from food industry, and sludges (organic and non-organic). Some of the waste types generated within the industries can be hazardous.

Waste Collection and Transportation

Household waste typically is collected from individual households at the curbside or from neighborhood collection stations with dedicated containers or bins.

Collection vehicles may range from horse-drawn carts, to pickup trucks, to back-loaded and compacting vehicles with a capacity of about 6 – 10 cubic meter (or up to 10 tons). One of the most common problems in developing countries has traditionally been the lack of household waste collection service in low-income neighborhoods with poor road infrastructure; in these settings, smaller vehicles are usually most effective.

Depending on the type, characteristics, volume, and compatibility of different categories of hazardous waste, generators may store them in containers, bins, drums, or aboveground or underground tanks, etc. These types of wastes are typically transported to the treatment or disposal facilities in trucks (for drums, bins or containers) or if larger volumes in tanker trucks.

Transfer Stations

Transfer stations serve as collection points for garbage and brush trucks to transfer their loads to other long haul vehicles. The small collection trucks unload the waste onto a concrete floor or into a hopper; the waste is then compacted further and loaded into containers (typically with a capacity of 20 cubic meters) or directly into specially designed semi trailers. As a rule of thumb, to optimize and reduce the number of trips to the treatment/disposal facility, transfer stations might be preferred if the distance to the treatment/disposal facility exceeds 30 km. In some cases, the distance to the treatment/disposal facility can be shorter and still be viable if the road conditions are poor.

Reception of Waste

When the collection vehicles or the long haul vehicles reach the treatment or disposal facility, the waste should be inspected visually and controlled that the paperwork corresponds to the actual load. In some cases, samples of the waste are taken and analyzed, (e.g., if the waste will be treated biologically where the end-product is utilized and there are demands for low contaminant concentrations such as heavy metals).

Waste Treatment and Disposal

Biological Treatment

Composting

Generally speaking, the purpose of the composting process is to decompose organic solids in the presence of air and humidity, producing a humic substance valuable as soil conditioner. Economic advantages include the reduction in the volume of waste deposited in landfills (extending the life of the landfill and avoiding or delaying the construction of additional ones), and the generation of commercially valuable agricultural nutrients.

Waste categories that are ideal for composting are park, yard and garden waste, paper, paper packaging, food scraps, animal manure and other types of organic waste. If animal waste is composted, the waste should be hygienized prior to composting.

There are several methods available for central composting; the most common and simple is windrow composting where the waste is distributed in rows with the application of oxygen from underlying active or passive ventilation systems. Other methods include closed systems such as drums, tunnel, and membrane methods. The operational conditions and odor generation of closed systems are typically easier to control and are definite advantages over open treatment methods.

Anaerobic Digestion

Anaerobic digestion facilities are ideal for the treatment of the same types of organic waste that can be composted including wastes from households food scraps, paper tissue, garden waste like grass cuttings, leaves; food processing waste such as vegetables, cheese, meat, sugar; manure and

animal waste; slaughterhouse waste; sewage sludge; and crop waste.

The quality requirements of the incoming waste to the digestion facility are typically higher than in composting requiring a more homogenized and heterogeneous waste.

Organic waste is treated in closed containers in the absence of air enhancing the generation of biogas (about 55-70 % methane) which can be recovered for subsequent use as a fuel source. The semi-solid residue (digestate) is normally treated through aerobic digestion and may be used as agricultural fertilizer.

Chemical and Physical Treatment

Chemical and physical treatment methods are varied and complex but may include: absorption, evaporation, distillation, filtration, chemical oxidation/reduction, neutralization, precipitation, solvent extraction, stripping / desorption, membrane-based separation, ion exchange, and solidification. Treatment systems may include one of these or a combination of multiple treatment operations. As most of these systems operate on a continual basis, they require a reliable, preferably homogenous source of material.

Incineration

Thermal treatment in incineration facilities can be used for all types of organic waste, including hazardous waste and mixed household waste. MSW incinerators reduce the volume of waste by about 90% and the weight by approximately 75%, while hazardous waste incinerators may achieve much higher waste volume and weight reductions, depending on the inorganic content of the wastes. Some incinerators today in operation are waste-to-energy facilities, which may use the combustion process to generate steam and electricity. Waste-to-energy facilities can be either mass burn or refuse-derived-fuel facilities. Incineration facilities typically range in size from 15,000 tons of waste per year to 500,000 tons per year. In mass burn facilities, wastes are injected into the boiler without any pre-processing or sorting of non-combustible materials.

Most mass burning facilities use grate incinerators and operated at temperatures of at least 850ºC with higher temperatures applied to hazardous wastes. Flue gas treatment is typically required regardless of the type of incineration system. Residual wastes generated from the incineration process include slag, ashes, and flue gas treatment residues.

Landfilling

Landfilling can be used for most waste categories, but ideally only for inert material. A modern sanitary landfill is an engineered facility for the disposal of municipal solid waste designed and operated to minimize public health and environmental impacts.

The typical landfill consists of several cells in which the waste is systematically placed. Compactors may be used to reduce the waste volume and to enhance the build up of the cells. The landfill base usually consists of a liner that minimizes the leakage of liquid waste materials from the landfill into the groundwater system. As the waste is built up in layers it is covered daily to prevent paper, dust or odors from escaping into the environment. The leachate that is generated can be collected and treated. If organic waste is landfilled, landfill gas will be generated and may be collected and utilized or flared.

Annex 13: 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 ESAMF stage, a Resettlement Policy Framework (RPF) has been provided as an 'insurance' that resettlement issues can be addressed in the event that they do arise during project implementation.

Project Description

Component 1: Strengthening and streamlining National SWM Policy Framework and its Implementation (US$ 2.50 million)

This component would channel Bank support to the activities related to the current policy implementation at the national level. This component will also be guided by priorities emerging from the current Solid Waste Bill, a draft for which is being processed in the MEE and AG office for deliberations in the Majlis in the New Year. Candidate areas include reuse of construction debris, Ocean Plastics, Extended Producer Responsibility (EPR), etc.

Sub-component 1a will support the revision of the GoMaldives' Solid Waste Management Policy, 2015, which will be formally launched in 2018, following completion of 5 years of implementation of the current version. The roadmap for this revision will be formed by the outputs from the below sub-components.

Sub - component 1b will provide funding for Technical Assistance on analyzing emerging issues. This would cover options analysis for household waste segregation, handling and treatment of non-biodegradable waste streams through waste minimization, and recycling of suitable streams like plastic bottles, operationalization of EPR, etc.

Sub – component 1c will support IEC campaigns on key issues facing the Maldives in Solid Waste Management. This would include targeted audio-visual campaigns to promote recycling, waste reduction such as plastic bottles with promotion of piped water supply in cities/islands where water quality is found to be adequate.

Sub-component 1d will cover Augmentation and improvements of the curriculum for the MNU course on Bachelor of Environmental Management, including the modules pertaining to waste management.

Sub-component 1e will provide funding support with focus on developing Maldives' leadership position in advocating effective management of marine litter, including Ocean Plastics, especially in the regional context of South West Indian Ocean. It will also support a national workshop on Operational Issues, Successes and Lessons learnt from the operation of the RWMC in Zone II will be organized after about 6 months of commencement of its routine operation to inform selection and design of RWMC options across the various zones where the system is under development.

Sub-component 1f will support capacity building of various entities involved in SWM arena in Maldives. Initial training of Waste Management Company (WAMCO) staff would be supported along with building of capacity of the EPA including with equipment and vehicles, which would be used for monitoring of illegal disposal of waste in the Maldives.

Component 2: Improving Regional Waste Management Facilities in select Zones (US$ 8.0 million)

This will have two sub-components – one focusing on the residual investments in Vandhoo, where the RWMC has been constructed under MEMP and other in making limited investments in newer Zones.

Sub-component 2a would support investment activities in Zone II for operationalization of the facilities created under MEMP in Vandhoo. This would include provision of equipment, augmentation of storage facilities, and access roads on the site. Currently identified equipment include a Jib crane to life waste containers from vessels bring waste to the island, a solid waste sorting line, and excavator.

Sub-component 2b, based on the outcome of the feasibility study for the integrated waste management system for the other zones included in the project (see details below), fund recommended investments to establish the RWMC facilities to service the new Zones IV and V (with a possibility of including other zones if the need arises).

Component 3: Improving Island Waste Management Facilities in select Zones (US$ 5.0 million,)

This component will support development/completion of island level facilities for managing collection, segregation, on-site treatment and storage of residual waste, until its eventual transfer to the RWMC. The candidate zones for the project are currently IV and V, in addition to residual activities in Zone II.

Sub-component 3a will support a feasibility study for determination of the most suitable integrated solid waste management system for the islands included in Zone IV and V. The study will identify any additional criteria that islands need to satisfy before a particular system – for collection, transportation, segregation and treatment of biodegradables, and storage of the more recalcitrant material to the RWMC – can be implemented. This study will also help choose the most appropriate technology for the treatment and disposal in the RWMC. This component will also fund the ESIAs for IWMCs as these get chosen, as well as the Best Practical Environmental Option study for the selected RWMC configuration.

Sub-component 3b support the supply of vehicles for collection of waste on the islands, and shredders for islands in Zone II to facilitate that full capacity utilization of the RWMC already constructed under the MEMP.

Sub-component 3c will fund the preparation and implementation of Island Waste Management Plans (IWMPs) across the atolls in Zones IV and V. To be eligible for funding support, each island council would need to have IWMP approved by the EPA, which includes waste minimization approaches, and be subject to the EA and SA in line with the ESAMF, and have fixed a tariff from each generator of solid waste (whether household or other commercial/industrial establishment) to support the implementation of the IWMP. Currently, it is expected that there is sufficient funding to cover all the potentially eligible islands in these two zones (as some islands in zone V are already supported to a limited extent under another Government of Maldives program – LCRED). The support will include investments to operationalize one of the two or three different possible models of integrated waste management systems depending on population, waste generator profile, land availability, and other relevant parameters.

Component 4: Project Management (US$ 2.00 million)

This component will finance equipment, technical assistance, training and incremental operating costs to strengthen the dedicated PMU established within the MEE. The PMU will assist the Government of Maldives in managing, monitoring, and evaluating project activities. Specifically, it will support staffing and operation of the PMU, establishment and operation of adequate fiduciary and safeguards management system, communication and outreach as well grievance redress. Headed by the Director General of Waste Management Department, the PMU will have the responsibility for ensuring that the Financial Management, Procurement,

and Safeguards management for the project preparation and implementation are in conformity with the legal agreements with the Bank. In addition, a communication specialist, and a monitoring and evaluation specialist will also be part of the PMU. A Civil Engineer will also be inducted into the PMU as and when appropriate. In addition, support staff including project coordinators, assistant procurement officer, and assistant financial management officer would also be drafted into the PMU as per need.

The project is expected to bring overall positive environmental and social benefits to the project areas through ensuring a sound system for solid waste management is established in the project regions. While the project activities themselves will facilitate in curtailing the major impacts associated with improper management of solid waste, there still remain the risks associated with the operation of solid waste management facilities and final disposal of solid waste that need to be managed accordingly. In addition, there is also the uncertainty regarding the exact locations of activities to be carried out under the project and project interventions that will involve physical alterations to the environment and land, such as those that fall within the activities of Components 2 and 3 which will be fueled by feasibility studies that will determine the nature of the investments.

Potential land requirements

Sub-Component 2a will support Activities in Zone II, which will include the following investment activities in Zone II for operationalization of the facilities created under MEMP at the RWMC in Vandhoo. Site specific Environmental and Social Assessments have already been completed for the RWMC facility at Vandhoo and has been cleared by IDA. Over the project period of the original project the key environmental and social impacts have been mitigated and well managed, thus the same safeguard instruments, which include the Environmental and Social Impact Assessment (ESIA) and Environment and Social Management Plan (ESMP) for the RWMC will be valid for the continuity of these projects. All environmental and social impacts identified during the implementation of MEMP have been well implemented and operational phase impacts are continuously monitored to ensure good compliance at the RWMC and at Island level.

Potentially the most serious impacts are likely to occur in the construction and operation of the RWMC under Sub-Component 2b. Based on past experience in the Maldives, it is not possible to build an RWMC on an inhabited island due to high population densities, coupled with community opposition. The only available alternative is to construct the RWMC on an uninhabited island or in islands with compatible land use such as Industrial Island. The nature, magnitude and scale of potential social impacts of the regional solid waste management component under Sub-Component 2b will only be known once the feasibility studies have been conducted under Sub-Component 3a and the technology for final disposal and site are known post the Best Practicable Environmental Option (BPEO) Study that will be conducted prior to the feasibility study and is inbuilt in to the project design.

The key impacts that can be envisioned at this stage will be the need for land for the establishment of the RWMC. In the context of the limited land availability due to the geographic setting of the Maldives, it is unlikely that there will be uninhabited islands with adequate land area to construct a regional solid waste landfill for waste disposal for a 20+year period. Reclamation of shallow lagoons surrounding islands is an option widely used for expanding the land area of islands. Considering the fragile ecosystems in the Maldives, this could result in loss of some areas of coral reef, with potentially irreversible impacts of the marine ecosystem. Considering the environmental damage and the cost incurred for reclamation, the project will not support this option. In order to minimize the adverse impacts on the coral reef system in an uninhabited island, site selection is critical and will be addressed in the BPEO study.

Component 3 - All parts of this component will support the development and completion of island level facilities for managing collection, segregation, on-site treatment of waste and storage of residual waste, until its eventual transfer to the RWMC. The candidate zones for the project are currently IV and V.

The sub-component will fund the preparation, feasibility and implementation of Island Waste Management Plans (IWMPs) and the establishment of Island Waste Management Centers (IWMCs) on inhabited islands. It is unlikely to cause any irreversible social impacts and will be subject to screening criteria in order to determine their reference to the SA processes. Approximately 130 IWMC's have been constructed across the Maldives under previous projects and none have progressed beyond an ESMP in terms of environmental and social assessment requirements. This is predominantly as the facilities often deal with less than 10 tons of waste per day. The interventions leading to the construction and expansion of IWMCs, however, could lead to future cases of involuntary loss of crop, land taking as a small percentage of communities rely on surrounding land for agriculture and livelihood. In order to mitigate the likelihood of this occurring, the following framework (RPF) has been prepared in line with the Bank's OP4.12 on Involuntary Resettlement.

Labor Requirements and Services

It is estimated that the total number of migrant labor during the construction stage will be at a minimum. 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 subprojects are unlikely to have any significant effect on the demand for services and resources. The Contractor is expected to provide workers with meals and appropriate entertainment facilities. The project would not be responsible for any of the services to be provided to the Contractor's staff or workers.

Principles and objectives of Resettlement Planning

This RPF is generic. The detailed social impacts of individual sub-components cannot be known until the subcomponents are 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 minimize dependency and be sustainable socially, economically and institutionally. Special attention must be paid to improvement of the living standards of any vulnerable or marginalized 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 itemized 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 nonphysical 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 dependents, 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 respective 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.

Screening and categorization of the project:

Screening of subprojects for assessing their potential impacts will be carried out during preparation using the Social Screening Format. Based on the screening data on the extent of likely impacts, the sub-project safeguard requirements will be categorized as follows:

A. Significant (Category A) – If, as a result of the subproject, about 200 or more people may experience major impacts, that is, being physically displaced from housing, or losing 10% or more of their productive (income-generating) assets;

B. Not significant (Category B) – If, as a result of the subproject, fewer than 200 people will be physically displaced from housing or lose less than 10% of their productive (income- generating) assets; Resettlement Plans are prepared commensurate to their impacts;

C. No resettlement effect (Category C) – If the subproject does not require temporary or permanent land acquisition, and there are no impacts involving the loss of land, structures, crops and trees, businesses or income; No resettlement plan is required. This category also includes temporary but not significant impacts which will have to be mitigated as part of construction management, in consultation with the affected, by the Contractor as specified in the entitlement matrix.

The screening and categorization of impacts on involuntary resettlement will be initiated by the project, either with its own environmental and social officers (ESOs) and other relevant staff or with the help of external consultants. The social screening report will be prepared by the ESOs, reviewed by the Sub-Project Manager and submitted to the PMU for clearance. The environmental and social coordinator (ESC) at the PMU will finally endorse the social screening and safeguard categorization of the proposed sub-project.

Any subproject causing significant resettlement impacts (Category A) will require a full scale SIA and will require preparation and implementation of a comprehensive RAP, whereas, abbreviated RAPs will be prepared for Category B sub-projects affecting less than 200 persons. If a sub-project has no adverse impact, a due diligence report (DDR) will be submitted confirming the same and also stating reasons for the same. Social DDRs, abbreviated and full RAPs will be shared with the WB for review and clearance prior to the award of civil works contracts. Both full and abbreviated RAPs shall ensure that compensation, rehabilitation, and relocation arrangements are planned and budgeted, meeting the agreed resettlement policy requirements. Once finalized, the RAP must be approved by a committee instituted for the Project at the MEE level. The following table summarizes the safeguards documentation required.

Type of Social Safeguard Documents required for the Project

Coverage of Negative Social Impacts	Type of Documents Required
For sub projects that will result in minor impacts affecting access to residences, improvement of existing properties	Due Diligence Report explaining the procedures adopted to minimize negative impacts and measures taken to mitigate construction induced impacts

For investments of sub projects that will result in affecting less than 200 people but not physically displaced and/or less than 10% of their productive assets are lost (WB – OP 4.12)	Abbreviated Resettlement Action Plan (ARAP)
Investment in sub projects that may result in more significant impacts, displacement of more than 200 people, and more than 10% of their productive assets are lost (WB – OP 4.12)	Resettlement Action Plan (RAP) Socio-economic Survey and income restoration measures to be covered by the Plan.

Social Impact Assessment (SIA)

Only new construction of IWMCs will require SIAs. In the case of improvements to existing IWMCs, an environmental and social management plan (ESMP) will be adequate. In carrying out an SIA, the project will need to 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 minimize 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 finalization 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 subproject 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 the affected;
(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 RAPs/ ARAPs.

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 structure, labor in agriculture fields; non-titleholders; etc.	Six months of income
Loss of community / public structure /	Community		Project to replace any structure / facility impacted by the project

facility			
Temporary Adverse Impacts of Civil Works (such as loss of access, damage to property or land, safety hazards, impact on mobility)	Household/ Businesses		Public notice at the site informing the people about: work schedule, likely temporary impacts, signage, safety advice and mitigation measures , contact details of officer in charge and GRM. Special measures to provide access for continuing trade/business The contractor shall bear the compensation cost of any impact on structure or land due to negligent movement of machinery during construction or establishment of construction plant, as per standard contract provision. All temporary use of lands outside the project area to be through written approval of the landowner and contractor. Steps to minimize and mitigate adverse impacts on human and vehicular mobility including through traffic diversions and management; phased construction strategy; avoiding work during peak hours. Measures as necessary to deal with any other emergent impacts.

Guide to cost estimation and funding

In order to implement the social management measures suggested above budgetary provisions will be made available, in terms of each sub projects. Budgetary estimates for sub project where resettlement implementation is necessary including resettlement management will be incorporated in to the cost estimates.

Accordingly, land acquisition and resettlement expenses for consultation and participation, grievances redressal, cost for relocation, Income restoration, transitional allowance, livelihood programme, monitoring and evaluation, administration, contingencies etc. will be included as cost estimates for social management.

Approval Process of Resettlement Plans

The approval process for the resettlement plans is briefly discussed with reference to the approvals at project level:

The RAPs and ARAPs may be prepared by the PMU or through the hiring of Consultants. Once finalized, the RAP must be approved by a committee instituted at the MEE level. Once approved, the RAPs/ARAPs will be submitted to the World Bank for review and final clearance.