January 2021

Updated Environment and Social Management Plan for Establishment of Island Waste and Resource Management Centre (IWRMC) in M. Mulah

PROPOSED BY: MINISTRY OF ENVIRONMENT

PREPARED BY: HAMDHOON MOHAMED (EIA P03/2017)

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Consultants Declaration

As the lead consultant of this ESMP,

This ESMP has been prepared according to the EIA Regulations. I hereby, declare that the content in this EIA is complete, true, and correct to the best information that I had while compiling this ESMP.

Name: Hamdhoon Mohamed (EIA P03/2017)

Executive Summary

This report discusses the findings of the Environmental and Social Assessment study undertaken by Environmental Consultant (Mr. Hamdhoon Mohamed) recruited by Ministry of Environment to establishment of Island Waste Management Centre (IWRMC) in M. Mulah. This report is prepared in accordance with Environmental Impact Assessment Regulation (2007) under the Environmental Protection and Preservation Act (1993) and the Amendments to the EIA regulation. The purpose of this ESMP report is to fulfill the requirements of the aforementioned law and regulation and conduct an assessment of possible impacts on the ecological, biophysical and socioeconomic environment arising from the proposed establishment of IWRMC in M. Mulah.

The main rationale of this project to provide a proper mean for disposal of solid waste accumulated in the dumpsites in M. Mulah . This project is expected to reduce the nuisance caused by smoke from open burning and reduce nuisance species such as house flies and rodents.

The proposed project will involve construction of IMWC in M. Mulah. Provision of the solid waste management equipment and establishment of fire safety equipment. An aerobic composting (Organic Waste Convertor (OWC) technology machine will be established in the IWRMC for producing compost from organic waste. This ESMP will also cover operational aspects of IWRMC including collection and transportation of the waste and other waste management practices such as reducing the volume of waste and composting.

Key Impacts

The project will involve impacts both during the construction and the operational phase of the project. The main project activities which may result in impacts during the construction phase include; Influx and settlement of workers for the project construction activities, transportation of materials, impacts from construction works, terrestrial pollution from construction waste generation and Impacts from resource use.

The main project activities during the operational phase which may have a significant impact on the environment include waste collection and transportation, waste management activities, waste generation - terrestrial pollution, groundwater contamination and resource consumption.

The major socioeconomic impact is found to be positive. The reduced volume of solid waste accumulated will have public health benefits for the residents of M. Mulah.

Mitigation Measure

An Environmental and Social Management Plan has been proposed with mitigation measures and estimated cost for implementing the proposed mitigation measures.

Alternate technology and power sources for IWRMC operation.

Alternative technologies for managing organic waste have been analyzed. The technologies compared include manual composting (windrow system), anaerobic digestion system (bio-gas generation) and aerobic OWC technology (in-vessel composting). From the analysis, the aerobic OWC technology was found to be most appropriate for the IWRMC in M. Mulah.

Furthermore, alternative power source for the operational phase of the IWRMC has been explored. The alternative options explored include installation of solar photovoltaic cells, installation of a stand-alone generator and utilization of existing electricity grid in the island to meet the power requirements of the IWRMC. Based on analysis the most feasible option to meet the power requirements of IWRMC was found to be utilization of existing electricity grid in the island.

Environmental Management and Monitoring

A monitoring regime of environmental and social safeguards has been proposed taking into consideration the impacts and mitigation measures to be implemented. The important elements that require checks such as implementation of mitigation measures, groundwater quality and spillage assessment at the project site will be monitored according to the developed monitoring program during construction and operation period.

Although the project involves inevitable negative environmental impacts, such impacts are not serving as to not undertake the project. Mitigation measures have been proposed to adequately minimize the significant impacts. Hence, the project is justifiable considering the socioeconomic conditions and anticipated benefits from the project which clearly outweigh the negative environmental impacts.

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ސާރާ ހުލާސާ

މ. މުލަކުގައި ކުނި މެނޭޖްކުރާ މަރުކަޒު އިމާރާތްކޮށް އަޕްގްރޭޑްކުރުމުގެ މަޝްރޫއަކީ ވޯލްޑް ބޭންކުގެ ހިލޭ އެހީގައި ކުރިއަށް ގެންދާ މޯލްޑިވްސް ކްލީން އެންވަޔަރަންމަންޓް ޕްރޮޖެކްޓް (އެމް.ސީ.އީ.ޕީ) ގެ ހަރަދުގައި ކުރިއަށް ގެންދާ މަޝްރޫއެކެވެ. މި މަޝްރޫއުގެ މައިގަނޑު މަޤްސަދަކީ ފެނާއި ބިމާ ގުޅޭ ކުނި ތަރުތީބުކުރުމުގައި ގެންދަން ވަސީލަތްތަކާއި، ފެނާއި ބިމާ ގުޅޭ ކުނި ބެލެހެއްޓުމުގެ ކަރުދާހުގައި ހިމެނޭ ބޭނުންތަކާއި މަދު ފަރާތްތަކާއި، ކުނި ނައްތާލުމުގެ މަސައްކަތަށް ހަރުދަނާ ޚިދުމަތްތަކެއް ދޭން ޖަގަހަ ހޯދުމުގައި ސަރުކާރާއި ވަސީލަތްތަކާއި ގޮތަށް ލިބިގެންވާ ބިންތަކެއް، މިފަދަ ހިދުމަތްތަކުން އަދި ދުރުގެ ސަރަހައްދުން ކަރަހީ ބޭނުންކުރުމުގެ ފުރުސަތު އަސާސީ ކޮށްދިނުމެވެ.

މ.މުލަކުގައި ކުނިމެނޭޖްކުރުމުގެ އުސޫލަކީ ނިޔާމުގެ ގޮތުން ގޮވާލެވިފައި ނުވާއެވެ. މިހާރު ކުނި އަޅުއްގަނޑުމެން އުކަމުން ކަނޑުއަޅިގަތުމާ ދި ސަރަހައްދުގައި ނަމަވެސް ކުނި ބިމުގައި ހަރާމަން އެއްލާލެވޭ ހުރަހެއް ނެތި ބައެއް ސަރުކާރު ފަރާތްތަކުން، ފުނާއި އެއްލުމަށް ކުނި ފޮނުވާ ސެނިޓަރީ ލޭންޑްފިލް ސަރަހައްދެއް ވަރަށް ބޮޑު ވަޒަނެއްގައި ފެނިދާނެއެވެ. ކަނޑު ދިއްޖެހެން ކުރުމުގައި ނިސްބަތުން ކުދިކުދި ތަނުގައި ލަފާކުރެވޭ ނުރައްކާތެރި ކުނިތައް ގިނަ ކުނި ބެހެއްޓުމުގެ ސަރަހައްދުން ހުރަހެއްވެސް ނުވަތަ ހަވާލުވާ ކަމެއް ކުރިމަތިވެފައިވާނެއެވެ.

މިމަޝްރޫއުގެ ސަރަހައްދަކީ މުލަކުގައި ކުނި މެނޭޖްކުރަން މިހާރު ދިރާސާކުރާ ދިމާލެއް އެކަނިވީ ސަރަހައްދު ބިމެއްގެ ހިސާބުގައި ބަލައިގަނެވިފައެވެ.

މިގޮތުން މިމަޝްރޫއުގެ ބޮޑުބައި، މަސައްކަތް ދަނޑު ހަރަކާތްތަކާ ކުނި ގޮތުގެ ހޯދާ ތަކެތި ނެގުމާއި، ލާފާތީ ޔޫޓިލިޓީ އަދި ތަކަތި ފެނަ ބިމަށް ޕެކްޓް ތައްތަކީ، އޮޑަރު ކުރުމުގެ ކަމަށް ބެލޭ ބުނެވިފައިވާ ހިސާބު ހަރާދިއްޗާއި، ވަރަށް ގާތްގަނޑަކަށް ޓަކައި ހަވާލުކުރުމާއި ކުނި ބޭނުން ބިމުގައި ކާރު ހުރުމަށް ތަޢާރުފުކޮށްދޭ މިހާރު އެރީ ޓަކާ ޖަހައިހުދާ ސަރުކާރު ހުއްދަ ހޯދަމުން ގާތް މަރަކިހި ފެނުމެވެ.

ކުނި ކޮރެ އެޅުއްގަނޑު ހަމަޖެހިލާއި ހަކަތަ ސަރަހައްދު އަކީ އެއް ސަރަހައްދުގައި ކުނި ކަރަހީ 65 ކުއްޔަކަށް ހުރުމުގެ ބިންތައް ތަރަހަކަށް ގުޅިގެން ފޯރުކޮށްދެވެއެވެ. އަދި މިގޮތުން ފެހިކަން ބޭނުންތަކަށް 5 ގަސް ހުރުމުގެ ބިންތައް ހަމަ ދަތުރުކޮށްގެންނެވެ. މިދަންނަވާ ގޮތައް އަދި ގަސްތަށް ކުނީގެ ކުލަ އަދި ގަސްތައްގެ މިންވަރު ފެށުނުއިރު ބޮޑު ދިޔަ ތަކެތި ބެލޭގޮތުން ކުލަ އަދި ގަސްތަށް އެހެން ސަރަހައްދު ތަކަށް ބޮޑު ކުރުމަށް އިސްކަންދޭނެއެވެ.

މ. މުލަކުގެ މިމެނޭޖްމަންޓް ޕްލޭންގައި އެއްގޮތަށް މަސައްކަތްތަކާއި ރާވައިގެން ކުރިއަށް ގެންދާނަމަ، އިމާރާތްކުރާ ތަނުގެ ތަރަހު އެތެރެކުރާއިރު އެތަކެއް ވެއްޓިވަރުން ގުޅިގެންގުޅޭ ބަދަލުތަކެއް ގެނެސްދީ ހުރިހާ ކަނޑައެޅުމަކާ ފުރަޕާސް ނުރައްކާ އަސަރުކުރާ ވަރަށް ބޮޑު ކުރުވިފައިވާނެއެވެ. އަދި މެނޭޖްމަންޓް ޕްލޭނުގައި ފާހަގަކުރާ ގޮތަށް ސަރުކާރު ގޮވާލުން ފައިސާ ޓެކްސްގެ ހަރަކާތް ގެނެސް އަސަރުކުރާ ބަދަލު އަދި ހުރަސް ކުރާ ބެލުން ބޮޑުތަކެއް ހިމަނައެއްގެ، އިމާރާތްކުރާ ހުރިހާ މަރުހަލާގަ ނުކުރާ، އިމާރާތްކުރުމުގެ ޕްރޮޖެކްޓްގައި ހަމަޖެހުނު ޕްރޮފެސަރ ނުރައްކާ އަސަރުކުރާ ވަރަށް ބޮޑު ކުރުވިފައިވާނެއެވެ.

މިމަޝްރޫއުގެ ދަށުން މުލަކުގައި ދާއިމީ ބިނާކުރުމުގެ ގޮތެއްގައި ކުނި މެނޭޖްކުރުމަށް ބޭނުންވާ ވަސީލަތް ގާއިމުކުރެވޭނެއެވެ. މިމަޝްރޫއު ދަށުން ގާއިމުކުރާ ކުނި މެނޭޖްކުރާ މަރުކަޒުގެ އަދަދާ މަސައްކަތް ނިމުމުން ކުނި މެނޭޖްކުރުމުގެ ހިދުމަތް ފޯރުކޮށްދިނުމުގެ މަސައްކަތް ކުރިއަށް ގެންދެވޭނެ ގޮތް މުލަކުގައި ހެދިފައިވާ ތަން ފެންވަރުގައި ކުނިމެނޭޖްކުރާ ބޭނުން ފޯރުކޮށްދޭ އިއުލާނުކުރި މިހާރުވެސް ހަމަޖެހިފައިވާ އުސޫލުން ހަރު ކަމަށްވާ ގޮތަށް ހަމަޖެހިފައިވާނެއެވެ.

މިމަޝްރޫޢުގެ ސަބަބުން ތިމާވެއްޓަށް އަސަރުކޮށްފާނެ މިންވަރު ދިރާސާކުރުމަށް ބޭނުންކުރެވިފައިވަނީ ލިޓްރޭޗަރ ރިވިއުކޮށް ސައިޓް ވިޒިޓް ކުރަމުން ކޮމިއުނިޓީގެ ގޮތަށެވެ. މިގޮތުން މިމަޝްރޫޢުގެ ސަބަބުން ޖެހިދާނެ ނަތީޖާ އިޤްތިސާދީ މާލީ ސިއްޙީ ގޮތް ވަކިވަކިން ފައިދާތައް ބަލައި ދިރާސާކުރެވިފައިވާ ގޮތުގައެވެ. މިގޮތުގައި ގޮތުން އިއާދަކުރެވޭ ޓެކްނިކަލް ފައިދާތަކާއި އިޖުތިމާޢީ ސަބަބުން ލިބިދާނެ ފައިދާ ތަފާތުގޮތްތަކަށް ބަލާލެވިފައެވެ.

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CHAPTER 1: INTRODUCTION

The Ministry of Environment has proposed a project to establish an Island Waste Management Centre (IWRMC) in M. Mulah as a part of the World Bank Funded Maldives Clean Environment Project (MCEP). An Environmental and Social Management Plan (ESMP) for the establishment of IMWC in M. Mulah was elaborated by EIA consultant Mr. Ahmed Saleem in July 2018. This ESMP report will built on the aforementioned ESMP. The main rationale for elaboration of the updated ESMP is to consider the proposed changes to an aerobic technology using composting machine, while manual compositing was covered in the initial ESMP.

1.1 Aims and Objectives of the project

The project is aimed to establish an IWRMC with aerobic technology using composting machine. In this regard the main objectives of the project are;

- Establish an IWRMC in M. Mulah with aerobic technology using composting machines;
- Improve the solid waste management practices in M. Mulah ;
- Provide a safe disposal means for the hazardous waste generated in the island;
- Produce compost to cater local farming needs.

1.2 Current situation in solid waste management and project rationale

The majority of waste sources in M. Mulah are households. Small scale boat building, production of dried fish, and operation of an ice plant were to be the notable commercial activities observed on the island. As far as institutions are concerned, typical institutions that are commonly found in an average island were found. These include school, Health Centre, Secretariat of Island Council and magistrate court. Agriculture is not practiced at a large scale, although the council is now in the process of allocating additional land for agricultural purposes. Therefore, in the future, increased waste input from agriculture may be expected.

The waste management at Mulah Island seemed to be in a very poor state. Construction work of an IWRMC by Canadian Red Crescent started in 2006 but the project was found to be incomplete. Although the island has an approved IWMP, due to resource constraints and limited capacity, the plan was never implemented. The island's waste management regulations have also been formulated and gazetted. Regulatory enforcements required for safe and sound waste management seemed to be completely lacking. Waste generated on the island is dumped in the open at a sensitive location. Waste separation was not practiced to any extent and hence waste was dumped as mixed waste. Pollution of the beach in various parts of the island was apparent. Open burning and burying of waste in the ground was practiced as means to reducing the volume of waste accumulated. As observed in many other islands in the Maldives, kitchen waste was dumped into the lagoon, in some cases along with their containers such as cans or plastic. Waste piles were observed on either side of the island's harbour. The harbour area seem to be the main location where the island's waste is mostly dumped. The following **Table 1** enlist the current situation of solid waste management in M. Mulah and **Figure 1** illustrates the main waste dumping areas in M. Mulah.

Table 1: Current situation of solid waste management in M. Mulah

Facilities/Practices	Current Situation/Practices
Waste transportation	No waste collection systems or services provided in the island.
Harbor (accessibility)	Determined to be accessible.
Vehicles for waste transportation	No vehicles for waste transport
Waste management equipment	No waste management equipment available
Dump site demarcated	Two Dump Sites. Dump sites are not demarcated
Separation of waste at dumpsite	Waste is not separated
Burning of waste	Mixed waste is burnt regularly
Burying of waste	Waste is buried to reduce volume
Dumping waste into the beach/sea	Kitchen waste is dumped into the lagoon along with their containers such as cans or plastic
Presence of large waste piles	Both dumpsites contain piles of waste mainly consisting of burnt residue, construction waste and mixed waste.
Pollution of inland/other areas	Terrestrial pollution of inland areas is controlled
Clinical waste management	Clinical waste is managed at the Health Centre
Public area waste collection	Council contracts Women's Committee to clean and collect waste from public areas, sometime locals take the initiative and clean themselves.
Presence of waste bins	No
Presence of workers	No
Electric connection at the dumpsite	No electric connection at the dumpsite

Figure 1: Areas where waste is currently disposed at M. Mulah (adapted from Saleem 2018)

M. Mulah has formulated an IWMP on December 2016 for the period of 2017 – 2021, which has been approved by the EPA. The plan includes main principles that need to be taken into account in establishing and implementing a suitable strategy for waste management; most notably, sustainable development, proximity and self-sufficiency, precautionary principle, polluter pays principle, waste hierarchy, best practicable environmental option (BPEO), and producer responsibility. More details of IWMP will be provided in the existing environment section of this report.

1.3 Project Proponent

The project proponent is Ministry of Environment. The Ministry of Environment is the implementing agency of the Maldives Clean Environment Project (MCEP) which is funded by the World Bank and will be funding the establishment of the IWRMC in M. Mulah . The following are the details of the proponent;

Ministry of Environment

Ameenee Magu, Maafannu, Male' 20392

Republic of Maldives

1.4 Desk Study Reviews

A literature review was conducted to acquire background information related to the site and the general environment of the island, as well as to identify possible environmental impacts of projects of similar settings. In this context, the following documents were reviewed:

- Environment and Social Management Plan (ESMP) for establishment of Island Waste Management Centre in Th. Thimarafushi (Saleem 2018).
- Environment and Social Management Plan (ESMP) for the upgrading of Island Waste Management Centre in N. Holhudhoo (Zuhair 2019).
- Environment and Social Management Plan (ESMP) for establishment of Island Waste Management Centre in Th. Kibidhoo (Saleem 2018)
- Environment and Social Management Plan (ESMP) for establishment of Island Waste Management Centre in Th. Omadhoo (Saleem 2018)
- Environment and Social Management Plan (ESMP) for establishment of Island Waste Management Centre in M. Mulah (Saleem 2018)
- Maldives Clean Environment Project Environmental and Social Assessment and Management Framework (ESAMF) & Resettlement Policy Framework (RPF) (Ministry of Environment [ME] 2016).

1.5 Report Preparation, Acknowledgements and Author Credits

This report is an update of the Environment and Social Management Plan (ESMP) for establishment of Island Waste Management Centre in M. Mulah prepared by Maldives Energy and Environment Company (MEECO) and authored by Environmental Consultant Mr. Ahmed Saleem. The author of this report gives due credit to the author of the initial ESMP.

The author would like to acknowledge the assistance and support received from the following people in organizing and undertaking field surveys and stakeholder consultations.

- Mr. Mareer Mohamed Husny (Fieldwork and Stakeholder Consultation Coordinator)
- Mr. Ahmed Hassaan Zuhair (Environment and Social Safeguards Specialist, MCEP)
- Mr. Eyman Ismail (Assistant Project Coordinator, MCEP)
- Mr. Mohamed Majid (Waste Management Focal Point/Administrative Officer, M. Mulah Island Council)

CHAPTER TWO: LEGISLATIVE AND REGULATORY CONSIDERATION

This Chapter of the ESMP will describe various legislation and regulation which are applicable to the proposed establishment of IWRMC in M. Mulah. This chapter will consider the national requirements and requirements of World Bank Environmental and Social Safeguards.

2.1 National Legal and Regulatory Framework

The main legislation which is applicable to the proposed project is Environmental Protection and Preservation Act (Act no. 4/93). The most applicable regulations are Environmental Impact Assessment (EIA) Regulation (2012). The EIA regulation (2012) sets out the Environmental Assessment requirements at a national level. Part III of this regulation includes a description of the Screening Process applied to development proposals. Schedule D of the Regulations provides a screening list of all development types for which full EIA is mandatory. According to Schedule D included in Amendment 2 to the EIA regulations 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 Environmental Protection Agency (EPA), for which a Screening Form must be submitted providing relevant development details. Within 10 days, the EPA will decide whether the proposed development is approved, or needs further study, which may be required in the form of an EIA or Environmental Management Plan (EMP) (Ministry of Environment [ME], 2012). The proposed project is small scale and therefore is not listed under the Schedule D of the EIA Regulation. A screening process was followed and the screening decision from EPA was to prepare an EMP for the project and to submit for review and approval.

2.2 World Bank Environmental and Social Safeguards Requirements

MCEP is categorized under Environmental Category A as per the World Bank safeguards categorization process.

Therefore, following safeguard policies are applicable to the MCEP

1. OP 4.01 – Environmental Assessment to ensure any environmental impact associated with project activities are identified in time and mitigated.

2. OP 4.04 – Natural Habitats is 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 Solid Waste Management.

3. OP 4.12 - The interventions leading to the construction and expansion of IWRMCs could lead to future in case finds of involuntary loss of crop and / or land taking as a small percentage of communities rely on surrounding land for agriculture and livelihood thus proper due diligence measures to tackle any in case finds have to be inbuilt into project screening.

MCEP being a Category A project an Environmental and Social Assessment and Management Framework (ESMF) was formulated. It is mentioned in the ESMF of MCEP that prior to the approval of disbursement of funds for project sub-components, International Development Association (IDA) will have to clear all safeguards documentation. Therefore, although an EMP is required as per the local regulation, an Environmental and Social Management Plan (ESMP) will be developed for the proposed project and simultaneously submitted to the World Bank for approval. This document is prepared consistent to the ESAMF.

A separate land selection process was not followed for this project since the project is undertaken in an site that has also been reflected in the LUP approved by Ministry of National Planning, Housing and Infrastructure (MNPHI).

2.3 Other relevant legislations, regulations, policies, and guidelines

The following **Table 2** enlist other relevant legislations, regulations, policies and guidelines relevant to the proposed establishment of IWRMC in M. Mulah .

Table 2: Relevant laws, regulations, policies and guidelines and their applicability to the project

#	Relevant laws, regulations, policies and guidelines	Requirements	Applicability to the project
Legislations			
1	The Land Act (1/2002)	National	All transactions concerning the issuing, receiving, owning, selling, lease, utilizing and using Maldivian land shall be conducted in compliance with this Act.
2	Law on Cultural and Historical Places and Objects of the Maldives (27/79)	National	Requires proponents to develop provisions for managing chance finds through 'a chance find procedure' which will be applied in the event that cultural heritage is subsequently discovered. The client shall not disturb any chance find further until an assessment by competent professionals is made.
3	Employment Act (02/08)	National	• Worker shall not be forced to work for more than 48 hours per week. • Workers shall not be made to work for more than 6 days a week consecutively without providing 24 hours for rest. • Workers shall not be made to work continuously for more than 5 hours without providing a break for at least 30 minutes.

			• Salary should be paid to all permanent contract workers once a month. • Minimum 03 meals shall be provided to construction staff per day or appropriate meal break time shall be provided.
4	Immigration Act (01/07)	National	All expatriate workers must have proper work visas and work permit cards.
5	Utility Regulation Authority Act (2020)	National	The regulatory works for waste management has been transferred to newly established Utility Regulation Authority (URA).
Regulations			
6	Waste Management Regulation (R-58/2013).	National	The regulation reflects the following: - Sets standards for waste collection, transfer, treatment, storage, waste site management, landfills and managing hazardous waste. - Defines approval procedures for waste sites and waste transfer. - Standards and permits required for waste transport on land and sea, including transboundary movements. - Defines reporting and monitoring requirements and procedures. - Defines procedures to implement WMR and penalties for non-compliance. • The IWRMC was designed conforming to the provisions of Waste Management Regulation.
7	Land Use Planning Regulations and Guidelines (2005)	National	• The Land Use Plan (LUP) of M. Mulah has demarcated an area for IWRMC. • The LUP of islands are reviewed by MNPHI in consultation with MLSA and EPA. The LUP of M. Mulah is approved by MNPHI. • Although the IWRMC is located at a close proximity to some residential houses, MNPHI has given consent to the land use

			given the scarcity of land and unavailability of an alternative location.
7	Coral mining regulation	National	Coral mining from house reef and atoll rim is banned.
8	Sand mining regulation	National	Sand should not be mined from any part of an inhabited island, beach or the newly reclaimed island beach. Sand should also not be mined from within 100 ft. of the shoreline
Policies			
9	National Waste Management Policy 2015	National	The establishment of an IWRMC is prerequisite to facilitate waste management at island level.
10	National Policy on Health Care Waste Management	National	• Stipulates that all health facilities have to be responsible for the safe management of health carewaste in an environmentally sound manner that minimizes risk to the community and the staff involved in its management. • The IWRMC should not accept healthcare waste as it has to be managed separate from the general waste directly at the health center.
11	World Bank Performance Standard 8 – Cultural Heritage (2012)	World Bank	Requires burrower's to develop provisions for managing chance finds through 'a chance find procedure' which will be applied in the event that cultural heritage is subsequently discovered. The client shall not disturb any chance find further until an assessment by competent professionals is made.
Guidelines			
12	World Bank Group Environmental Health and Safety Guidelines for SWM Facilities	World Bank	Sets procedures to reduce the risk of accidents and injuries, minimize dust and air quality related impacts, reduce the probability spillage of oil and hazardous substances and leachate on site due to stormwater runoff during operations of waste management facilities.

13	Environmental Guidelines for Site Selection of Waste Management Centers (2017)	National	• Provides recommendation for optimum zoning of IWRMC sites. • Although the IWRMC is located at a close proximity to some residential houses, MNPHI in consultation with EPA has given consent to the land use given the scarcity of land and unavailability of an alternative location.

CHAPTER THREE: STUDY AREA

3.1 The Project Setting

Mulah is one of the inhabited islands of Mulaku atoll located 02°56'50"N and 73°35'05"E the island covers an area of approximately 68.2 ha. Mulah measures approximately 1.32 km in length and 0.49 in width. The nearest inhabited island is Veyvah located northeast to Mulah. Maalhaveli being the nearest uninhabited island the nearest resort is Medhufushi Island Resort Hotel in the island of Medhufushi. There is no airport in Mulaku atoll hence the closest airport to Mulah is in Dhaalu atoll Kudahuvadhoo which is approximately 80 km from Mulah. The **Figure 2** show the location of M. Mulah in Meemu atoll.

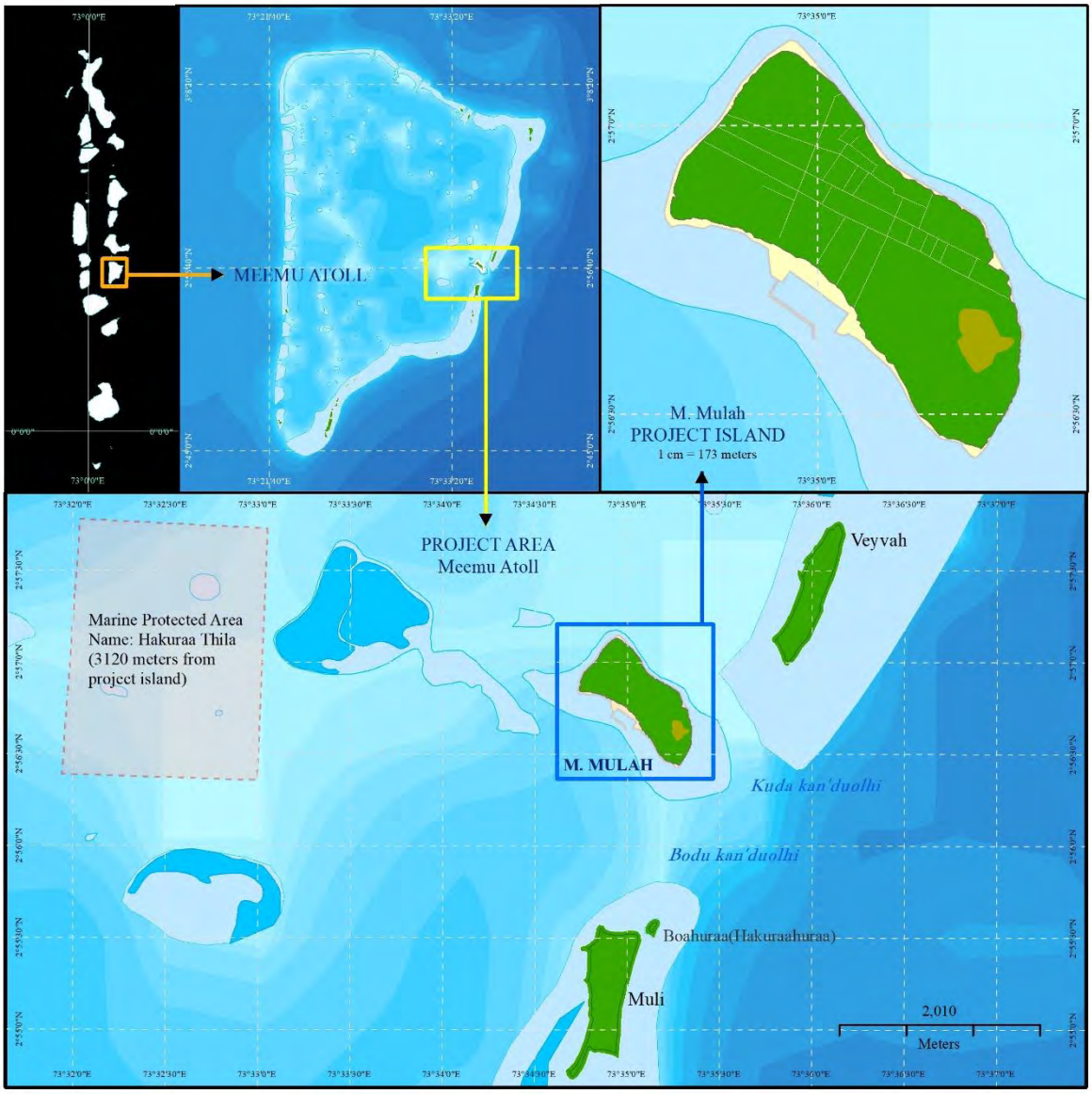


Figure 2: Location of M. Mulah (adapted from Saleem 2018)

3.2 Site Location

The proposed Island Waste Management Centre (IWRMC) is located in the southern end of the island at 2°56'29.5"N, 73° 35'14.6"E. The site requires vegetation clearance and there is no cleared road giving access to the plot. Plot vegetation includes *Terminalia cattapa* (Midhili), *Psidium guajava* (feyru), *Cocos nucifera* (Dhivehi ruh), *Hibiscus tiliaceus* (Dhigga) and some undergrowth. It is estimated that 65 coconut palms and 5 other trees will require removal from the site. The **Figure 3** show the location of IWRMC in M. Mulah.

Clearance of vegetation for the access road does not fall under the contractor's scope of works, therefore the Island Council is responsible for clearing the access road. There are 107 coconut palms and 6 other trees on the proposed access road. An A3 sized map of the site location is included in the **Annex 02** of this report.

In order to reserve area for future expansion, Ministry of Environment requested for an additional land of 400 m^3 which has been approved by the M. Mulah council on 17th August 2020 and the letter of approval has been attached to the **Annex 5** of this report.

Figure 3: Location of the IWRMC in M. Mulah

CHAPTER FOUR: PROJECT DESCRIPTION

4.1 Project Components

The proposed establishment of the IWRMC in M. Mulah involves the following components. Detailed information of each of the project component will be described in the chapter. The main components of the project are;

- General construction
- Aerobic System (Composting Machine) for composting
- Health and Fire Safety Measures
- Management of construction waste and waste oil
- Operation of IWRMC

4.1.1 General Construction

The development of the IWRMC consists initially of site selection, site approval, mobilization, site clearing followed by site construction. The works include shallow excavation, substructure and superstructure works as well as masonry works. The proposed design of the IWRMC requires a shallow foundation due to the structure being a single storey structure. After the structural works are done, masonry, plastering, roofing works are completed prior to the addition of the services components such as electricity and plumbing.

The proposed IWRMC is made up of an equipment room, and separate areas to store metal waste, paper and cardboard, plastic waste, glass waste, reusables as well as hazardous waste. Staff quarters as well as an office is included in the IWRMC. A mechanical compositing area will be constructed which will contain the aerobic system (compositing machine). The **Figure 4** is site plan for the proposed IWRMC in M. Mulah. An A3 sized map of the site plan is attached to the **Annex 01** of this report.

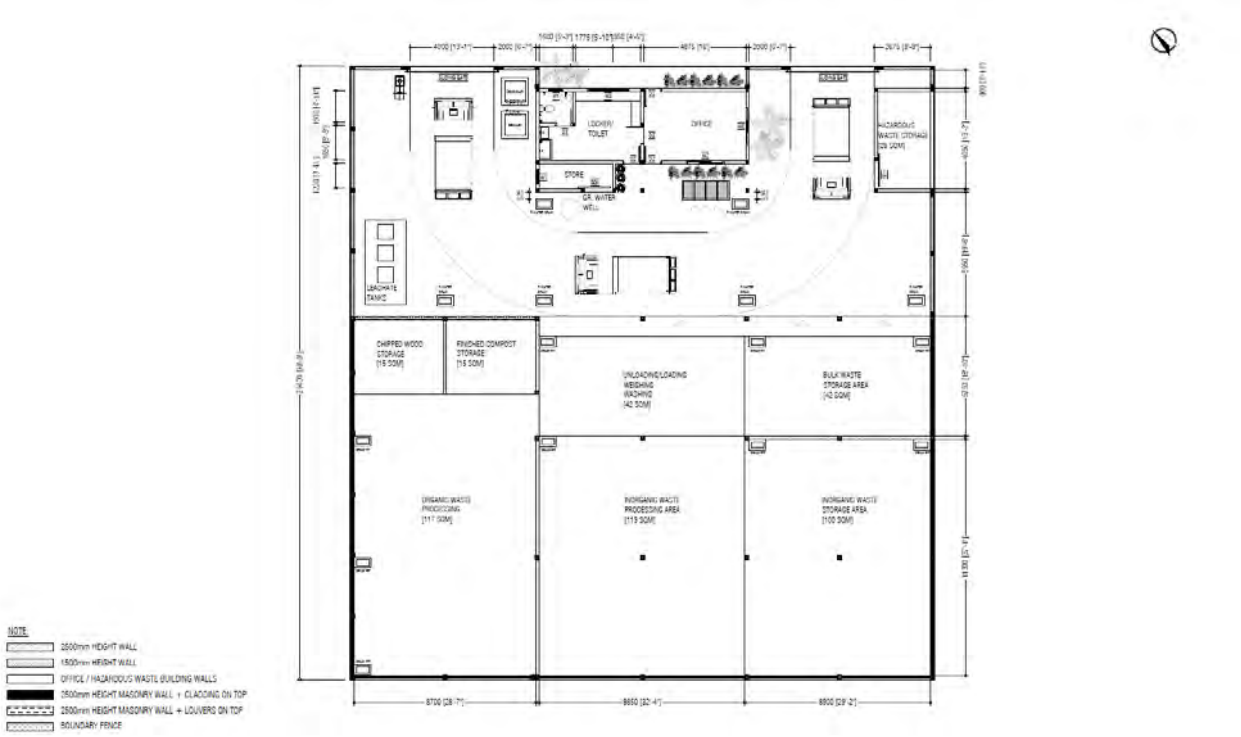


Figure 4: Site Plan for IWRMC in M. Mulah

4.1.1.1 Machinery

The following plants and equipment will be mobilized specifically for the project during construction phase.

- Truck for transportation of materials;
- Vibratory plate compactor;
- Concrete mixer;
- Concrete supply pump and piping; and
- Daily 4” pump.

4.1.1.2 Site Mobilization

As the amount of input materials are relatively minor, the construction materials shall be stored inside the demarcated site throughout the construction period. The workers if sourced from outside the island can be accommodated in the existing houses with a small rent. This is expected to eliminate the need for putting up a labour quarter and can be cost effective.

4.1.1.3 Demarcation and Site Clearance

Prior to beginning construction works, a survey shall be done by the contractor to demarcate the limits of the site, determine exact number of trees intersecting with the plot. The site shall be fenced off and work shall be conducted within these limits.

The site in the project island requires removal of vegetation and palm trees. This Section highlights the site conditions of proposed location in the island. Results include actual survey data.

Before the site clearance activities begin a professional surveyor will need to be engaged mark the boundaries using pegs. These control points will guide the construction crew during the entire process of site clearance. The survey will include a tree survey which will list all tree species within the footprint of the project, including the type, height, diameter and the estimated age. Following the set out survey all trees will be marked as per its final use using a letter code; ***RI (number) – relocation within the project island***, ***RO (number) – relocation outside the project island, T(number)*** – ***timber*** **and** ***W(number) – waste***. Hence trees needing removal can fall into any of these four categories. Abbreviation shall be used to code for the location and batch, as well which would make tracking and distribution easier. The final outcome of the set out survey will be a detailed inventory of all trees (not including shrubs, herbs and vines) requiring removal appropriately labelled.

At the time of the field survey; the proposed site contained *cocos nucifera* (Dhivehi ruh) and some other trees. It is estimated that 65 coconut palms and 5 other types of trees will require removal from the site.

Uprooting Trees

All trees within the site will require removal using hydraulic excavators by direct pulling. The excavator will have a lock-out mechanism fitted to the hydraulics so that the boom does not drop if a hose bursts. During the felling process, the excavator will be directly behind the tree. This is the position from which it can apply the most leverage. The excavator should contact the tree with either the bucket or live heel. Holding the tree with the grapple is not considered the best practice. The grapple can knock bark down on to the faller and even the smallest boom movement will alter the forces on the tree. Stump pullers may also be attached for removing dead stumps. In areas where undergrowth is found, the process of removing larger trees will begin by clearing undergrowth using machete or chainsaw which will be necessary for making tree access and creating work space also for enhancing visibility of the tree crown and removing obstructions in the landing zone. All the private trees that have been marked shall be compensated prior to removal.

An alternative method for removal of the trees will be manual removal of trees. This method will be employed where removal using hydraulic excavators by directing pulling is not possible.

Site clearance will be conducted responsibly aimed at removing only targeted trees that are pre-labelled and identified. Work will be done under strict supervision and clear record keeping by the site supervisor. Work can progress in multiple sections simultaneously depending on availability of workers, supervisors and equipment. Within a given section, trees removed for timber will be uprooted using excavator arm, the trees will be pushed from the mid-section until the root bulb detaches from the ground and falls down. The uprooted trees will be set aside until all the trees in the surveyed section has been removed.

i) <u>Trees for relocation</u>

Trees identified for re-location shall be removed with extreme care as palms are not very tolerant of extreme root disturbances. According to literature, for palms less than fifteen feet in height, a root ball of shovel-width radius from the trunk is a common industry average for size of root ball that needs to be carefully extracted. This would provide for adequate root survival chance once the tree is replanted elsewhere (Broschat & Meerow, 1997).

Soils that cling to the root ball are the most amenable to mechanized harvest. Prior to digging, the soil around the root system will be thoroughly wetted to help keep the root ball together. Palms grown on sandy soils will usually need to have their root balls burlapped after digging, while palms grown on soils with greater structural integrity may not require burlapping. Excess sand shall be removed prior to burlapping. However, since trees will be stacked for some time before being transported to replanting site, it is recommended to burlap all palm trees removed for relocation. A supporting splint will be required to tie each trunk and this will extend up to the foliage to protect the bud.

The greatest loss of water in newly dug palms occurs from transpiration through the leaves. To minimize this, one half or more of the older leaves will be removed at the time of digging. The remaining leaves will be tied together in a bundle around the bud with a twine.

Once the palm tree is carefully extracted it will be transported and stacked at the harbour area, where it will be transported out of the island by concerned parties. The root ball cavity will be filled and levelled. Sand shall be used as a fill material for the root cavities before levelling. (See **Figure 6** for an illustration of uprooting method). The **Figure 5** indicates the location to which the uprooted trees will be relocated according to the consultation with the island council.

Figure 5: The location for relocation of the uprooted trees from the project site

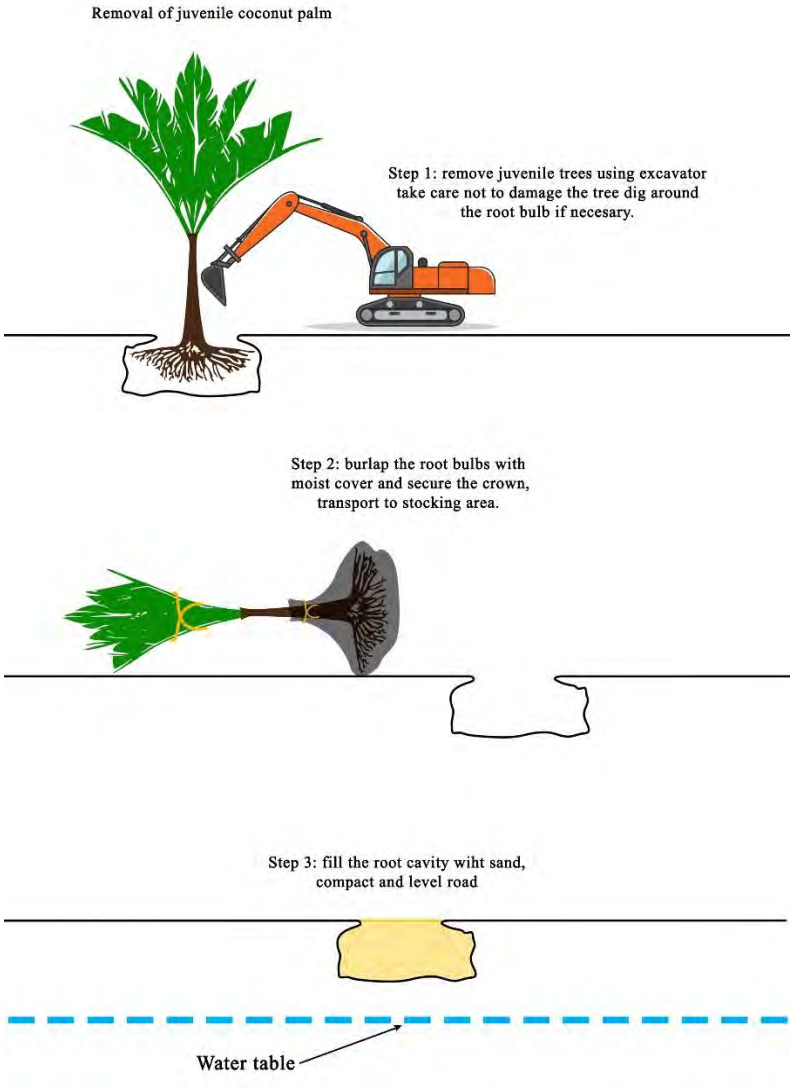


Figure 6: Illustration of uprooting palm trees for re-plantation (adapted from Saleem 2018)

If the water table is reached during removal of trees, sand shall be used to cover up before adding organic material. Trees removed for relocation out of the island shall be stored at the designated areas illustrated in **Figure 8**.

ii) Trees for timber

All fronds and root bulb and base of the trunk of the tree that is felled for timber or firewood shall be cut using a chainsaw and only trunk will be transported to the stockpiling area to be sold. Parts of the root bulb will be used for backfilling of the depression created (See **Figure 7** for illustration of removal method). The use of root bulbs for backfilling or grinding the stump of the root bulb will minimise waste generated during site clearance, maintain original

soil conditions as well as minimise additional sand needed for filling. All fronds and nuts will be removed from the terminal bulb and piled up separately. Nuts will be sold and fronds will be left to dry and eventually burned. All residual waste shall be disposed of as described in **Section 0**.

Similarly, all the undergrowth and other trees will be removed and depending on the size of the tree, excavator or chainsaw shall be used. Branches of shrubs and other types of trees will be cut to manageable pieces to be stockpiled for firewood and smaller branches and leaves will be left for sun drying after which they will be burnt.

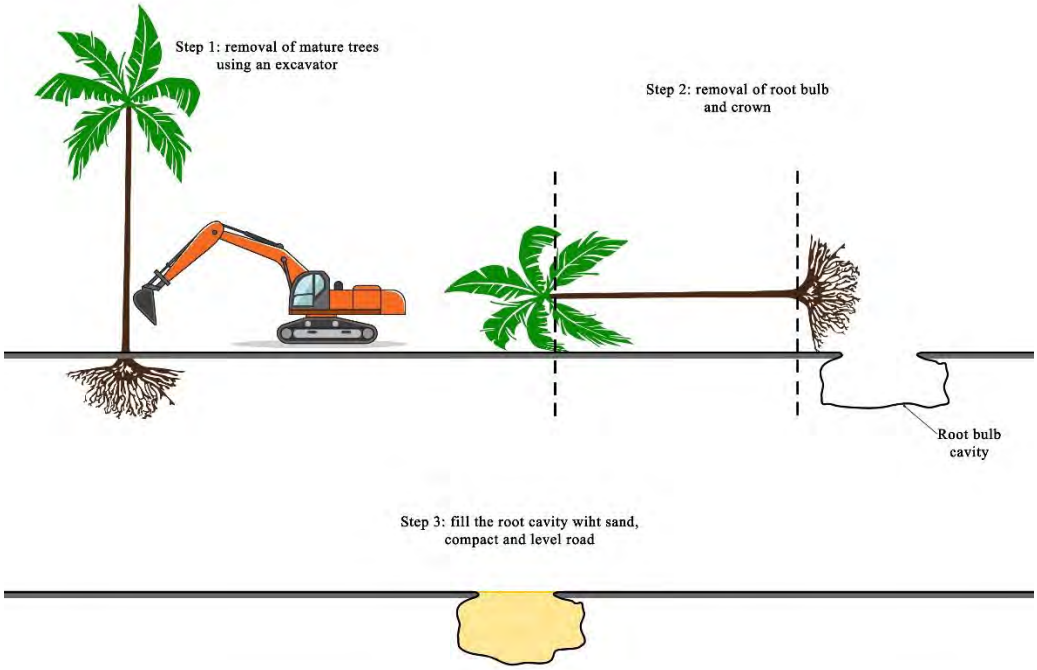


Figure 7: Illustration of removal of trees for timber (adapted from Saleem 2018)

Number of trees intersecting with the proposed and approved IWRMC plot based on the vegetation survey undertaken for the ESMP are summarized in **Table 3.**

Table 3: Summary of trees intersecting with proposed plot for IWRMC

Type of Vegetation	Estimated Quantity
Juvenile medium coconut palms	25
Juvenile small coconut palms	8
Mature Coconut Palms	32
Other Trees	5

4.1.1.4 General construction works

All construction works will follow the Annex 5 (page 89 to 115) of the ESMF Guidelines for IWRMC Establishment.

4.1.1.5 Foundation

The foundation for the proposed IWRMC consists of 300mm wide foundation beams. 300x300mm footings are proposed for the collection bay, in addition to the 450x450mm footings for the lamp post.

Excavation: Excavation will be undertaken to the required width, depths and dimensions of footings shown on the Drawings. Excavations will be done manually to receive the ground beams as per the drawings indicate. The foundation level will be defined as the level at the underside of the concrete. The base of the excavation will 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 will be backfilled and re-compacted. Surplus excavated material will be used in the construction of embankments or spoiled as directed by the project officer. The excavation will be kept free of water.

The deepest excavation expected from foundation works include the 700 mm excavation to receive the light post foundation.

Concreting Materials: Cement used will be Ordinary Portland Cement. All cement will be transported in watertight containers and will be protected from moisture until used. Caked or lumpy cement will not be used.

4.1.1.6 Construction of Leachate Tank

The leachate collection tank is located at the end of the compost slab. The leachate tank has an area of 2 m by 4 m and a depth of 1 m extending below ground. Excavation of the leachate tank area will be done to the required depth. Formwork is placed to the sides prior to placement of 10 mm reinforcing bars at 100 mm centre to centre distance, horizontally and vertically. The mixed concrete will be poured into the formwork and curing commences until the concrete reaches desired strength. The excavation can be done manually and the excavated material is stored on the side of plot.

4.1.1.7 Construction of Sorting Area

The sorting area is 4.85 m long by 4.0 m wide and 100 mm thick slab consisting of high tensile reinforcement placed at 200 mm centre to centre along the breadth and width. The slab rests on 300 mm thick concrete columns. The top of the sorting area is 750 mm above the floor finish level. Formwork is placed to the sides prior to placement of 10 mm reinforcing bars at 200 mm centre to centre distance, horizontally and vertically. The mixed concrete will be poured into the formwork and curing commences until the concrete reaches desired strength.

4.1.1.8 Construction of Perimeter Fence

The perimeter of the site is to be fenced except the gate area. The fencing includes a 150 mm thick masonry wall of 0.6 m height from ground level, followed by the PVC coated mesh fence of elevation 2.8 m from ground level. The mesh is held together by 50 mm diameter GI pipes vertically at equal centres which are welded to three evenly spaced 50 mm GI pipes horizontally. The strip foundation below the

masonry wall has a depth of 0.6 m with a 50 mm thick lean concrete placed below. The trenches required to receive the strip foundation and footings will be excavated manually.

4.1.1.9 Construction of Well

A well is proposed to be constructed at the eastern corner of the IWRMC. This well is 1000 mm in diameter and the walls will be precast concrete while the base and top cover will be precast reinforced concrete. The pre-casting of the well will be done on site. Excavations will be done to a depth depending on the depth of the water table. After the excavation, the well base and body is fitted into the pit, and the top cover is laid on top of it. A lorry crane will be used to lower the body into position.

4.1.1.10 Construction of Superstructure

The superstructure of the IWRMC consists of the sorting area, storage area, staff quarters, office and the equipment room. The structure consists of a 4 m high wall for the office/equipment room building. The 150 mm masonry wall and roof beams are supported by reinforced concrete columns 150 x 150 mm size. The roofing is made of LYSAGHT roofing sheets. The roof truss is made of 50 mm GI pipe horizontal members and 25 mm GI pipe vertical members

4.1.1.11 Construction of Septic Tank

Construction of a septic tank is proposed to manage the sewage generated during the operational phase. The tank will be constructed to ensure water tightness. Waterproof paint will be used on the masonry wall.

The septic tank consists of a primary tank of 1.3 m by 1.3 m made of 150 mm brick wall, covered with 75 mm thick concrete with 6 mm reinforcing steel placed at 150 mm center to center. The primary tank is 2 m deep. The primary tank is connected by a 100 mm diameter PVC pipe to a secondary tank of the same dimensions filled with 1 m of coral stone and white sand filling. The bottom 1 m of this secondary tank is perforated with 25 mm equally distributed holes to allow for discharge of treated effluent.

4.1.1.12 Inspection of concrete works

Inspection of foundation, formwork and reinforcement will be made by the Proponent before concrete pouring is commenced.

4.1.1.13 Labour Requirements and Availability

A 10 person workforce would be involved in the construction. It is encouraged to choose workers from within the island, to reduce the impacts of influx of non-local workers. If no such arrangements are made, labour accommodation will be arranged for the 10 person workforce from existing houses.

4.1.1.14 Waste Management during construction phase

Construction waste, which would mainly be excavated earth, nylon cement bags and general construction debris shall be collected and temporarily stockpiled in the project site. The small amounts of waste oil that may be generated from vehicles shall be contained in closed containers and shall not be allowed to leak into the ground.

A description of how various types of wastes generated from the project will be managed is given below.

A. Biodegradable waste

Wastes such as leaves, branches, paper, and materials collected from the general cleaning of the site areas will be stored as described in **Figure 8.** Only organic waste generated during site cleaning may be burnt to reduce its volume. If burning is opted it shall be carried out in such a way that fire is controlled and considering the wind direction such that smoke plume moves away from the residential area. Burning shall only take place during day time and schedule shall be discussed with the Island Council. Large wood stumps shall be cut into smaller pieces and sold to locals to be used for firewood or carpentry. If not sold they shall be stored in bins or sacks and transported to nearest waste management facility. All residual biodegradable waste shall be kept within the site for removal from the island at the end of the project.

B. Non-biodegradable waste

Materials such as plastics and glass will have to be collected separately and transported to nearest waste management facility at the end of the project construction period. These will most likely be nylon cement bags, wrappings, steel/glass leftovers and other municipal waste generated at the construction site.

C. Kitchen waste

Food wastes and other biodegradable wastes generated in food preparation shall be buried in the ground. The pit dug to bury such wastes shall not reach the water table.

D. Waste from Site Clearance

Most of the waste is expected to be generated during the site the clearance process. However the volume of the waste generated would depend on the option adopted for managing trees that fall within the footprint. Relocation (Option 1) would significantly lower the volume of waste generated while cutting down of trees (Option 3) would generate greatest volume of waste. Waste produced by removal of coconut palms will consist of parts of palm tree which cannot be utilised for a meaningful purpose, such as the crown and root system of the palm that are bulky, heavy and occupies a large volume, which makes their management even more challenging.

For those trees that are not suitable for re-planting but may be useful as timber the crown and root bulb of the coconut palm will have to be removed and those residual parts generated will become waste elsewhere. This is mainly because the root section of the coconut palm trees comprises of soft pith that cannot be used as timber. This means the Project's negative impact will be extended, beyond Project Island. Transportation of these waste will not be viable hence; the following waste reduction strategy shall be applied.

1. The highest priority shall be given to reduce the number of trees removed during the site clearance. Careful surveying and strict supervision shall ensure that the trees removed are absolutely essential;
2. trees that are removed because they fall on the footprint of the IWRMC shall be relocated as far as possible;
3. those trees which require removal but are not suitable for replanting shall be assessed for their suitability for use as timber or firewood;
4. only once these uses have been thoroughly exhausted can a tree be considered as "waste"; and

5. waste generated after relocation of trees shall be managed at the island level by burning them as described below. Those that cannot be managed at the island shall be transported to nearest operational waste management centre.

E. Burning of Site Clearance Waste

Since transportation of all the yard waste from the island will be prohibitive in terms of costs and other resources required, residual yard waste at the site, shall be left to dry and may be burned at a designated safe area away from residential areas. Burning shall be carried out in an open area that would not impact unintended vegetation. Wood ash that results from burning can be buried as it contain calcium, potassium, and a variety of trace minerals that can enrich the soil. They can also be stored in sacks and used for composting once the IWRMC becomes operation.

During burning care should be taken to contain fire within the area of burning to prevent fire becoming uncontrolled. Plastics, metals, fabric and other inorganic wastes shall NOT be mixed with yard wastes while burning. In effect this means, majority of yard waste generated from land clearance can be managed at the island level avoiding the costlier transportation of these waste to the nearest waste management facility.

Yard waste shall be burned only after attempting to reduce site clearance waste as described in the previous sub-section of report.

F. Hazardous waste

During construction phase, hazardous waste generated from machineries such as oils, solvents, batteries etc shall be sealed in labelled containers and shall be stored on paved hard surface before being transported to the nearest waste management facility. They shall be stored at the designated areas illustrated in **Figure 8**. It is essential to ensure that hazardous waste is fully contained and transported out of the island to nearest waste manage facility as quickly as possible. It is recommended to install signs in the designated temporary storage area.

Figure 8: Transportation route and storage area (adapted from Saleem 2018)

4.1.1.15 Pollution and Control Measures

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

a) Machinery to be properly tuned and maintained to reduce emissions/spills/leaks;
b) fuel storage, paint, lubricants will be stored securely and bunded; and
c) spill kits would be made available on site to control any liquid spills;
d) construction site will be wetted regularly to minimize impacts of dust; and
e) all vehicles used for the project must have up to date road worthiness license.

4.1.1.17 Demobilization

The demobilization plan will commence in the last week of the contract. This would involve removing all items and personnel belonging to the contractor and handing over of the site to Ministry of Environment. Prior to demobilisation and site handover site inspection by the officials of the Ministry of Environment will take place to ensure that project has been completed to the full satisfaction of Ministry of

Environment and scope of work fully competed. The demobilisation shall also involve removal of all residual waste generated from the project and repairing of any public property damaged during the project. These will be the responsibility of the contractor.

4.1.2 Aerobic System (Composting Machine) for compositing

The proposed technology for the composting is "Organic Waste Converter [OWC]" machine which involves initial 'in-vessel' processing of the waste unlike a normal windrow-based system. The main concept and processes involved in compositing of organic waste using aerobic OWC system is described below.

4.1.2.1 Concept Design

The bio-degradable waste is chopped to the desired size; moisture is adjusted to 40-45%, using an organic absorbent (typically sawdust or shredded leaves), if required, and treated with Bioculum OWCTM [a formulation with 5 different Bacillus species] @ 1-2gm per kg of waste. The OWC machine has a running time of 15 – 30 minutes per batch, depending on unit and batch size. The treated waste is kept for composting and curing. This system has been designed for south Asian conditions as experienced in India and the Maldives.

It is claimed "that treatment, composting and curing is achieved within a short time of 10 to 12 days. Processing of waste through the OWC machine overcomes the problems of odour, leachate generation and ground water contamination associated with traditional methods of waste disposal. It converts unsightly and odorous garbage into a beneficial material devoid of foul odours and unsightly appearance. It is an innovative method for the bio-stabilization and beneficial conversion of organic waste. The organic material produced by this method not only provides nutrients to the plants, it also improves the organic-carbon content and moisture retaining capacity of the soil."

Advantages claimed for the OWC include:

- Simple and convenient to operate without the need for constant attention;
- Short processing times ensures economic in use with low energy consumption;
- Requires minimal maintenance;
- Beneficial to the environment.

4.1.2.2 Process Diagram

Pic 1: Segregate the waste

Pic 2: Input wet waste into OWC with Bioculum

and Absorbent

Pic 3: After 15 minutes collect raw compost from OWC

Pic 4: Place raw compost in the curing system for 10-day maturation cycle

The pictures give an overview of the OWC process. If required, as shown in pic 1, waste can be further sorted and segregated. The waste is then added to the OWC unit, pic 2, together with the Bioculum, which is a bacterial powder that enhances the natural aerobic process. The Bioculum is added at the rate of 1 gm/kg of raw waste. Also added at this stage, if required, is the absorbent at a rate of up to 2 kg per batch. The OWC unit is operated for a period of 15 – 30 minutes, depending on size of unit and batch size, during which the waste, Bioculum and absorbent are mixed to achieve a homogenous consistency. The raw compost is discharged into crates of 25kg capacity, pic 3. The crates are then placed in curing racks for a period of 10 to 12 days, pic 4. The curing racks are equipped with an automatic fogging device that maintains moisture content at the correct level thereby ensuring curing is completed.

At the end of the curing period, the crates can be emptied with the cured compost ready for use; however, after emptying the crate, leaving the cured compost for a further seven days enhances the composts maturity, providing a higher quality product. Typically, the cured compost amounts to some 25 – 35%, by weight, of the raw waste input.

It is worth noting that the amount of waste that can be processed through the OWC each day is determined by the operating hours. This provides flexibility during times of unexpectedly high inputs or following unanticipated outages. It also allows increasing throughputs to be accommodated at minimal cost. The critical sizing and potential pinch point is the curing system; however, additional racks and/or crates require only small areas of land and modest capital expenditure.

4.1.2.3 Requirements of feed waste types and activation requirements

The waste feed need to be segregated and only organic waste such as food waste, green waste and paper can be used for the feed. Absorbent material such as saw dust and dried leaves are required to maintain the moisture at 40 – 45%. Bioculum OWCTM which contain 5 different species of *Bacillus* bacteria is required for activation at a rate of 1 to 2 grams per kg of organic waste.

4.1.2.4 Bi-products and output of the process

One of the prime advantages of this method of composting is that it does not yield any bi-products and cured compost can be readily used for farming and gardening purposes. The organic material produced by this method not only provides nutrients to the plants, it also improves the organic-carbon content and moisture retaining capacity of the soil

4.1.3 Health and Safety Measures

The project involves many activities that can put workers as well as the general public to risk of injuries and accidents. However, with careful precautionary measures and good practices during the works can eliminate or reduce many of these risks. Health and safety measures for the construction phase include and are not limited to:

- Undertaking all relevant safety measure during construction works shall be part of the legal contract to undertake the works. The contractor shall be made to bear the responsibility to protect the workers as well as the general public from activities related to the project;
- Strict supervisor shall take place during construction and decommissioning phase of the project;
- Only experienced and licensed operators will be allowed to operate heavy machines;
- First aid kit should be made available at the work site;
- PPE should be provided to all workers and the work force would be required to use safety gears as appropriate;
- Fire extinguishing equipment would be available at the site;
- Operation of any heavy machinery will need the assistance of a banksman as all times;
- All heavy lifts must be supervised and slings inspected; and
- Appropriate safety signs shall be placed at the work site.

4.1.4 Operation of IWRMC

The following Section will briefly highlight the operational aspects of the IWRMC. This includes the machinery and equipment proposed to be used in the IWRMC, in addition to the main activities to be carried out at the IWRMC and within the island. The IWRMC activities begin from collecting waste generated at source and transporting it to the IWRMC. This collected waste will be pre-sorted into categories such as compostable waste, recyclable waste and hazardous waste. Compostable waste is used in making compost while glass, plastics and metals undergo volume reduction processes before being stored in their respective compartments. The hazardous waste is stored in the hazardous waste compartment. The **Figure 9** is the operational phase flow chart for IWRMC in M. Mulah.

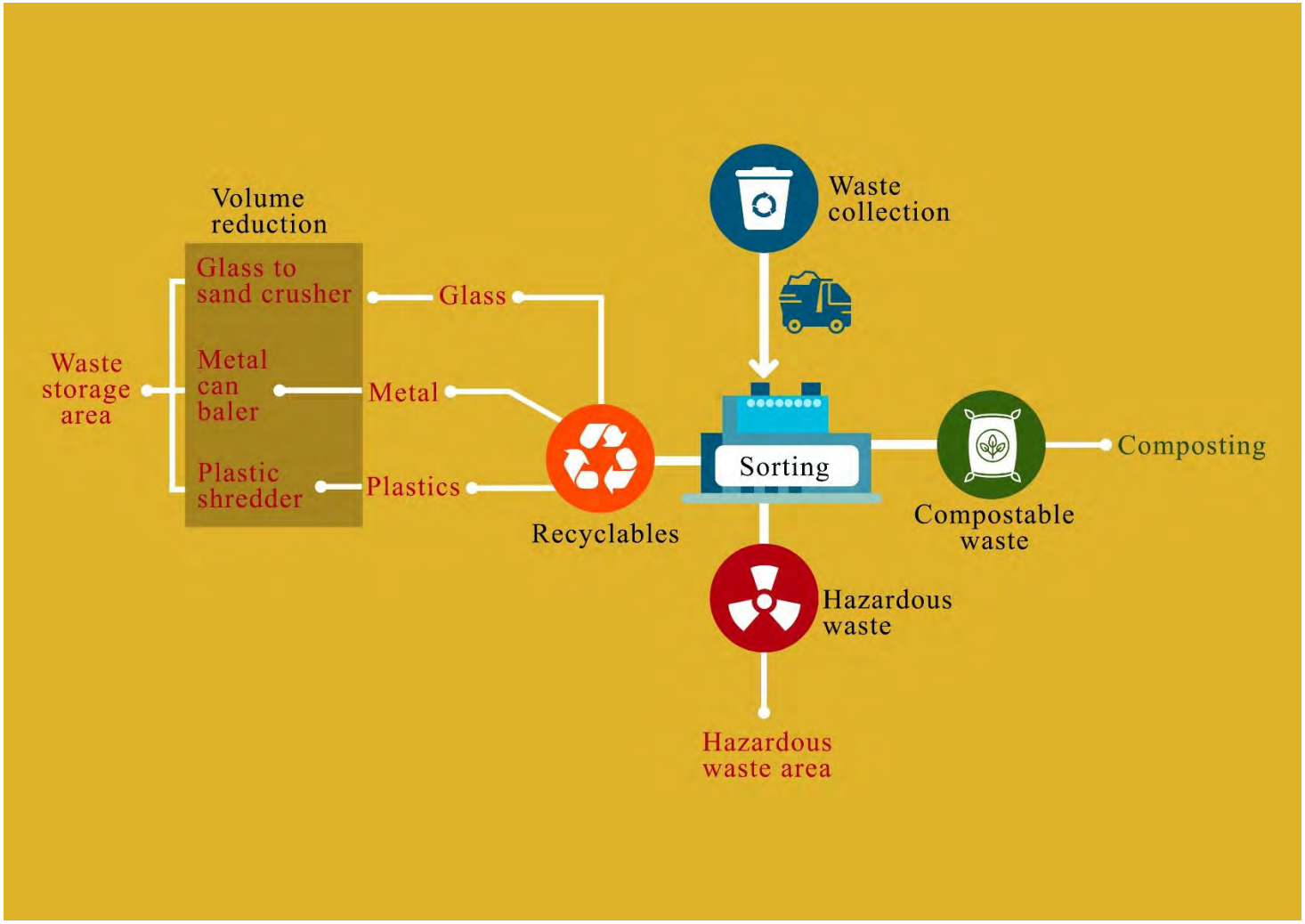


Figure 9: Operational Phase flowchart for M. Mulah IWRMC (adapted from Saleem 2018)

4.1.4.1 Machinery and equipment proposed

The IWRMC will require general equipment and tools needed to handle the waste. These include wheelbarrows, garden hoes, shovels, buckets and cultivators. This equipment will be used during the IWRMC operation for handling as well as composting operations. A OWC machine is also included for the composting process.

Other equipment required includes waste volume reduction equipment such as a plastic shredder, metal can baler, vegetation shredder, and glass to sand crusher. Typical equipment required is detailed below.

Table 4: Typical equipment proposed for waste management works (adapted from Saleem 2018)

Waste Management Equipment
Chainsaw
Wheelbarrow
Heavy Duty Gumboots
Heavy Duty Hand Safety Gloves
Long Handled Flathead Steel Rake
Long Handled Cultivator
Garden Hoe
Round Point Shovel
Square Point Shovel
20L Bucket
40L Bucket
Polypropylene Surgical Mask
Weighing Bench Scale
Wheelie Bins
Glass to Sand Crusher
Plastic Shredder
Metal Can Baler
Vegetation Shredder
Manual Rotary Compost Screen

4.1.4.2 Waste Collection

During the consultation meeting with the Council, it was learnt that the IWRMC operational works will be conducted by the Council. The waste will be collected from source using a vehicle.

4.1.4.2.1 Sorting of Incoming Waste

Incoming waste is required to be sorted to separate biodegradable and non-biodegradable waste. The separation of kitchen waste, yard waste and other types of waste at household level can streamline this process.

Table 5: Domestic Waste Categories

Incoming Domestic Waste			
Biodegradable materials	**Hazardous materials**	**Others**	**Recyclables**
Organics • Food waste • Garden waste • Animal waste Paper & Cardboard • Printed paper • Cardboard	• Paints & Solvents • Batteries • Cleaners • Expired medicine • Medical waste • Pesticides • Special (Nappies, tampons)	• Textiles • Wood • Inert (Dust/Dirt/Ash/Rock) • Liquid container	• Metal • Plastic • Glass

As per the IWRMC site layout plan, a slab is dedicated for the sorting area. Here, the collected waste will be kept, and further sorted into their respective categories. The IWRMC is designed to have separate storage areas for reusable waste, metal, paper and cardboard, plastic, glass, and hazardous waste. After sorting, the waste is stored in the respective location.

4.1.4.3 Composting

One of the main operations that will be conducted in the IWRMC is the composting of the organic waste such as kitchen waste and green waste. Composting uses the process of the slow decomposition of the organic matter by various microorganisms, in an optimised and controlled process. The process is controlled in terms of parameters such as input materials, temperature, moisture and pH. The finished product of composting can be sold as fertilizer, thus enabling the reuse of the waste collected within the island.

The composting process has been described in the section 4.1.2.2 of this report.

4.1.4.4 Leachate Management

As the process of composting occurs, leachate will be produced from the organic waste within the compost pile. The composting will be done on the specially constructed compost slab. The bottom of the slab and ground beams in this area have an HDPE membrane between the reinforced concrete and the ground.

In addition to this, the expansion joints of the compost slabs are filled with silicone and polythene joint filler foam. This ensures that the leachate does not leak into the ground. The compost slab is also designed with a 1˚ slope from both sides, towards the centre, where the ground beam is fitted with a 100 mm PVC pipe cut in half with 1% slope towards the leachate collection tank. The leachate is then collected in the dedicated leachate collection tank at the end of the mechanical composting area.

4.1.4.5 Volume Reduction

Prior to storage, volume reduction of the waste is conducted. This includes metal can baling using the metal can baler, plastic shredding using the plastic shredder, and glass bottle crushing using the glass to

sand crusher. The resulting reduced volumes of the waste is then easily stored in their respective compartments.

4.1.4.6 Sewage management

The 'primary tank' facilitates 'primary treatment'. The separation of liquids and solids by gravity - to take place. Raw sewage flows into the tank and the heavy solids, 'sludge', sink to the bottom, lighter solids, grease and oils or 'scum' float to the surface. Some of the sludge is degraded by naturally occurring anaerobic (without oxygen) bacteria. The liquid effluent flows to the secondary tank which is filled up to 1 m with coral stone and white sand layer. This tank is perforated at the bottom 1 m to allow for discharge of liquid effluent into the land.

The most environmentally sound method for disposing the domestic sludge is allowing it for drying in a sludge drying bed. The dry sludge can be used following appropriate treatment, as part of compost. Sludge will be dried on a sludge drying bed.

4.2 Project Inputs and Outputs

The **Table 6** below elaborates the approximate amount of resources that will be required for the project. These include workers, fuel, water, and construction materials.

Table 6: Project Inputs

Stage	Input	Source / Type	Estimated Amount	Means of obtaining the resources
Construction	Workers	Local and foreign	10	Encourage the use of local / regional workers
	Fuel	Diesel		Local Suppliers
	Water	Groundwater for non-potable use	Average 150 l/p/d	Groundwater wells present in the island
	Materials	Concrete including reinforcement and formwork	78 m^3	Local Suppliers
		Masonry Works (150 mm bricks)	553 m^2	Local Suppliers
		Structural Steel		
		50mm GI Pipe for perimeter fence	57 m	Imported / purchased where available locally
		75mm GI pipe (structural columns)	10 Nos.	
		Truss	23.45 m	
		75mm GI pipe for flood light fixing poles	2 Nos	
		Paint		
		Emulsion paint coating	1105 m^2	Local suppliers

		Electrical Components		
		3 Phase power sockets	6 Nos.	Local suppliers
		20W LED lights	7 Nos.	
		18W LED lights	3 Nos.	
		Ceiling fan	3 Nos.	
		AC	1 Nos.	
		Exhaust fans	4 Nos.	
		Well water pump	1 Nos.	
		200W flood light	2 Nos.	
		Metal doors for		
		Equipment room	1 Nos.	Local suppliers
		Hazardous waste area	1 Nos.	
		Waste yard entrance	1 Nos.	
		Plumbing		
		Fresh water pipe network and plumbing fixtures		Local suppliers
		Roofing		
		Lysaght roofing sheets	286.6 m^2	Local suppliers
		Flashing sheets	86.4 m	
		Lysaght gutter		
		Timber beams 150x75mm	59.7 m	
		Timber beams 100x50mm	318.47 m	
		Timber beams 50x38mm	477.70 m	
		50x50 PVC coated mesh fence	138.93 m^2	Local suppliers
		HDPE membrane	238 m^2	Imported / purchased where available locally
		Timber top cover	3 nos.	Local suppliers
		PVC pipe for leachate tank drain	15 m	
		600 x 900 5mm plastic sheet signboard	1 Nos.	Local suppliers
		Firefighting equipment and fire alarm system	1 Nos	Local suppliers
		Septic tank	1 Nos	Materials from local suppliers
Operation	Equipment and Materials	IWRMC tools	1	Imported / purchased where available locally
		Weighing Bench Scale	1	
		Glass to Sand Crusher	1	

		Plastic Shredder	1	
		Metal Can Baler	1	
		Vegetation Shredder	1	
	Waste	Waste generated within the island	Approximately 1.9 ton of waste per day	Waste collected by vehicle from the waste bins within the island
	Fuel	Diesel	5000-15000 L/month	Local suppliers
	Water	Freshwater	200-1000l/day	Groundwater

The **Table 7** provides the information on the project outputs.

Table 7: Project Outputs

Stage	Output	Source / Type	Amount	Means of managing
Construction	Land plot for IWRMC	Cleared land for construction of IWRMC	750 m^2	N/A
	Removed Coconut palms		65 (for site)	
	Removed mature trees (other than coconut)		5 (for site)	
	Soil	Excavation for substructure	8.30 m^3	To be used back in the levelling and backfilling of site.
	Construction Waste	Construction works	Moderate amount of construction waste	Transfer all waste to nearest Waste management facility
	Yard waste from site clearance	Yard waste While a great Emphasis is placed on relocating, trees some trees and branches may have to be removed and preferably used as timber or discarded as yard waste.	Approximately 5-10 tons	
	Hazardous waste	Construction and clearing of vegetation	Moderate amount of hazardous waste	
	Municipal waste	Workers	346.5 kg	
	Dust	Excavation	Moderate amount of dust	
		Cement mixing	Moderate amount of dust	
	Greenhouse gases	Machinery	Moderate amount of GHG from direct and indirect emissions	
		Concreting works	Moderate amount of GHG from direct and indirect emissions	
		Reinforcement	Moderate amount of GHG from	

			direct and indirect emissions	
		PVC Pipes	Moderate amount of GHG from direct and indirect emissions	
Operation (based on presumption the IWRMC will be fully functional without major issue)	Compost	In-vessel Composting	39 m^3 of compost per full batch	Sold as fertilizer
	Green waste	Residual		
	Crushed Glass	Glass crusher	1.14 ton per month	Crushed glass stockpiled in the IWRMC compartment prior to sale. Unmanaged waste transferred to central waste management facility
	Compacted Metal	Metal baler	0.57 ton per month	Compacted metal stockpiled in the IWRMC compartment prior to sale. Unmanaged waste transferred to central waste management facility
	Shredded plastic	Plastic shredder	2.9 ton per month	Shredded plastic stockpiled in the IWRMC compartment prior to sale. Unmanaged waste transferred to central waste management facility
	GHG	Electricity usage		N/A

4.3 Project Schedule

The construction works of the proposed project is expected to be carried out in 12 weeks. A tentative schedule of the shortest duration of work is found in **Table 8**.

Table 8: The schedule for the construction phase of the project

#	Activity	Weeks
		1 2 3 4 5 6 7 8 9 10 11 12
1	Mobilization	
2	Site clearing	
3	Excavation works	
4	Substructure and superstructure works	
5	Masonry works	
6	Plastering works	
7	Roofing works	
8	Structural steel works	
9	Electrical works	
10	Plumbing works	
11	Doors and windows	
12	Demobilization	

CHAPTER FIVE: EXISTING ENVIRONMENT

The existing environment is described based on photographic evidence provided by the island council. No detailed data collection and survey analysis techniques are used for this purpose as this is an ESMP, not a full ESIA report.

Information regarding existing environment of the project site and existing waste management practices within the island were obtained through photographic evidence provided by the island council and subsequent online meetings held with the Island Council. Due to the COVID19 pandemic situation the consultants were unable to conduct field visit and online meetings were conducted with Island council on 10th January 2021. Community survey were conducted with the assistance of island council.

5.1 Current Waste Management Practices

The rate of solid waste production depends on the socio-economic situation, the level of industrialization, type and numbers of industries, climate, and land use and therefore can vary from island to island. However such variations are not expected to be significantly different from island to island and therefore in making estimates waste audits conducted for similar islands can be safely applied. Hence, past waste audits had been used to estimate waste composition and quantities for M. Mulah.

According to the waste audit conducted in 2016 for Zone 1 (which includes HA, HDh, and Sh.) an average per capita waste generation was found to be 1.30 kg/person/day. The study also finds that, by far the most significant proportion of the waste is green and compostable (75%), plastics comprising of 6%, paper and cardboard making 5% of the waste, 1% metals, 6% hazardous waste, 1% glass and 6% attributed to all other types of waste.

In another waste audit study conducted by the Ministry of Environment and Energy in 2011 under the Maldives Environmental Management Project (MEMP) for five inhabited islands in the north central region of the Maldives (Hinnavaru, Naifaru, Eydhafushi, Maalhos, Lhohi), it was determined that 0.83 Kg of waste was generated/person/day. Similar to the above study it was revealed that organics was the largest component making 65% of the household waste stream, plastics comprising of 5%, paper and cardboard making 5% of the waste, 1% metals, 8% hazardous waste, 2% glass and 8% attributed to all other types of waste.

The estimated percentage of organic waste as well as the sum of the plastics, glass and metals for the for both zones were found to be very similar hence the averages of the two studies were taken and considered to be the estimated percentages of various types of waste generated in M. Mulah Island as shown in **Figure 10**. Similarly per capita waste generation for the island had been determined by taking the average per capita in the two studies above which is **1.07 Kg/person/day**. This finding is expected, since the lifestyle and food habits are similar for most of the inhabited islands across Maldives with the exception of Male' and few other cities.

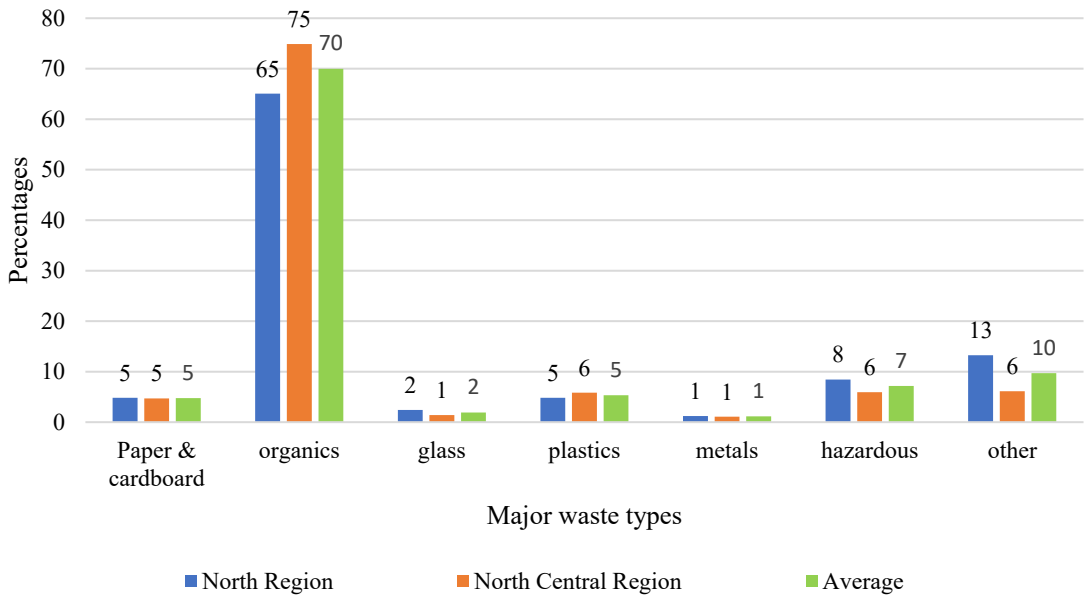


Figure 10: Waste composition comparison in two separate regions of the Maldives

Hence it is expected that the majority of the waste generated in the island to be organic wastes at 70%, which include kitchen and green wastes or compostable waste. Paper and cardboard wastes is estimated at 5% of the total waste generated. Recyclable materials such as plastic, metals, and glass make up 8% of the composition. Approximately 7% of the total waste generated is chemicals and hazardous waste and all other types are expected to be at 10%. Using these estimates and considering the current population of M. Mulah , the daily waste generation was determined as shown in **Table 9**.

Table 9: Estimated waste generation quantities of M. Mulah households (adapted from Saleem 2018)

Waste Type	Average (%)	Waste Generation (Kg/Person/Day)	Total (Kg/Day)
Organic (kitchen & green waste)	70	0.75	1347
Paper / cardboard	5	0.05	96
Glass	2	0.02	38
Plastic	5	0.05	96
Metals	1	0.01	19
Chemicals / Hazardous	7	0.07	135
Others	10	0.11	192
Total	100	1.07	1925

Hence it is estimated that a total of **1925 Kg** of solid waste will be generated daily at M. Mulah.

The majority of waste sources in M. Mulah are households. Small scale boat building, production of dried fish, and operation of an ice plant were to be the notable commercial activities observed on the island. As far as institutions are concerned, typical institutions that are commonly found in an average island were found. These include, school, Health Centre, Secretariat of Island Council and magistrate court, and Police Station.

The Island Council has allocated an area in the north eastern side of the island to dump waste. Here, metals, glass and plastic are separated. Garden waste and nappies are regularly burnt while kitchen waste is dumped into the lagoon, in some cases along with their containers such as cans or plastic. The Island Council stated that even though two mini pickups operate on the island, households take their own waste to the dumpsite on their own. Waste is not buried at this dumpsite. The dumpsite is located at close proximity to the shore, especially the garden waste which is burnt. The waste can easily scatter into the lagoon due to wind and inundation.

The island's waste management regulations have also been formulated and gazetted. Regulatory enforcements required for safe and sound waste management seemed to be completely lacking.

The following **Table 10** illustrates the current situation of the dedicated dumpsite and some other waste management practices followed in M. Mulah in terms of the practices and resources dedicated for solid waste management.

Table 10: Current situation of solid waste management in M. Mulah

Facilities/Practices	Current Situation/Practices
Waste transportation	No waste collection systems or services provided in the island.
Harbor (accessibility)	Determined to be accessible.
Vehicles for waste transportation	No vehicles for waste transport
Waste management equipment	No waste management equipment available
Dump site demarcated	Two Dump Sites. Dump sites are not demarcated
Separation of waste at dumpsite	Waste is not separated
Burning of waste	Mixed waste is burnt regularly
Burying of waste	Waste is buried to reduce volume
Dumping waste into the beach/sea	Kitchen waste is dumped into the lagoon along with their containers such as cans or plastic
Presence of large waste piles	Both dumpsites contain piles of waste mainly consisting of burnt residue, construction waste and mixed waste.
Pollution of inland/other areas	Terrestrial pollution of inland areas is controlled
Clinical waste management	Clinical waste is managed at the Health Centre
Public area waste collection	Council contracts Women's Committee to clean and collect waste from public areas, sometime locals take the initiative and clean themselves.

Presence of waste bins	No
Presence of workers	No
Electric connection at the dumpsite	No electric connection at the dumpsite

Figure 11: Photographs taken from existing dumping sites in M. Mulah

5.2 Island Waste Management Plan

Island Waste Management Plan

M. Mulah has formulated an IWMP on December 2016 for the period of 2017 – 2021, which has been approved by the EPA. The plan includes main principles that need to be taken into account in establishing and implementing a suitable strategy for waste management; most notably, sustainable development, proximity and self-sufficiency, precautionary principle, polluter pays principle, waste hierarchy, best practicable environmental option (BPEO), and producer responsibility.

Outcome

Since formulation of the IWMP not much progress had been made in order to effectively implement it. There is currently no waste management system in place in the island and therefore the objectives of the IWMP are yet to be met.

Consultation

The plan was formulated with wide stakeholder consultation and engagement. In the process of formulating IWMP, institutions, women's committee, clubs and associations, schoolchildren and general public were consulted. Consultations were held with different groups separately. Hence community

ownership of the IWMP is expected to be greatly felt which is believed to be a prerequisite for the successful implementation of the IWMP.

Current situation

Since the project to construct a waste management centre began in 2008 and was subsequently halted, there is no demarcated area to dump waste. Council has temporarily set two areas for this purpose where the population can easily access. As the waste accumulated in these areas cannot be managed, it has become a nuisance for the general population.

Waste Management Goals

1. Formulate waste management regulations and gazette;
2. Reduce the amount of waste produced;
3. Reusing and recycling waste;
4. Generating income from waste;
5. Conduct waste management in a sustainable manner;
6. Separation of waste category at household level;
7. Further separation of waste at IWRMC;
8. Establish a way to transport unmanaged waste out of the island;
9. Transportation of waste daily from households using a vehicle;
10. Safe management of medical waste; and
11. Safe management of hazardous waste

Under this IWMP, Mulah Council plans to achieve sustainable waste management through the following means.

- Establish an IWRMC;
- Obtaining a vehicle to transport waste to the IWRMC;
- Employing permanent staff for IWRMC operations;
- Obtaining machinery required for IWRMC operations;
- Conducting awareness programs regarding sustainable waste management;
- Collecting a monthly fee from households, businesses and institutions;
- Separation of waste to five categories at household level;
- Daily collection of waste using vehicle;
- Making arrangements to manage clinical waste within the health center; and
- Transportation of waste that cannot be managed within the island to Thilafushi.

In order to sustainably conduct IWRMC operations, Mulah Council states that 4 permanent staff will be utilized for waste management purposes. The Council plans to conduct composting for kitchen waste and garden waste produced within the island. Plastics, glass and metals will be separated, compacted or shredded and sold to markets.

Fee schedule

The fee schedule proposed within the IWMP is as below:

- Households – 100 MVR
- Businesses, restaurant/cafes and offices – 200 MVR
- Industrial works – 300 MVR

Waste management committee

Under the IWMP, a waste management committee is proposed with the following composition:

- 3 island councilors;
- 1 member from Atoll Family and Children Center;
- 1 member from School;
- 1 member from Health Center;
- 1 member from Police Station;
- 2 members from clubs and associations;
- 2 members from women's committee;
- 2 members from the general public; and
- 2 members from business community.

Waste management committee will play a role in monitoring waste management within the island, provide feedback and awareness programs aimed at the community.

5.3 Existing Environment at the Project Location

The proposed site for Island Waste Management Centre (IWRMC) is located at the southern side of the island. The project site was selected by a rigorous process involving the Maldives Land and Survey Authority of the MNPHI. EPA's "Environmental Guideline for Site Selection of Waste Management Centers (Sep 2017) is referred to during the site selection process.

The site measures an area of 825 m^2 which requires vegetation clearance. An access road which measures approximately 510 m in length and 6 m in width that connects the project site to the islands' existing road network has been cleared by the island council.

It is estimated that 65 coconut palms and 5 other trees will require removal from the site, this amount is not considered to be significant considering the remaining vegetated area of the island even after the land clearance works. No rare, protected or endangered tree will require cutting or removal as a result of the project. The **Figure 12** shows the vegetation on the proposed project site. The **Figure 12** shows the access road created by the island council.

Figure 12: Vegetation at the project site

Figure 13: Access road created by the island council.

Site zoning guidelines by EPA and MLSA

The EPA has provided guidelines for the optimum zoning of the IWRMC site. The distances include, the site being at least 20 to 30 m from the coastal vegetation belt, at least 30 m from the nearest freshwater well, at least 40 m from the nearest recreational area and at least 30 m from the wetlands area as well as the residential area. The field surveys done on the island recorded the locations of the aforementioned categories and the comparison table for the actual distances and EPA guidelines are provided below:

Table 11: Comparison between the proposed site location and EPA Guideline distances

Location	Distance from site (m)	EPA Guideline Distance (m)
Coastal vegetation	54.5	20 - 30
Freshwater well	374.3	30
Recreational area	40+	40
Wetlands	147.1	30

As seen on

Table 11, the proposed plot is located 54.5 m from the shoreline and 374.3 m from the nearest residential areas. The site is 147.1 m away from the closest wetland area, therefore it fulfils the EPA and MLSA recommended buffers. The site meets all the recommendations of the EPA and MLSA

5.3.2 Coastal Environment near project location

The coastal area close to the project site was observed to have a stable beach with a low gradient. Exposed beach rock outcrop was observed in high abundance in this area. A healthy coastal vegetation belt was present in the area. The **Figure 14** shows the coastal environment near the proposed project location.

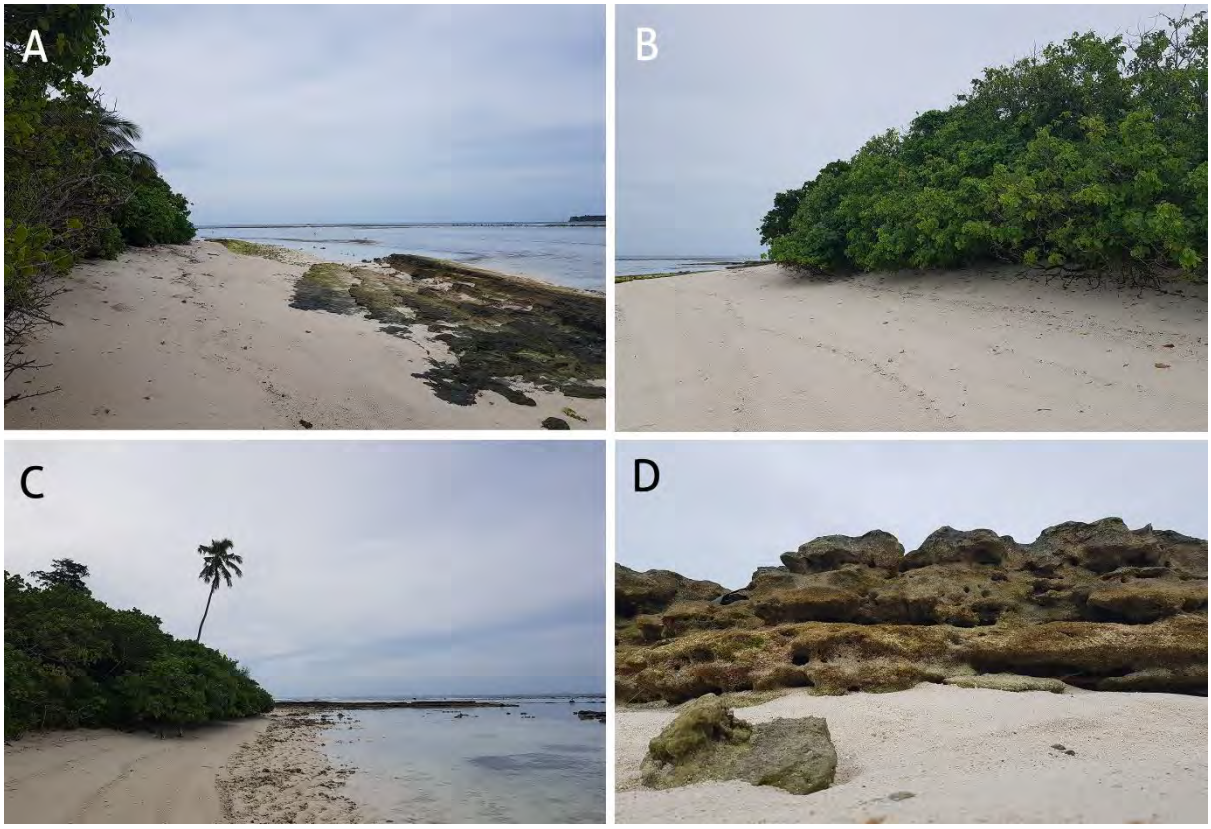


Figure 14: A, B,C and D: Coastal features close to the project site at M. Mulah.

5.3.3 Wetland

A wetland of approximately 2.46ha is located on the islands eastern side. This makes up approximately 7% of the islands natural vegetation. It should be noted that the exact boundaries of the island's wetlands have not been surveyed during the visit, and approximate areas have been determined with the use of satellite imagery and approximate boundaries provided by the Island Council. The wetlands at M.Mulah are densely vegetated. Common plants in the area include Coconut palms (*Cocos nucifera*), Red bead tree

(*Adenanthera pavonina*), Screwpine (*pandanus*) and mangrove plants *Bruguiera cylindrica* and *Rhizophora mucronate*. The **Figure 15** is a photograph of wetland in M. Mulah.

Figure 15: Wetlands in M. Mulah

5.4 Environmentally Protected Areas and Environmentally Sensitive Areas

The closest to the project site is *Hakuraa Thila* which is a turtle nesting site approximately 3.34 km east of the project location.

Since the project does not involve any proposed activity in the marine environment and due to distance between the project site and the Hakuraa Thilaa no adverse impact of the project are anticipated on the Enviromentally Sensitive Area. The **Figure 16** illustrates the proximity between the project site and the *Hakuraa Thila.*

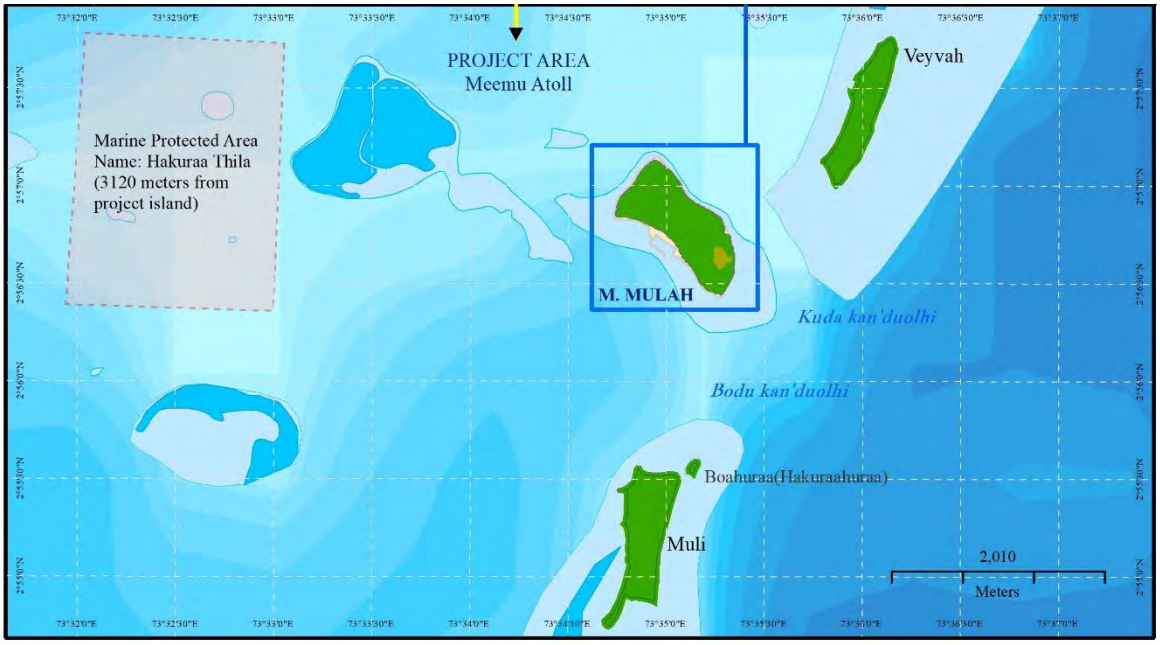


Figure 16: The distance between the project site and the nearest Environmentally Sensitive Area (Hakuraa Thilaa)

The **Table 12** provides more information about the MPA closest to the project site.

Table 12: The geographical coordinates and the distance between the project site and closest ESA

Name of the MPA	Geographical Coordinates	Distance from the project location
Hakuraa Thila	2°56'29.67"N 73°35'14.79"E	3.12 km North west of the project site

5.5 Areas of Historic and Cultural Significance

There are 1 mosque and 1 cemetery on the island. However, there are no mosques of cultural significance. The project site maintains a sufficient distance from the cemetery. The cemetery is located at the other side of the island approximately 870 m away from the project site.

5.6 Socio-economic Environment

5.6.1 Population and population growth

The total population of M. Mulah estimated in 2014 census is 1275 corresponding to 661 males and 614 females. The total number of foreigners were 21. The table below depicts comparison of total population with 2006 census.

Table 13: Population growth rates in M. Mulah

	Census 2006	Census 2014	Percentage change in population (2006 – 2014)
Total	1129	1275	+12.93 %
Female	576	614	+6.59%
Male	553	661	+19.52%

5.6.2 Population Density

The total land area of M. Mulah is 68.4 hectare. The population density is 18.64 per hectare.

5.6.3 Economic Activities

The main livelihood activity of residents of M. Mulah is Fishing. In addition to this there are several other sectors contribute to the overall economic activity of the island. These include resorts and related to fisheries.

5.6.4 Infrastructure

The island have its own stand-alone electricity provided by FENAKA. Similarly, there is a 10-bed capacity island health center. The island has only STO pharmacy. The island also has an approximately 225 by 93 m harbour built to improve access to the island.

5.6.5 Water Resources

The community of Mulah use desalinated water as the main source of portable water. The island have both water and sewerage network which is operated by FENAKA. The installed desalination plant produces approximately 7 ton of water per day. Some of the residents also use bottled water, as drinking alternatives. For washing and other non-consuming method groundwater and desalinated water are largely used.

In addition to that, given the island is very depended on fishing activities, there is one Ice Plant which has a production capacity of 15 tons of ice per day

5.6.6 Tourism Activity

There are 2 guest houses on the island, which are temporarily closed due to COVID19 pandemic.

CHAPTER SIX: ENVIRONMENTAL IMPACTS

6.1 Introduction

This section of the report provides a detail description of the methodology used to identify, predict and assess the environmental impacts due to construction phase and the operation phase of the proposed establishment of IWRMC in M. Mulah . First, the potential impact will be identified and then the identified impact will be evaluated to determine its level of significance. This section consists of the method used for impact assessment, the limitation and uncertainties, the justification for the method used for impact prediction and description of impacts during both construction and operation phase of the project.

6.2 Method Used for Impact Prediction

The impacts on the natural and social environment that may be caused due the project interventions are predicted and is distinguished from construction and operation phases of the project. A simple descriptive matrix has been utilized to predicted the aforementioned impacts. The impact prediction was done using expert judgement and professional opinions of the ESMP consultant and also the based on the information provided in the reviewed EIAs mentioned earlier in this report. Once the impacts have been predicted, a detailed description has been given for the purpose of understanding the nature and type of the impact.

An impact is any change to a resource or receptor brought about by the presence of a project component or by the execution of a project related activity. The evaluation of baseline data provides crucial information for the process of evaluating and describing how the project could affect the biophysical and socio-economic environment.

Impacts are described as a number of types as summarized in **Table 14**. Impacts are also described as associated, those that will occur, and potential, those that may occur;

Table 14: Types of Impacts (adapted from ERM 2008).

Nature or Type	Definition
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (e.g. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).
Indirect	Impacts that result from other activities that are encouraged to happen as a consequence of the project (e.g. in-migration for employment placing a demand on resources).

Cumulative	Impacts that act together with other impacts (including those from concurrent or planned future third-party activities) to affect the same resources and/or receptors as the project.

6.3 Analysis for Significance of the predicted impacts

The analysis of environmental impacts is done in terms of their level of significance. According to Environmental Resource Management 2008, Significance is a function of the magnitude of the impact and the likelihood of the impact occurring. Impact magnitude (sometimes termed severity) is a function of the extent, duration and intensity of the impact. The criteria used to determine significance are summarized in table 15. Once an assessment is made of the magnitude and likelihood, the impact significance is rated through a matrix process as shown in **Table 15** and **Table 16**. For ease of review, the significance rating is colour-coded in the text according to **Table 17**. Outlined in **Table 18** are the various definitions for the significance of an impact.

Significance of an impact is qualified through a statement of the degree of confidence. Confidence in the prediction is a function of uncertainties, for example, where information is insufficient to assess the impact. Degree of confidence is expressed as low, medium or high.

Table 15: Criteria used to assign level of significance

Magnitude – the degree of change brought about in the environment	
Extent	**On-site:** impacts that are limited to the Site Area only. **Local:** impacts that affect an area in a radius of 20 km around the development area. **Regional:** impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystems. **National:** impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences. **Transboundary/International –** impacts that affect internationally important resources such as areas protected by international conventions.
Duration	**Temporary:** impacts are predicted to be of short duration and intermittent/occasional. **Short-term:** impacts that are predicted to last only for the duration of the construction period. **Long-term:** impacts that will continue for the life of the project, but ceases when the project stops operating. **Permanent:** impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the project lifetime.

Intensity	***BIOPHYSICAL ENVIRONMENT***: Intensity can be considered in terms of the sensitivity of the biodiversity receptor (E.g.: habitats, species or communities). **Negligible:** the impact on the environment is not detectable. **Low:** the impact affects the environment in such a way that natural functions and processes are not affected. **Medium**: where the affected environment is altered but natural functions and processes continue, albeit in a modified way. **High:** where natural functions or processes are altered to the extent that it will temporarily or permanently cease.
	SOCIO-ECONOMIC ENVIRONMENT: Intensity can be considered in terms of the ability of project affected people/communities to adapt to changes brought about by the project. **Negligible:** There is no perceptible change to people's way of life. **Low:** People/communities are able to adapt with relative ease and maintain pre-impact livelihoods. **Medium:** Able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support. **High:** Those affected will not be able to adapt to changes and continue to maintain pre-impact livelihoods.
Likelihood - the likelihood that an impact will occur	
Unlikely	The impact is unlikely to occur.
Likely	The impact is likely to occur under most conditions.
Definite	The impact will occur.

Table 16: Significance Rating Matrix

SIGNIFICANCE				
		LIKELIHOOD		
		Unlikely	Likely	Definite
MAGNITUDE	Negligible	Negligible	Negligible	Minor
	Low	Negligible	Minor	Minor
	Medium	Minor	Moderate	Moderate
	High	Moderate	Major	Major

Table 17: Significance Color Scale

Negative Ratings	Positive Ratings
Negligible	Negligible
Minor	Minor
Moderate	Moderate
Major	Major

Table 18: The definition of difference level of significance

Significance definitions	
Negligible significance	An impact of negligible significance is where a resource or receptor will not be affected in any way by a particular activity, or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background levels.
Minor significance	An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.
Moderate significance	An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that "moderate" impacts have to be reduced to "minor" impacts, but that medium impacts are being managed effectively and efficiently.
Major significance	An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the EIA process is to get to a position where the project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the project.

6.4 Limitations and the uncertainties of the impact assessment methodology

The following aspects are considered as limitation and the uncertainties which may be involved in the impact assessment process;

- All the potential environmental aspects have been predicted and assumed for the proposed project development hence they may differ in the natural context such as site conditions and uncertainties in scales and magnitude.
- Expert judgement and professional opinion of the ESMP consultant were enhanced using the existing EIA reports of similar nature, however due to the unique nature of coastal processes,

lagoons and reef system in the Maldives each island is unique. Hence the predicted environmental impacts may vary from island to island.

6.5 Justification for the Methodology used

There are many various methodologies used for impact assessment in environmental context. One of the most commonly used methodologies include check lists and matrices such as Leopold Matrix (Lohani et al., 1997) The Leopold matrix was conceived by geologist Luna B. Leopold and his colleagues in 1971, as a response to the US Environmental Policy Act of 1969, which didn't give clear instructions to the Federal Government agencies for preparing an impact report or for examining the environmental effects of the projects that an agency plans. The Leopold matrix addressed this challenge by 'providing a system for the analysis and numerical weighting of probable impacts' (Josimovic et al., 2014).

According to the Leopold matrix method, ESMP should consist of three basic elements:

1. a listing of the effects on the environment that the proposed development may induce, including the estimate of the magnitude of each of the effects;
2. an evaluation of the importance of each of listed effects (e.g., regional vs. local); and
3. a summary evaluation, which is a combination of magnitude and importance estimates.

The impact assessment method used in this report is a matrix which is derived from the Leopold Matrix however this method uses a colour code to assign the significance level of each predicted impact. This method has been adapted from the Environmental Resource Management (2008).

Leopold Matrix is an effective impact assessment methodology which has been extensively used by EIA practitioners across the world. The colour coding enhance Leopold Matrix further. Since ESMP is a technical report which are read by both technical experts of different field as well as the general public, the colour coding of the significance level will enhance the report in a manner which would be easily comprehended by general public and people with no technical expertise in this field.

6.6 Impact Prediction

The environmental impacts of the proposed establishment of IWRMC in M. Mulah project are predicted in this section of the report by using a simple descriptive matrix. The following matrix distinguishes the types of environmental impacts that may be associated with various project actions on key environmental components and distinguishes whether these are impacts during construction period or during post-construction and operations period.

The following **Table 19** predicts the nature and types of environmental impacts based on the existing environmental condition of the islands and the surrounding environment;

Table 19: Impact Identification matrix for proposed establishment of IWRMC in M. Mulah

	Natural Environment				Social Environment			
Project Activities	**Reef and Coastal Environment**	**Soil and groundwater**	**Lagoon and seawater**	**Air/Noise**	**Services and Infrastructure**	**Health and Safety**	**Employment**	**Costs to consumer/tax payer**
Construction Phase								
Influx and settlement of workers for the project construction activities (flora and fauna, resource use and sociocultural impacts)	Waste produced by the workforce may be affect reefs if not properly disposed via existing solid waste management regime. However, this impact is anticipated to be short term and work force will be few expatriate workers due to small nature of the project.	Increased burden on groundwater resources since workforce will utilize groundwater for various purposes. However, this impact is anticipated to be short term and work force will be few expatriate workers due to small nature of the project.	No significant impact	No significant impact	The expatriate workers and workers from other islands will relay of the existing services and infrastructure to meet their basic needs hence extra burden of the existing services and infrastructure. However, this impact is anticipated to be short term and work force will be few expatriate workers due to small nature of the project.	No significant impact	Expatriate workers and workers from other island will decrease the chance of employment for residents of M. Mulah	No significant impact
Transportation of materials. (climate	Potential oil spill from the cargo boat	Operation of vehicles on unpaved road	Potential oil spill from the cargo	GHG emissions from the	Unpaved roads in the island may be	Temporar y deteriorat	No significant impacts	Remediation of road may require public

impacts, and impacts on roads)	and during transport of material.	may lead to soil compaction.	boat and during transport of material.	transportation processes and operation of vehicles may deteriorate air quality for short period of time.	affected due to operation of vehicles and harbour will be utilized for unloading the construction material.	ion of air quality to operation of vehicles.		finance but heavy vehicles will not be used for construction phase.
Site demarcation and clearance (Impacts on flora and fauna)	No significant impacts	Removal of vegetation may cause temporary flooding at the project site during rainy season.	No significant impacts.	No significant impact.	No significant impact	No significant impact.	No significant impact	Compensation will be provided to any plant removed in the project site. But no large trees were found at the project site.
Impacts from construction works (air quality, noise and vibration, accidents and injuries, pollution from material storage)	Minor vibrations are anticipated due to construction activities, however, the project locations is far from the	Oil spill during from vehicles and maintenance works may affect the groundwater quality. Pollution from material	No significant impact	Utilization of vehicles and tools which uses fossil fuel is expected to deteriorate the air quality at the vicinity	Minor vibrations near the project site.	Noise pollution at the project site and residential areas in close vicinity to the	No significant impact	No significant impact

	house reef of the island.	storage may affect the groundwater quality		of the project site.		project site.		
Terrestrial pollution from construction waste generation	No significant impact	Potential contamination of groundwater due to construction waste generated.	No significant impact	No significant impact	Since there are no established IWRMC in the island the construction waste will be managed on site at project location.	No significant impact	No significant impact	No significant impact
Impacts from resource use	No significant impact	Water used for construction works will be rain harvested or obtained from the existing resources in the island hence no impact on groundwater quality is anticipated	No significant impact	Electricity will be obtained from the existing grid of the island hence increase of GHG emission due to increase in power demand.	Electricity and water will be obtained existing systems in the island which may increase the burden of the existing system of the island.	No significant impact	No significant impact	No significant impact
Operational Phase								
Waste collection and transportation (Climate impacts, air quality, amenity impacts)	Establishment of waste collection bins, collection	Seepage of leachate from existing dump sites will be prevented	Establishment of waste collection bins, collection	The air quality of the island is expected to improve due	IWRMC will be additional infrastructure contributes to	Beneficial health impact due to improved	The IWRMC would employ locals for its operation.	The council intends to collect a fee for sustainable

	service and transportation will decrease dumping of waste to lagoon environment.	and is expected to improve groundwater quality at the dumping sites over time.	service and transportation will decrease dumping of waste to lagoon environment.	to reduce open burning and accidental fires at dump sites.	the island development. The amenity of the island will improve due to lack of dumping sites around the island.	air quality and reduces pests such as rodents	More farmers could utilize the compost prepared in the IWRMC	operation of IWRMC
Waste management activities (Public health, noise, groundwater, fire, accidents, odour impacts)	No significant impact	Public health impacts may be localized due to increase in house flies and rodents near the project area.	No significant impact	Temporary air quality deterioration due to accidental fires. Odour impacts may be felt at the vicinity of the project site.	Waste collection and transportation may affect other services if collection is done during the day.	Public health impacts may be localized due to increase in house flies and rodents near the project area.	Compost generated from OWC machines can be used readily for gardening and farming purposes.	Compost generated from IWRMC will be sold.
Waste generation (terrestrial pollution, groundwater contamination)	No significant impact.	Leachate may seep and contaminate groundwater during a flooding event. The leachate tank will prevent this in normal circumstances.	No significant impact	No significant impact	No significant impact	Indirect impacts of groundwater contamination	No significant impact	No significant impact

		If not properly de-slugged the sewerage may seep into group water and lead to groundwater contamination.						
Resource consumption (water and electricity)	No significant impact	Groundwater may be utilized for the operational purposes which will have impact on the contribute to saltwater intrusion to groundwater lens.	No significant impact	No significant impact	The electricity required for IWRMC operations will be obtained from the existing electricity grid of the island which put additional burden on the power needs of the island.	No significant impact	No significant impact	No significant impact

The above table illustrates project activities both during the construction and operational phase. The impacts of these project activities are predicted both for the biophysical environment of M. Mulah is also shown the **Table 19**. The following **Table 20** is a summary of project activities which has the greatest impact on both natural and social environment respectively. It can be noted that some of these impacts are considered to be positive.

Table 20: Main anticipated impacts for Establishment of IWRMC in M. Mulah

Phase of the project	Natural Environment	Social Environment
Construction Phase	• Influx and settlement of workers for the project construction activities (Negative Impacts) • Transportation of materials. (Negative Impacts) • Site demarcation and clearance (Negative Impacts) • Impacts from construction works (Negative Impacts) • Terrestrial pollution from construction waste generation (Negative impacts) • Impacts from resource use (Negative impacts)	• Influx and settlement of workers for the project construction activities (Negative Impacts) • Transportation of materials. (Negative Impacts) • Site demarcation and clearance (Negative Impacts) • Impacts from construction works (Negative Impacts) • Terrestrial pollution from construction waste generation (Negative impacts) • Impacts from resource use (Negative impacts)
Operational Phase	• Waste collection and transportation (Positive and Negative Impacts) • Waste management activities (Negative and Positive impacts) • Waste generation - terrestrial pollution, groundwater contamination (Negative impacts) • Resource consumption (water and electricity) (Negative impacts)	• Waste collection and transportation (Positive and Negative Impacts) • Waste management activities (Negative and Positive impacts) • Waste generation - terrestrial pollution, groundwater contamination (Negative impacts) • Resource consumption (water and electricity) (Negative impacts)

6.7 Description of impacts

6.7.1 Construction phase

6.7.1.1 Influx and settlement of workers for the project construction activities

A large number of work force is not expected for the project. An estimated 10-15 workers will be required for this project. Since resource consumption, waste generation and behavior related impacts on the environment are likely to have an incremental increase with additional people to the island. However,

even though minor workers related negative impacts can range from damage to flora and fauna of the island, impacts associated with resource utilization, waste generation and potentially negative social impacts. On the other hand, even though small, more people to the island could have a positive effect on the local economy.

The main impacts predicted on the bio-physical environment include;

- Waste produced by the workforce may be affect reefs if not properly disposed via existing solid waste management regime. However, this impact is anticipated to be short term and work force will be few expatriate workers due to small nature of the project;
- Increased burden on groundwater resources since workforce will utilize groundwater for various purposes. However, this impact is anticipated to be short term and work force will be few expatriate workers due to small nature of the project.

The main impacts predicted on the socio-economic environment include;

- The expatriate workers and workers from other islands will relay of the existing services and infrastructure to meet their basic needs hence extra burden of the existing services and infrastructure. However, this impact is anticipated to be short term and work force will be few expatriate workers due to small nature of the project;
- Expatriate workers and workers from other island will decrease the chance of employment for residents of M. Mulah

The following are the mitigation measures proposed;

Mitigation for impacts on flora and fauna

- The contractor is required to keep the workforce as minimum as possible, and to not bring in any surplus workers for the project;
- the project island currently has vacant properties as well as rooms to let in houses, which can easily house the influx of 10-15 workers. Therefore no new facilities will be made for the accommodation of the workers in order to avoid clearing of land or spending resources unnecessarily for making worker quarters;
- all construction workers and persons on site must be given specific instructions not to catch or harm birds and animals allow them to retreat into undisturbed areas and prohibit damaging vegetation that are not;
- rules shall be formulated by the contractor and workers shall be oriented on the rules and conduct during the project works;
- enclosed containers shall be provided to dispose of waste oil and other hazardous waste;
- workers shall be given instruction not to catch or harm any birds or animals present on the island, and not to damage any vegetation that is not already sanctioned for removal within the demarcated site bounds;
- littering shall be prohibited; and
- waste bins shall be placed within the site.

Mitigation for impacts on resource use

- Reducing, reusing and recycling of resources shall be encouraged through proper monitoring of worker activities and awareness; and
- Keep workforce to the minimum required.

Mitigation for sociocultural impacts

- hire local workers where possible;
- orient foreign workers on communication, personal hygiene and sanitation and infectious diseases; and
- ensure all foreign workers have their legal permits.

6.7.1.2 Transportation of materials

Transportation of construction materials from the source to the project island is identified as an activity with climate impacts, through the transportation of sea vessels, as well the transportation of the materials on land. The use of vessels and vehicles would require burning of fossil fuels which result in the release of greenhouse gases (GHG) into the atmosphere. The fuel usage of a supply barge is estimated at 1.3 kWh /t. As a general rule the longer distance would mean more fuel burnt and more GHGs produced. As the resource sourcing hierarchy in **Figure 17** shows, the greatest importance shall be placed on sourcing any available materials from within the island, with the next option being from within the region. Next in the hierarchy is Male' and the industrial areas in the zone, from where majority of the remaining materials can be sourced. Lastly, in cases where a proposed material cannot be obtained from within the country, only shall the contractor procure the material from a neighboring country which is not likely due to relatively small volume of material requirement and commonly available nature of those. The multi-criteria impact magnitude for this activity was -22, which meant that it will have a moderately negative impact.

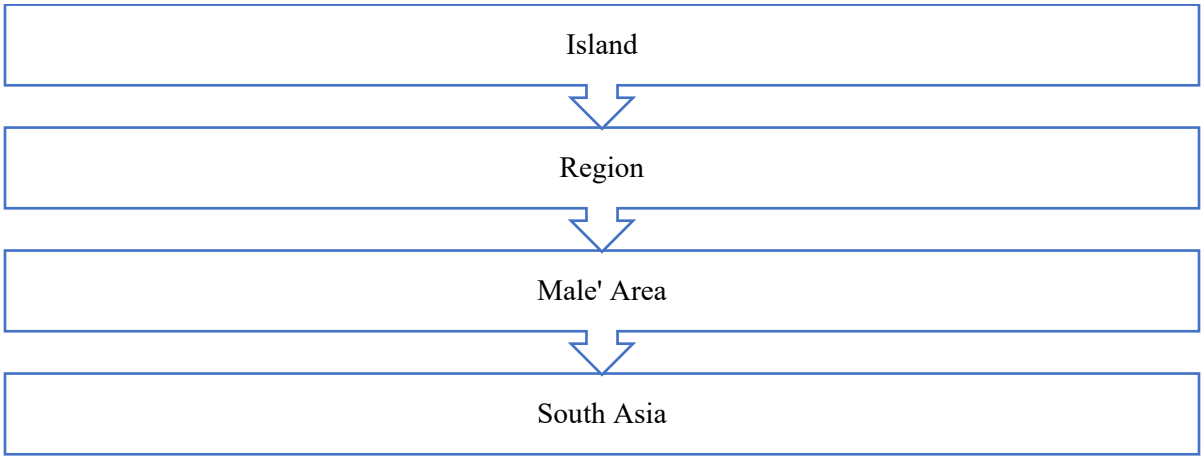


Figure 17: Material sourcing hierarchy proposed for the project (Adapted from Saleem 2018)

Along with the reduction in travel distances by choosing a close source, the number of trips to be made can magnify the distances travelled. The Proponent has produced the Bill of Quantities (BoQ) for the project works, which enables the contractor to purchase the required amount of materials in bulk, reducing the number of trips and wastage of materials. While the sea transport is expected to have the greatest impact of released GHG, the transport on land is expected to be minor, due to the short inland travel distances within the island.

The inputs of the project elaborated in the **Chapter 3** show the estimated amount of resources that will be used for the project. The use of resources for the project can have indirect impacts of GHG emissions from the production process. The main materials used in this project include concrete, reinforcing steel, structural steel, in addition to PVC pipes. Defra / DECC (2012) states that for every tonne of concrete casted, 135 kg of indirect CO_2 emissions result. Due to the small scale of the construction, the estimated indirect CO_2 emissions from material usage are minimal for this project.

The use of heavy vehicles on unpaved roads can cause compaction of the soil by the force applied by the tires of the vehicles. This can lead to the destruction of the soil structure, reduction of porosity, and thus reducing the water and air infiltration into the soil. The resulting soil is dense with few large pores and poor internal drainage (Wolkowski & Lowery, nd.). Roads impacted with the traffic from heavy vehicles can thus result in undulations and puddling.

Figure 18: Impact on roads from heavy vehicle transport in an island in Maldives (Adapted from Saleem 2018)

For the purpose of construction, no heavy vehicles are proposed. Although this is the case, a pickup truck will be used to transport the construction materials to the site, in addition to yard waste and construction waste from the site. The vehicle is not expected to cause major impacts on the road, force applied by the

pickup truck is expected to be lower than heavy vehicles and plant. The number of trips required are also reduced in the case of the proposed project, due to the small scale of construction.

Other impacts on roads due to transportation include the generation of dust during transportation, which can lead to impacts on the local air quality especially during dry weather. In addition to this, littering of construction materials from uncovered transportation vehicles can cause terrestrial pollution and amenity impacts.

The main impacts predicted on the bio-physical environment include:

- Potential oil spill from the cargo boat and during transport of material;
- Operation of vehicles on unpaved road may lead to soil compaction;
- GHG emissions from the transportation processes and operation of vehicles may deteriorate air quality for short period of time;

The main impacts predicted on the socio-economic environment include:

- Unpaved roads in the island may be affected due to operation of vehicles and harbour will be utilized for unloading the construction material;
- Remediation of road may require public finance but heavy vehicles will not be used for construction phase;

The following mitigation measures proposed:

Mitigation for climate impacts

- Sourcing of materials shall be done according to the hierarchy presented in **Figure 17**. Materials shall be obtained from the closest source;
- The materials shall be bought in bulk and transported to the island within a single trip where possible;
- Detailed BOQ has been produced by the Proponent, which shall be followed by the contractor when purchasing materials in order to reduce wastage of materials as well as the number of trips;
- The materials shall be stored on the project site to eliminate transportation of vehicles within the island throughout the construction phase;
- Idle time of the vehicles shall be avoided in order to reduce emissions;
- contractor shall use serviced vehicles and plant equipment for the project;
- contractor shall only use the needed amount of vehicles and plant for project; and
- vehicle used for the purpose should comply with the roadworthiness requirements of the Transport Authority and display the compliance stickers.

Mitigation for impacts on roads

- The contractor shall only bring in the necessary number of vehicles and plant to the island for the project;
- it shall be stated in the contract that any damages to the roads from transportation of construction materials and machinery shall be assessed after the civil works are completed, and the damages shall be repaired by the contractor;
- use the closest route from the harbor area to the site;
- cover the materials being transported to and from the site; and

- spray water on the road surface during dry periods to suppress dust.

Mitigation for accidents and injuries

- Vehicle drivers shall be licensed and competent;
- loads being transferred shall be fully secured; and
- transportation shall be done during day time as far as possible; and
- speed limits shall be observed when operating vehicles especially in residential areas.

Mitigation for marine and terrestrial pollution

- contractor shall clean any littering on the terrestrial or marine environment caused during transportation; and
- contractor shall enforce strict policy against littering and appropriate penalties; and

6.7.1.3 Site demarcation and clearance

During the construction phase among all activities expected to take place, vegetation clearance, by far, is expected to have the most negative effect on the environment. It is estimated that 45 mature palm trees will be removed from the island in order to clear the IWRMC plot under the scenario where no actions are taken to mitigate or salvage trees falling onto the direct footprint area of IWRMC plot.

Overall, the multi-criteria impact magnitude for this activity was -40, which meant that it will have a major negative impact. Trees will be removed for creating space for the waste management center. Approximately 0.4% of the existing vegetated area will be removed as part of this project. Although in relation to the island the percentage is considered small, the impact has been considered to be significant due to the absolute number of commercially important coconut trees that need to be felled. In addition removal of vegetation will inexorably change the natural façade of the island and adversely affect its natural ambience in relative proportion. Consequently, reduction of habitats available for nesting and roosting birds and endemic bat is expected. Cutting down of trees will destroy any nests on trees and will directly affect invertebrates and microorganism that live on the trees. Clearance of undergrowth will affect microorganisms and micro-climate of the area. These impacts however, will not result in the loss of any significant animal species, and birds and bats may get adjusted to the changing environment and may avoid areas of heavy disturbance and occupy less disturbed areas of the island or move to another island nearby. Earthworks such as trenching and digging will alter the habitat impacting the structure of soil and organisms that occupy the affected area. Land clearance will also involve removal of undergrowth which will be stockpiled and burned. Trees that require removal shall be labeled and identified during the site demarcation.

The environmental impacts to the island resulting from the removal of trees can include, damage and death of trees. Loss of trees can directly affect the nests and nesting birds on such trees and destroy habitats for invertebrates that live on trees. Tree removal can alter the visual landscape of the island. Trees provide numerous eco-system services. They help reduce, storm water runoff, wind penetration and air pollution. Trees, prevent and reduce soil erosion which is one of the major issues currently faced by Maldivian islands. Trees maintain groundwater quality, and keeps the land fertile. Removal of trees, could increase surface salinity of groundwater. They are a habitat for animals and act as a food source.

They enrich soil nutrient, facilitating growth of different types of trees. Maldivian soils are generally weak in nutrient. The typical concentration of total nitrogen in soil samples tested in Maldivian islands hovered at 1140 mg/kg (ALS Scandanavia AB, 2015). Nitrogen content decreased rapidly, at the bottom soil layer where, concentration hovered at 209 mg/kg. Hence removal of trees would reduce the thickness of organic topsoil. Addition of fill material which usually consists of coralline sand and rubble to cover root bulb cavities and use of fill material to level the road would further deplete the organic top soil and interfere with the natural bioturbation of the soil. Since the root systems of coconut palm trees are embedded deep into the ground, removal of the root system may expose the groundwater below, which will be sensitive to pollution (Meerow & Broschat, 2003).

Forests and tree plantation crops are particularly important as carbon reservoirs because trees hold much more carbon per unit area than other types of vegetation (Lasco et al., 2002; Lamade & Bouillet, 2005). Coconut, being a perennial tree crop with 50-60 years of economic lifespan, has a potential to act as a carbon sink (Jayasekara & Jayasekara, 1995); (Ranasinghe & Silva, Photosynthetic assimilation, carbohydrates in vegetative organs and carbon removal in nut-producing and sap-producing coconut palms, 2007) and their potential to sequester carbon and the net carbon exchange rates were found to be in the range of 0.4 –1.9 Mg C ha^{-1} $month^{-1}$ (Ranasinghe & Thimothias, Estimation of carbon sequestration potential in coconut plantations under different agro-ecological regions and land suitability classes, 2012). In this regard, removing mature trees imply reducing the potential of the island's vegetation to act as a carbon sink.

Palm trees hold cultural and economic value. Coconut palm tree is a national symbol which is integrated to the national identity. All parts of the coconut palm tree are utilised in the Maldives. They provide wood for construction, leaves for shelter and fruits as food and fibre for rope making.

The method proposed to remove trees has inherent risks which may result in accidents. If trees are not removed with precaution they may potentially damage adjacent plants/equipment/people. Secondary impacts of the activity include air pollution and propensity for accidents as a large excavator will be used to remove trees. Health implication are also prominent as there is a risk of falling trees/coconuts and accidents due to electric saws which will be used to separate the crown and root.

The project will however not result in a loss of protected species or have an effect on threatened or rare plant species.

Although removal of trees and associated activities are considered to have the highest degree of negative impacts of all the activities that are planned under the proposed project, most of these can be reduced to an acceptable level through appropriate mitigation measures proposed in the report. Since the most significant impact of the project is expected from the removal of trees, all necessary measures shall be in place to minimise the number of trees that are removed and to salvage as many trees as possible by making arrangements to relocate them.

Mitigation Measures to Reduce Number of Trees Targeted for Removal

- During the initial set out survey, mark the limits of the plot as accurately as possible to avoid damaging or removing trees not intersecting with the plot.
- In site clearance works the priority shall be given to minimise the trees removed or felled by minor adjustments that could be brought in marking the final boundaries of the plot as well as the road.

- In the case of those trees that require absolute removal priority shall be given for relocation.
- For those trees that cannot be relocated for various reasons shall be checked for their suitability as timber or firewood;
- For each tree that is felled, two new trees of the same type shall be planted; and
- Considering a tree as waste shall be considered when all the above options have been exhausted.
- A thorough tree survey shall be carried out to ensure only those trees that are absolutely required for uprooting is removed from the island;
- once the trees have been identified and marked as requiring removal, all trees suitable for re-location shall be identified. Relocation of trees shall be prioritised as illustrated in Figure 19**.**

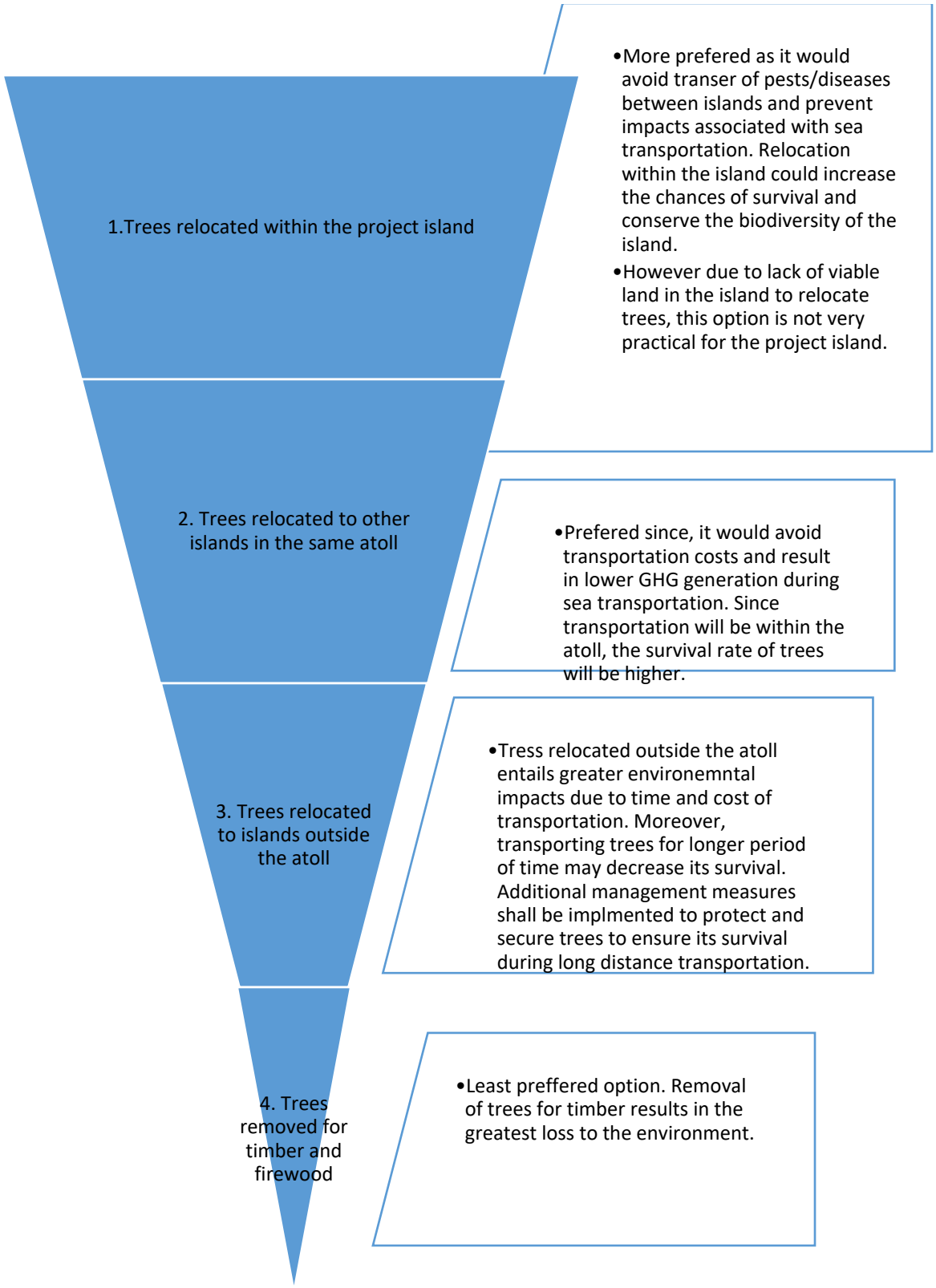


Figure 19: Preferred steps of relocation and removal of trees

- minimise the transfer time and enhance tree survival;
- strict supervision shall be in place during the tree removal works to ensure only the intended trees are removed;
- method prescribed for removing the tree in **Section 4.1.1.3** shall be followed;
- method prescribed for replanting trees in Figure 20 shall be followed; and
- all records of trees removed and their end use shall be kept and monitored.
- Social impacts shall be mitigated by following the steps illustrated in **Figure 18**.

Mitigation Measures to Minimise Social Impacts

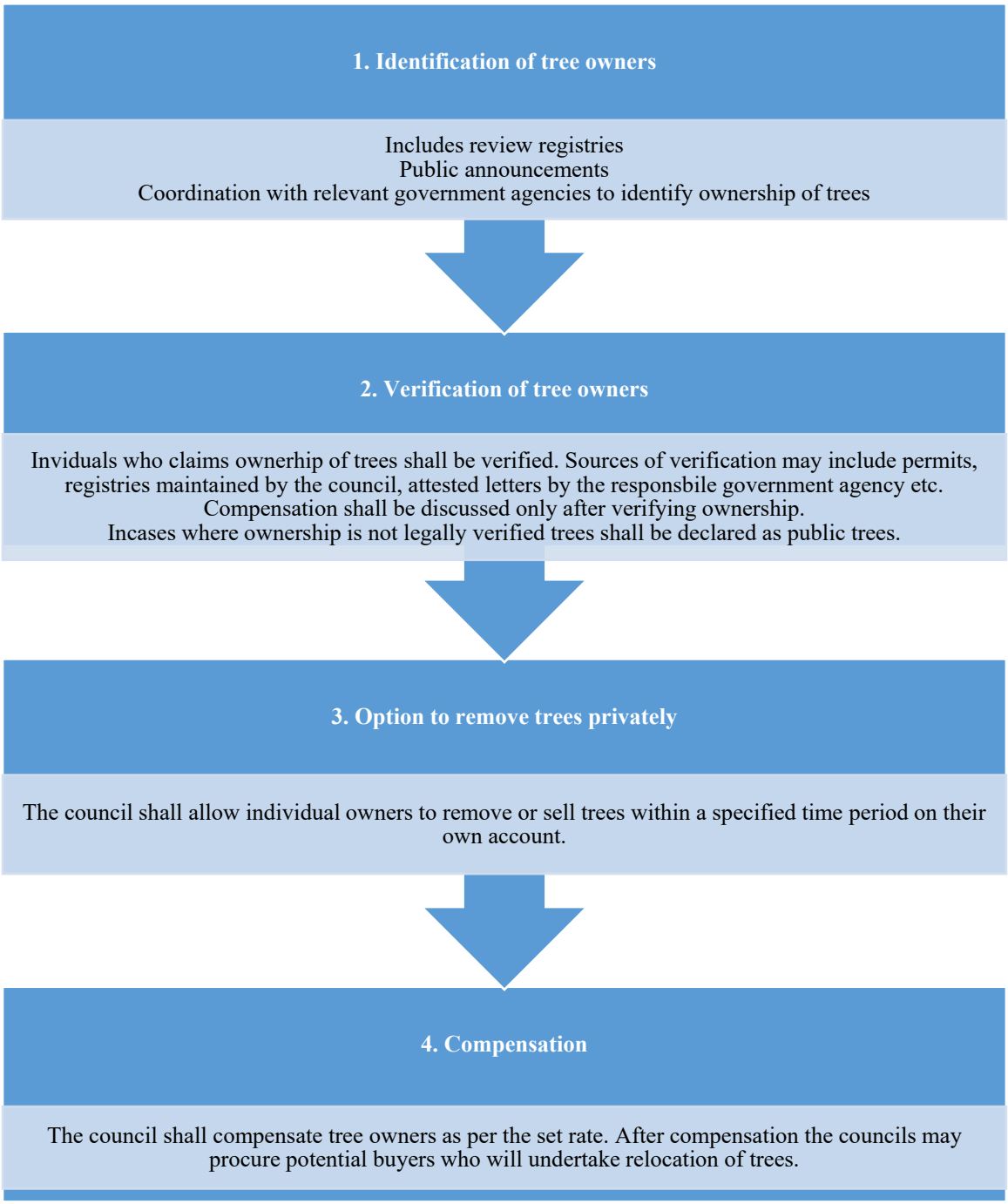


Figure 20: Social Impact Mitigation associated with removal of tree

6.7.1.4 Impacts from construction works

There are a number sub-activities that can affect the environment related to construction of the IWRMC. Overall, the multi-criteria impact magnitude for this activity was -30, which meant that it will have a moderately negative impact.

Material Storage

At the initial stage all resources required for the construction of the site will have to be procured and stored. These include construction materials, vehicles, machineries, fuels, and tools required for IWRMC construction. Due to the nature of the project, even though a large volume of construction materials are not required care must be taking in storing materials to avoid any potential damages to the environment. The improper siting of stockpiles and storage of sand, gravel, cement, fuel, etc., at the construction sites could lead to fine materials being lost, damaged during heavy rainfall events. This would not only represent a waste of resources but could also be a cause of project delays. Hazardous and flammable materials (e.g. fuel, paints, thinner, solvents, etc.) improperly stored and handled on the site are potential health hazards for construction workers and spilled chemicals would have the potential to contaminate soil and inhibit plant growth in localized areas.

Mitigation for material storage impacts

- Safe storage area should be identified and retaining structures put in place prior to the arrival and placement of material;
- the stockpiling of construction materials should be done in a such a way that the materials are not exposed to weather conditions and are properly controlled and managed by the site supervisors; and
- hazardous chemicals (e.g. fuels) should be properly stored in appropriate containers and these should be safely locked away. Conspicuous warning signs (e.g. 'No Smoking') should also be posted around hazardous waste storage and handling facilities.
- equipment shall be stored in fenced areas and maintained appropriately during the course of the project and no new such facilities shall be developed for the purpose of the project;
- National Fire Code (NFC) shall be strictly followed while handling, transporting and storing fuel. Inflammable goods such as fuel drums, portable fuel containers and cleaning solvents and chemicals will be closed off from public access.
- portable extinguishers placed to be readily available when someone finds a fire;
- fuel should be stored in well contained barrels and place over a concrete. This is to contain oil spills during storage and to prevent infiltration of oil into soil; and
- tool shed shall be locked and all the equipment, vehicles and tools must be accounted for.

Noise and vibration

It is important to identify the sources of noise and vibrations and the intensity of such impacts on the project island. The noise and vibration impacts are expected to be moderate as the nearest residential area to the project site is more than 42 m away.

The main source of noise from the construction phase of the project will be from the engines used in the machinery and vehicles. No high impact works such as pile driving or demolishing structures are part of

the proposed construction, therefore the impact noise is not a major source of noise pollution for this project. Typical noise level of construction equipment are detailed below:

Table 21: Typical construction equipment and their noise levels 50ft from the source

Equipment	Typical Noise Level (dBA) 50ft from source
Concrete mixer	85
Concrete pump	82
Concrete vibrator	76
Pump	76
Saw	76
Shovel	82
Tie Cutter	84
Truck	88

Assuming the highest noise produced during construction is at 85 dBA, a noise decay calculation was done using initial assumptions without factoring for dampening effects due to obstacles and vegetation. From the initial calculations, the noise levels are projected to decrease down to less than 73 dBA at the nearest residential area.

Noise during construction is determined to be a short-term negative impact. Due to the distance of the project site it is identified that noise impacts will be minimal to the residential zones, while the construction workers will be most affected by the noise impacts.

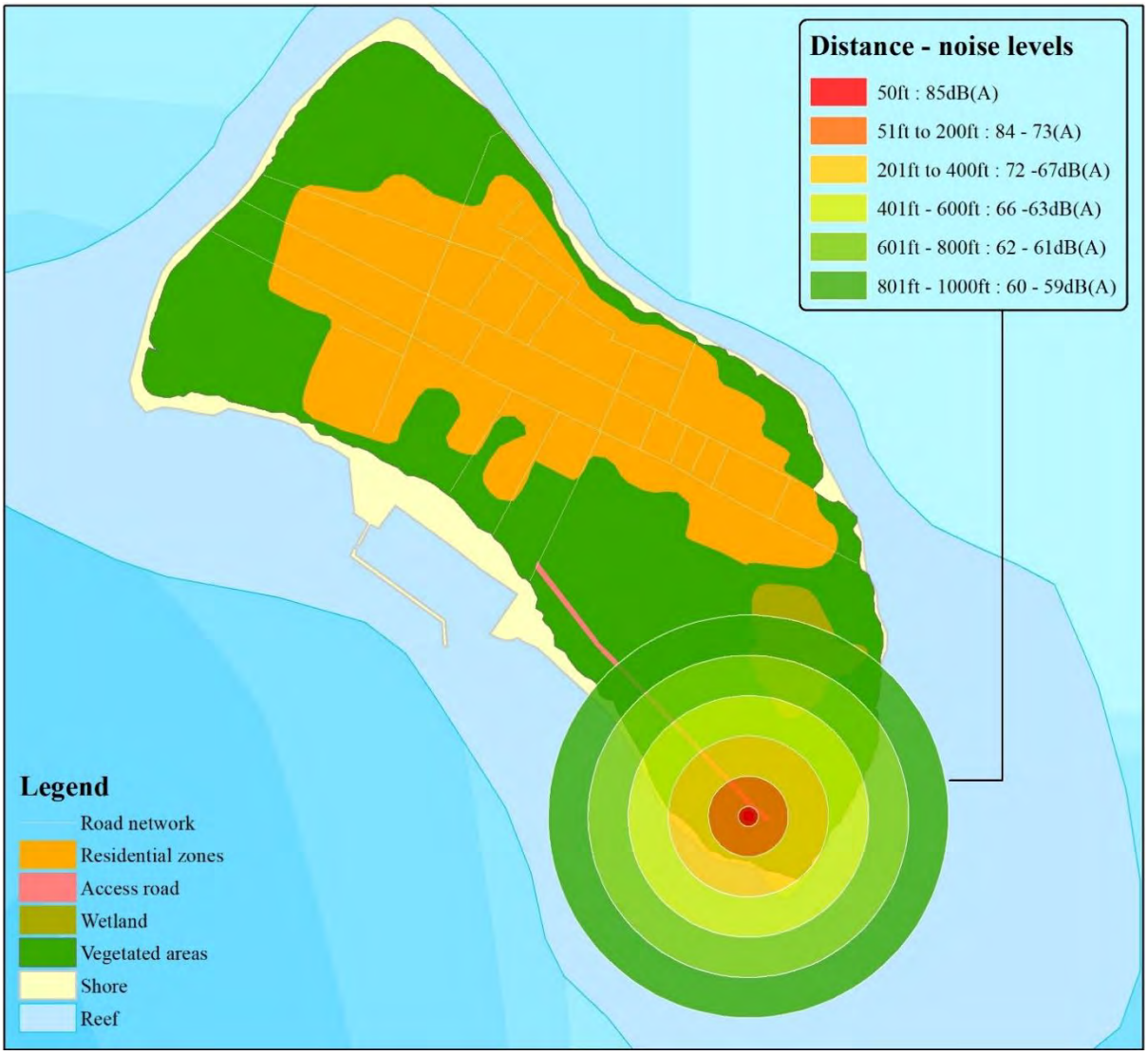


Figure 21: Noise range map for M. Mulah (adapted from Saleem 2018)

Mitigation Measures

- Confine construction activities to day time, from 8 am to 6 pm. Ensure no construction activities occur during night time; and
- Use of earmuffs by workers during operation of heavy machinery.

Impact on vegetation

No large trees are to be removed as part of this project. Careless workmanship may result in damages to the vegetation during movement of materials and other project related activities during the construction phase.

Mitigation Measures

- Workers shall be informed to avoid damaging trees and disturbance to animals and to generally avoid engaging in destructive activities to the environment intentional or unintentional.

Accidents and injuries

For a construction project of this nature there can be a number of causes that can result in accidents and injuries to workers. Hence it is imperative to identify and put in measures to avoid accidents and injuries to workers during construction phase. Some of the likely causes include:

- inhalation of cement during the site cast and pre-casting of concrete: inhaling high levels of cement dust during construction can be irritating to the nose and throat. Prolonged exposure to cement dust can result in silicosis (CSAO, 2001);
- contact with concrete mix: concrete has caustic, abrasive and drying properties and prolonged contact with concrete allows the alkaline compounds such as calcium oxide to burn the skin;
- wet concrete trapped against the skin can cause first, second, or third degree burns;
- falling of heavy objects: constructions sites are prone to falling of heavy objects which can be fatal to workers;
- falls: workers may be under the risk of falling into open pits, trenches and seriously injuring themselves;
- Bodily injuries due to manual lifting of heavy items; and
- being struck by moving equipment and vehicles.

Mitigation measures

For all works the following safety measures will be required during the construction phase.

- Appropriate PPE will be worn at all times. This will typically include hard hats, eye protection,
- protective trousers, gloves and reflective clothing, hearing protection, masks and wet weather clothing as appropriate;
- first aid kit will be on site at all times;
- all plant will be operated by competent certified operators. Plant to be inspected regularly;
- have the appropriate certification;
- manual lifting operations will be kept to minimum by the use of mechanical means;
- site visitors should not be generally allowed to work site except when its essential in such cases shall be accompanied at all times and required PPE shall be provided;
- provide first aid services in the site;
- proper signage and fencing should be provided around the site;
- carry out works during good weather;
- well trained personnel to use machinery and vehicles;
- avoid transportation during night; and
- Securing any loads on vehicles during transportation.

6.7.1.5 Terrestrial pollution from construction waste generation

Solid waste generated during IWRMC construction work would negatively impact the site and surrounding environment if not properly managed and disposed of at an approved dumpsite. Overall, the multi-criteria impact magnitude for waste generation was -30, implying that it will have a moderately negative impact. Waste burned onsite would generate smoke, possibly impacting negatively on ambient air quality and human health. Solid waste, if allowed to accumulate, could cause localised conditions conducive to the breeding of nuisance and health-threatening pests such as mosquitoes. Poor construction waste management constitutes a short-term, possibly long-term, negative impact.

Vehicle, equipments and tools maintenance works will likely be the primary source of chemical wastes during the construction period. The majority of chemical waste produced is therefore expected to consist of waste oils, solvents and used batteries. Typical wastes may include the following:

- Solid wastes (Empty fuel/lubricant drums, used oil/air filters, scrap batteries, vehicle parts);
- and
- Liquid wastes (waste oils/grease, spent solvents/detergents and possibly spent acid/alkali from batteries maintenance).

However, the amount of chemical and hazardous waste produced will not be significant. Other construction waste includes, packaging, concrete, wood and steel in minor quantities.

Municipal wastes are also expected to be generated during the construction phase by the workers comprising of food wastes, packaging wastes and waste paper.

The amount of human waste generated per person is approximately 125 g/day, which means 1.9 kg will be produced daily if approximately 15 workers were active which equates to discharge of approximately 2,550 l/day of waste water. Sewage will be managed through existing septic tank systems that have been installed in the island.

Since there is no existing waste management system in the atoll and since there is no waste management practice in the island to accommodate the construction waste generated, the environmental receptors will have a significant burden from construction waste. Some of the hazardous oils if not disposed properly may cause health implications to the people and vegetation.

The main impacts on the bio-physical environment include;

- Potential contamination of groundwater due to construction waste generated.

The main impacts on the socio-economic environment include;

- Since there are no established IWRMC in the island the construction waste will be managed on site at project location.

Mitigation Measures

- avoiding cooking and eating at work site to eliminate food waste and kitchen waste. Hence food for workers can be arranged with existing services on the island;

- reusable inorganic waste (e.g. excavated sand) should be stockpiled away from drainage features and used for in filling where necessary;

- regular sweeping of the of the worksite to collect litter, empty cans etc which could become breeding ground for mosquitoes and other pests;
- open defecation whether it's on land or on the beach shall be prohibited;
- appropriate general site cleanliness related signboards could be placed on the worksite to give workers reminders on good waste management practices;
- ensure to reduce waste by following the 3R steps; and
- waste collected shall be transported to nearest waste management facility after the construction works have ended.

6.7.1.6 Impacts from resource use

As shown in the BoQ for the project various types of construction related resources are required for the project. Consumption of goods impacts the environment in many different ways. For instance materials used for the project would contribute, directly or indirectly through the product lifecycle, to climate change, pollution, and biodiversity loss and resource depletion locally or elsewhere in the world. The most important resource as far as the current project is concerned would be the allocation of land for the site. For the purpose of developing the waste management center at least 735 m^2 of land would be required which represent 0.8% of the existing area. Allotting a plot of land for waste management with permanent concrete structures developed would essentially will result in a loss of the options for alternative land use and thus represents an irreversible commitment of land resources. The loss of optional uses for the allocated land although is inevitable is considered a negative impact. Other resources required would include sand, water, power and construction materials required for the IWRMC development. Since the resource utilization is considered to be relatively small, and that it is not expected to significantly contribute to deplete the natural resources and would be a major source of GHG emission, the multi-criteria impact magnitude for this activity was -22, which meant that it will have a moderately negative impact.

Since it would be very difficult to precisely determine by how much exactly the current project would contribute to the depletion of each type of various natural resources required for the project at local and global levels and by how much it would have contributed to global climate change, general impacts that are normally associated with natural resource use can be applied in relative terms for the project.

The main impacts on the bio-physical environment include the following:

- Water used for construction works will be rain harvested or obtained from the existing resources in the island hence no impact on groundwater quality is anticipated;
- Electricity will be obtained from the existing grid of the island hence increase of GHG emission due to increase in power demand.

The main impacts on the socio-economic environment include

- Electricity and water will be obtained existing systems in the island which may increase the burden of the existing system of the island;

Mitigation Measures

- Resource conservation shall be given a high priority in all stages of project development through bulk purchasing, putting in place measures to avoid wastage, encouraging reuse and recycling;
- initiate rainwater collection and storage as early as possible into the project construction;
- careful store management and record keeping on use of materials;
- reduce idle time for vehicles and equipment's and switching off after use;
- use well maintained, energy efficient equipment and lights;
- sand shall not be mined from beaches and lagoons of the island for construction purposes, if coral sand is used it should be obtained from a government approved location;
- materials that are locally available shall be obtained as such instead of opting to bring those after a long haulage;
- materials shall be procured in bulk as much as possible;
- utilize day time hours for the construction when plenty of light is available; and
- FENAKA power supply will be used for electricity generating purposes.

6.7.2 Operational Phase Impacts

6.7.2.1 Waste collection and transportation

As stated in this report, waste management is a pressing issue at the island with a high rate of waste generation and lack of resources and budget to properly manage the waste. Until recently, there was no area to dump waste and locals usually burnt and buried their waste in different areas of the island. The island council has now selected a specific area for dumping waste which is utilised by all the islanders. This area is not demarcated. The practice of open burning of waste also takes place resulting to potential respiratory issues from the inhalation of smoke. A reliable, affordable and locally appropriate transport system is critical to collecting waste from houses, businesses and institutions. Equally important is an arrangement for marine transport to remove residual waste from the island in order to make the system complete and effective. The successful implementation of the IWRMC together with land and marine transfer arrangement are two important aspects to implement Waste Management Plan to make the island cleaner and healthier for the people to put a stop to littering and burning of waste in the island. This will lead to the improved health and psychological well-being of the residents and visitors of M. Mulah. It has been identified as a long term positive impact on the residents and visitors of M. Mulah.

The Council is considering to repair the previously used vehicle for the purpose of collecting and transporting the waste within the island daily, at a set schedule. At the moment there is no specific arrangement for marine transfer of residual waste from the island although by the time IWRMC is complete it is expected to have this arrangement in place.

While both land transport and marine transfer of waste are expected to have significant positive impacts, unregulated transport arrangements can result to environmental issues. If not properly managed likely environmental impacts include, noise, hardening of road surface, creation of puddles during wet season, and littering on the roads, bad odour during transport, and health issues to workers, vehicular emission, dust generation as a result. In the case of marine transport, there can be chances of dumping of waste intentional or unintentional en-route to the final disposal site in addition to engine emissions. However, these impacts can be effectively managed and negative impacts can be kept at an acceptable level.

Measures to ensure and enhance the positive impacts

- Proponent and Island Council shall follow the management plan provided with the ESMP in order to monitor the operations of the IWRMC, and bring about any necessary changes to the operations and policies, in addition to providing any needed technical assistance for the island;
- proponent shall review the waste management operations within the island regularly and update the National Waste Database;
- Island Council shall update the IWMP by consulting relevant stakeholders and get approval from EPA before commencement of construction works or at least prior to operationalization of the IWRMC;
- Island Council shall conduct awareness programs to the residents of the island regarding the best practices in waste management, as well as conduct programs to familiarize the residents with the gazetted regulations and guidelines to manage the waste within the island;
- regular awareness programs conducted to minimise waste generation and Polluter pays principle established in order to reduce the waste generation within the island;
- proponent shall provide resources in terms of required equipment and machinery, and technical expertise to ensure the operation of the IWRMC; and
- Proponent shall assist in creating markets / avenues where the IWRMC's can generate income through selling compost and recycled metals, plastics and glass.

Mitigation for terrestrial pollution

- Implement rules within the IWRMC workers to impose penalties for any littering within the island due to improper handling of the waste and improper transport practices;
- the status of the vehicles used shall conform to the Waste Management Regulations 2013/R-58 and provide cover to the waste being transported in order to avoid littering;
- during waste collection instead of stopping the vehicle at every house, the residential area can be divided into blocks and vehicle stops can be pre-determined and from where waste containers can be hand carried by the workers from respective houses to be loaded to the vehicle.

Mitigation for accidents and injuries

- Waste collecting workers shall wear appropriate clothing and PPE to avoid injuries in handling waste;
- vehicles should be driven by licensed drivers;
- records of the vehicle trips shall be properly maintained;
- speed limits shall be observed; and
- a strict schedule shall be stated in the IWMP and followed in order to reduce the transportation frequency thus reducing the probability of accidents.

Mitigation for air quality impacts

- Vehicle speed shall be kept appropriately to suppress dust;
- vehicles used shall be regularly washed and kept clean; and
- The waste being transported shall be covered to minimise the impact of odour on the public.

Mitigation for climate impacts

- Regular servicing of vehicles used to transport waste;
- ensuring the vehicle has roadworthiness certification from the Transport Authority;
- restricting the use of the vehicle only for the stated time in the IWMP;

Measures to prevent marine pollution

- Wastes destined to the nearest waste management facility will require to keep logs of waste being loaded from the island and unloaded at the nearest waste management facility. The records to be signed by the vessel captain and a copy returned to the waste management supervisor;
- vessels used shall have a certified captain and vessel should have valid seaworthiness certificate;
- vessels shall not be overloaded and waste containers shall be kept closed and shall not be allowed to flyaway due to wind and sea conditions; and
- Waste shall not be transferred during extreme weather conditions.

6.7.2.2 Waste management activities

In general, the operational phase of the project will greatly improve the existing waste management condition of the island preventing pollution and spread of diseases. These activities would prevent pollution of groundwater, coastal areas and forested areas which would prevent impacts to biodiversity, health and wellbeing of the public.

However, if these activities are not properly implemented there is a risk of IWRMC being deteriorated into a dump site where mixed waste are disposed, burned and buried. This means without proper mitigation measures and regular transportation of waste out of the island to a central facility, there is a greater risk of IWRMC being overfilled. This entails a loss of investment and a greater impact to environmental receptors as some sites are moderately close to public areas. Moreover, impacts associated with composting sorting and storing waste has inherent impacts which will have to be properly managed, identified and mitigated to enhance and ensure the positive impacts of the proposed IWM. Propensity of these impacts are greater for the following environmental receptors:

- Groundwater;
- Climate/air; and
- Health and wellbeing: noise, odour and accidents/injuries

The following Sections describes the factors influencing these impacts and proposes measures to mitigate negative impacts and to ensure the overall positive impact of the IWRMC during operational phase.

Impacts on health

While overall positive impacts on public health are identified from this project, the negative impacts of running a waste management centre (especially one where composting is to be done) shall be highlighted. Composting can be a source of particulate matter in the atmosphere. The highest concentration of particulate matter in the air occur during the pre-treatment phase where the fresh organics are shredded and mixed. Particles also become airborne during the turning of the biodegrading compost heap to regulate the temperature.

Certain pathogens may also be transmitted via air during the composting process. These include *Legionella longbeachae, Aspergillus fumigatus, Mycobacterium tuberculosis* and *Hantavirus* (DEC NSW, 2004). Harrison (2007) has done a comprehensive literature review on the health effects of composting operations, which show increased concentrations of bio-aerosols within the vicinity of the composting facilities and related health effects to workers as well as affected public. Bunger et. al (2006) states that exposure to organic dust at composting workplaces is associated with acute and chronic respiratory health effects. Muller et. al (2006) and Wouters et. al (2006) agree with these findings, stating that changes were found in white blood cell counts, increase in neutrophils, decrease in oesinophils were measured in healthy subjects.

As for the association between the health symptoms and the distance from the site, Herr et. al (2004) showed that total bioaerosols were found at > 10^5 CFU / m^3 close to the composting site and dropped to background levels within 550 m from the site. Herr et. al (2004) also showed from another study where higher than background concentrations were found within 200 m from an outdoor composting site (> 10^5 CFU / m^3), and dropped to background concentrations at 300 m.

Wheeler et al (2001) stated that composting activities do not emit bio aerosols at levels that can be of a hazard to the public. Wheeler et al suggests a buffer zone of 250 m. The conservative values for the concentrations given by Wheeler at al includes:

Table 22: Background concentrations of bio aerosols (Source: Wheeler et al (2001))

Bio aerosol	Concentration
Total Bacteria	1000CFU/m3
Total Fungi	1000 CFU/m3
Gram-negative bacteria	300 CFU/m3
Inhalable dust	250 µg /m3

Wheeler et. Al; (2001) states the concentrations of bio aerosols exceed this limit where 10^5 – 10^6 of bacteria and 10^3 and 10^4 of fungi have been measured, the concentrations drop to background levels at 250m distance from site. Although it should be noted that the expected composting operations in the IWRMC are not as large scale as the studies cited above. Therefore, the health impacts of the bio aerosols can be minimised by following the mitigation measures provided.

Other potential health effects can arise from the introduction of vermin or pests, putrescible wastes attracting flies, puddles allowing the breeding of mosquitoes. Impacts that may arise from the IWRMC becoming a makeshift waste dumpsite for organics are also addressed in the subsequent Sections of the report.

Impacts on groundwater

When organic waste is stockpiled for composting, there is potential for leachate production from the waste. This is especially prevalent in cases where the waste includes food, meat, fish and fatty sludges. This leachate can infiltrate into the ground and mix with the freshwater lens of the island, thus polluting the lens with high amounts of nutrients, which can introduce bacteria and other microbes. If the conditions are anaerobic, the resulting leachate can be acidic and cause the corrosion of metals and introduction of metallic compounds in the groundwater. If the conditions are aerobic, alkaline leachates

will result with a low carbon – high nitrogen ratio. The main parameter in leachate that is considered to have a negative environmental impact is nitrogen that results from biodegradable waste.

Leachate production can increase during the rainy season, with the additional water from rain causing leachate from garden materials, wood and fibrous materials. Rain can also cause the stockpile to become anaerobic, thus resulting of undesirable odors.

The operation of the IWRMC is identified to have an overall positive impact of the groundwater of the island. While the aforementioned infiltration of leachate would still be an issue (if improperly managed at the IWRMC), it should be noted that the same waste has been dumped throughout the island without any measures, enabling the pollution of the groundwater with the leachate. Therefore, the proper operation of the IWRMC and the proper management of the collected waste will result in the reduction of the pollution of the groundwater from waste sources, thus improving the status of the groundwater in the island.

GHG emissions

The waste management activities will require power consumption for operation of the machines, lighting and pumping. Since the island's power system is fossil fuel based incremental increase in electrical energy consumption at the IWRMC will result in GHG emissions. However, the power consumption at IWRMC is expected to be small and therefore is not considered a significant issue. In addition, CO_2 which a GHG will be the main gas produced during the composting process in aerobic conditions while in anaerobic conditions, methane is released into the atmosphere, which has even a higher greenhouse warming potential compared than CO_2. In open systems, methane is not released in large quantities as long as the aerobic environment is maintained. (USEPA 2002). If the composting is well managed and kept in aerobic conditions, the methane production is reduced, which contributes to the reduction in global warming, as such waste would otherwise produce methane in a normal oxygen poor landfill or dump. It has been debated that, the CO_2 produced from the degradation of the compost pile would have been produced anyway, in the longer term if kept in a landfill or dump.

Amenity impacts

The IWRMC operations can cause various negative amenity impacts from inappropriate management. This issue is especially exacerbated through improper handling of raw organics as well compost windrows. The potential negative impacts include:

- Odour pollution;
- Particulate matter;
- Vermin and pests;
- Litter;
- Fire; and
- Noise

Biodegrading organics as well as compost heaps can attract birds such as crows which can lead to noise problems, and the littering of organic waste scraps within the site as well as away from the site. The unprocessed organic wastes as well as the compost heaps can be an attraction to pests and vermin. These

pests can be environmental as well as health hazards. Airborne dust from a poorly managed site can have a visual impact as well as public health impacts including respiratory issues.

Wind can blow the materials off the compost heaps as well as the other stockpiled waste types out of the IWRMC, which can degrade the local amenity. This impact is mitigated through the design of the IWRMC perimeter walls which include a perimeter fence made of 50 × 50 PVC coated mesh.

Littering inside the IWRMC can cause amenity issues such as tracking of litter on the wheels of the waste transport vehicles leaving the IWRMC. The litter can be deposited out on the roads of the island, which leads to issues such as visual impacts, odour, and possible contamination of groundwater from leachate.

Air quality impacts

Odour

Composting odours can originate from sulphur compounds, nitrogen compounds and volatile organic compounds. Ammonia is also commonly associated with unpleasant odour resulting from composting. If the composting is done under aerobic conditions, the main gaseous product is carbon dioxide. Gas compounds contributing to the odours of composting organics containing bio solids include dimethyl sulphide, dimethyl disulphide, dimethyl trisulphide, carbon disulphide and benzothiazole. These chemicals, while potentially toxic, are not present in high concentrations in open air composts. The gas methane is generated when the microbes do not get enough oxygen, and anaerobic biodegrading occurs. Methane gas has a strong and foul odour. The generation of ammonia, volatile amines, hydrogen sulphide and volatile organic compounds cause these odours.

Table 23: Odours generated from the composting process (Source: Goldstein (2002)

Compound	Description of smell	Detection limit for a particular odour panel (µg/m³)
Sulphur compounds		
Dimethyl disulphide	Rotten cabbage	0.1
Dimethyl sulphide	Rotten cabbage	2.5
Carbon disulphide	Rotten pumpkin	24
Hydrogen sulphide	Rotten egg	0.7
Methane thiol	Pungent sulphur	0.04
Nitrogen compounds		
Ammonia gas	Medicinal	27
Trimethyl amine	Fishy	0.11
Volatile fatty acids		
Acetic acid	Sour (vinegar)	1019
Propionic acid	Rancid	28
Butyric acid	Putrid	0.3

Fire hazards

There is a possibility of fire hazards at the IWRMC coming from biogas emissions and human activities. Fires can pose a risk to the workers through explosions and suffocation from smoke, in addition to damage to equipment.

Possible fire hazards are caused by the following (DCE NSW, 2004)

- Spontaneous combustion;

- Sparks from welding;
- Lightning strikes;
- Cigarettes; and
- Arson

The most common causes of fire during composting activities are reported to be cigarettes, welding activities and spontaneous combustion (Rynk 2000). The cause of spontaneous combustion is when the decomposing organics self-heat to ignitable temperatures (DCE NSW, 2004). Although Rynk (2000) states that spontaneous combustion is more prevalent within large undisturbed piles containing raw organics, curing compost or finished compost rather than active composting. Therefore it is important to limit the storage of organics (meant for transport to a central waste management facility) on the IWRMC.

Noise and vibration impacts

The main sources of noise from the operation of waste management centres come from the material recovery machineries used and the operation of vehicles. According to the Health and Safety Executive UK, most material recovery facilities have noise levels exceeding 80 dBA and 85 dBA. Assuming a maximum noise level of 85 dBA, the noise decay map in Figure 21 can be used for this purpose too. From the initial calculations, the noise levels are projected to decrease down to less than 73 dBA at the nearest residential area.

Workplace safety and accidents

The group of people most likely to be impacted by the IWRMC operations are the workers at the site. The various operations such as transportation, collection, handling, sorting and storing of the wastes, in addition to the composting and volume reduction operations all pose different risks to the worker onsite. The impacts discussed above and their proposed mitigation measures can provide a level of safety to the workers. Even with these mitigation measures put in place, a proper workplace safety guideline shall be formulated by the contractor for all workers onsite to follow.

In addition to the impacts discussed above, other work-related safety issues include falling stock or during lifting activities, moving vehicles and falls from height. The accidents can result in injuries of varying nature.

Impact to IWRMC from *udha* events

The proposed IWRMC is located 30 m from the vegetation line of the island, as directed by the MLSA.

As the IWRMC is located in the south western side of the island it is possible in the future that a swell or *udha* event may effect this area and cause flooding inside the IWRMC. Such an event occurring would cause damage to machinery and equipment in the IWRMC as well as potential damage to in-vessel composting causing a loss of investment and future revenue. With potential damage to waste management machinery and equipment the IWRMC works will be halted, leading to the site quickly overfilling with waste collected daily.

Mitigation for flooding from udha events

- elevate the ground level of the IWRMC by 0.6m using sand from the stockpiled dredged material next to the proposed IWRMC site;

- a wall shall be constructed on the lagoon-facing side of the IWRMC instead of a metal fence; and
- the proponent and Island Council to consider providing coastal protection to the adjacent coastal area in any potential coastal protection project.

Keeping pest and vermin populations low

- An area where waste (especially raw organics) is concentrated will naturally be an attraction to pests and vermin. In order to reduce the possible health hazards from such pests, their population shall be kept low with the following mitigation measures;
- unprocessed waste (including those waiting to be processed and unmanaged waste awaiting transportation) shall not be kept uncovered. Bins are provided to store such organic wastes. The bins are lidded, which controls both the possibility of odours emanating and the means of access to pests. The bins are also watertight in order to avoid the infiltration of water both into and out of the bin. The bins shall be designed to resist the action of organic acids and facilitate washing;
- ensure that the IWRMC surfaces are adequately drained to prevent the occurrence of ponds; and
- establish deterrence and eradication measures to control the outbreaks of pests or vermin.

Control of wind-blown litter

Wind-blown litter control is incorporated in the design of the IWRMC, with the provision of PVC coated mesh fence. Even with this mitigation measure in place, there is a possibility of wind-blown littering occurring. Such litter shall be cleaned by the occupier of the IWRMC. It is recommended to implement procedures to clean up the wind-blown litter after strong winds; and
clear all litter within the premises daily and any litter that has been blown out of the IWRMC.

Mitigation for fire hazards

- A fire management plan shall be developed by the IWRMC occupier;
- Adequate firefighting equipment shall be provided at the IWRMC, and placed at locations easy to access. The current design of the IWRMC includes a fire alarm system as well as firefighting equipments;
- the IWRMC occupier shall be able to show that firefighting capacity of the IWRMC is sufficient to suppress and minimize the incidence and impact of fires;
- training and awareness raising on firefighting shall be conducted on a regular basis for the workers; and
- signs shall be kept on the premises stating that open flames are not permitted on site.

Mitigation for noise impacts

- Obtain noise data from supplier prior to purchase of machinery;
- enclose the noisy machinery with sound insulating enclosure;
- reduce duration of exposure by implementing job rotation; and
- provide employees with hearing protection if required.

Mitigation for workplace accidents

- The IWRMC occupier shall be required to develop occupational safety management plan, and safety guidelines shall be displayed in the work site at all times;

- provide clear instructions to the workers on:
    - The possible risks
    - Measures in place to control risks
    - Follow emergency procedures;
- provide proper training including manufacturer's safety instructions to employees on how to operate machinery;
- conduct proper and regular maintenance of machinery used;
- prior to maintenance, make sure the equipment is made safe and prevent access to dangerous parts. Make sure others are aware that maintenance is being carried out;
- machinery and vehicles should only be handled by employees with the proper credentials and training; and
- proper PPE should be provided at work. PPE should be used after all possible risks have been eliminated as much as possible and to manage any remaining risks.

Table 24: Operational phase hazards and suitable PPE

Hazard	Suitable PPE
Stock movement and falling items	• Safety shoes • Hard hats
Moving vehicles	• High-visibility jackets
Slips	• Safety shoes with slip resistant soles
Sharp edges	• Gloves • Forearm protection • Aprons • Hand pads • Thumb guards • Head protection
Noise	• Noise cancellation headphones

6.7.2.3 Waste generation - terrestrial pollution, groundwater contamination

Not considering the waste collected from the island, waste generated as a direct result of operations at IWRMC during the operational phase of the IWRMC will be relatively low. These will include waste oil/batteries for waste management equipment, yard cleaning waste, used spare parts, used clothes, etc. Since eating and cooking inside the IWRMC will be prohibited, no mixed municipal waste will be generated during the operational phase of the project.

The main impacts on the bio-physical environment include;

- Leachate may seep and contaminate groundwater during a flooding event. The leachate tank will prevent this in normal circumstances.
- If not properly de-slugged the sewerage may seep into group water and lead to groundwater contamination.

The main impacts on the socio-economic environment

- Indirect impacts of groundwater contamination

Mitigation Measures

- All wastes generated as a direct result of the waste management activities shall enter the waste management stream and managed as prescribed for different waste types; and
- prohibit eating/cooking in the IWRMC.

6.7.2.4 Resource consumption

Electricity, fuel and water will be directly required for the operation of the IWRMC. Water will be mainly sourced from the ground while electricity will be obtained from the island's mains.

A compactor and shredder/crusher can be used to reduce the volume of waste streams. The waste weight will remain the same so there will be no savings from the total amount of waste produced. However, savings will occur because waste volume will be reduced by approximately 80% which will decrease the number of times the storage area is required to be emptied, therefore resulting in lower transportation costs.

Depending on the type of equipment's used such as chainsaws will require small volumes of fuel for operations. Most of these equipment's, however, are run very infrequently when enough waste has been separated and stored and are relatively efficient when run, meaning the amount of energy consumed by the compactor will be low. The running wattage mid-range compactors and shredders may range from 700 – 2000 watts, which means approximately 30-60 kW will be required to power all equipment simultaneously. However, this will not be the case since many of these equipment don't need to be switched on daily and at the same time. However, the composting machine will require electricity for its operation.There may be periods where the only electricity required will be for switching on the lights at the IWRMC. Therefore. Electricity consumption of the IWRMC during the operational phase will be relatively low. The activity would have a minor negative impact on environmental receptors.

However, the following mitigation measures shall be implemented to reduce water and electricity consumption.

The main impacts on the bio-physical environment include the following;

- Groundwater may be utilized for the operational purposes which will have impact on the contribute to saltwater intrusion to groundwater lens.

The main impacts on the socio-economic environment include the following;

- The electricity required for IWRMC operations will be obtained from the existing electricity grid of the island which put additional burden on the power needs of the island.

<u>Mitigation Measures</u>

- It is strongly encouraged to install solar panels on the IWRMC roof to generate required power for the IWRMC;
- use solar lights in the premises;
- work shall be planned to be carried out during day times;
- ensure that all equipment is serviced and kept clean daily, to reduce the amount of water required for cleaning;

- prepare a plan to switch on the compactors and shredders depending on the incoming waste stream to conserve electricity and
- make sure all equipment are properly serviced and maintained.

6.8 Impact Analysis and Evaluation

The following section will provide an analysis and evaluation of the previously described impacts on the biophysical and socio-economic environment in order to identify their significance.

The **Table 25** is an impact analysis table. From the **Table 25** it can be inferred that magnitude of the most of the negative impacts on the natural and social environment is moderate, or minor.

Table 25: Impact Analysis Matrix for proposed establishment of IWRMC in M. Mulah

Project Activity/ Impact	Extent	Duration	Intensity	Likelihood	Significance	Color Scale
Construction Phase						
Influx and settlement of workers for the project construction activities	Local	Short-term	Low	Likely	Minor	
Transportation of materials	Local	Short-term	Medium	Definite	Moderate	
Impacts from construction works	Local	Short-term	Low	Likely	Minor	
Terrestrial pollution from construction waste generation	Onsite	Short-term	Medium	Likely	Moderate	
Impacts from resource use	Local	Short-term	Medium	Definite	Moderate	
Operational Phase						
Waste collection and transportation	Local	Long-term	Medium	Definite	Moderate	
Waste management activities	Local	Long-term	Medium	Definite	Moderate	
Waste generation - terrestrial pollution, groundwater contamination	Local	Long-term	Medium	Definite	Moderate	
Resource consumption	Local	Long-term	Low	Likely	Minor	

CHAPTER SEVEN: MITIGATION MEASURES

One of the most important functions of an Environmental and Social Management Plan (ESMP) is to propose ways to manage the negative impacts that are likely to occur as a result of the proposed development. For this purpose, it is essential to identify mitigation measures to minimize impacts and identify cost of mitigation measures and parties that are responsible for implementation of these measures. As highlighted in the description provided in the chapter 6, most of the negative impacts envisaged for the proposed development occur during construction phase. Therefore, the proposed mitigation measures mostly focus on the construction phase of the project. However, the slight negative impacts envisaged for the operational phase are also taken into consideration and mitigation measures are proposed for these impacts as well.

7.1 Environmental Management Plan

Table 26 provides details of the key mitigation measures for various environmental and socioeconomic aspects that are impacted as a result of the project.

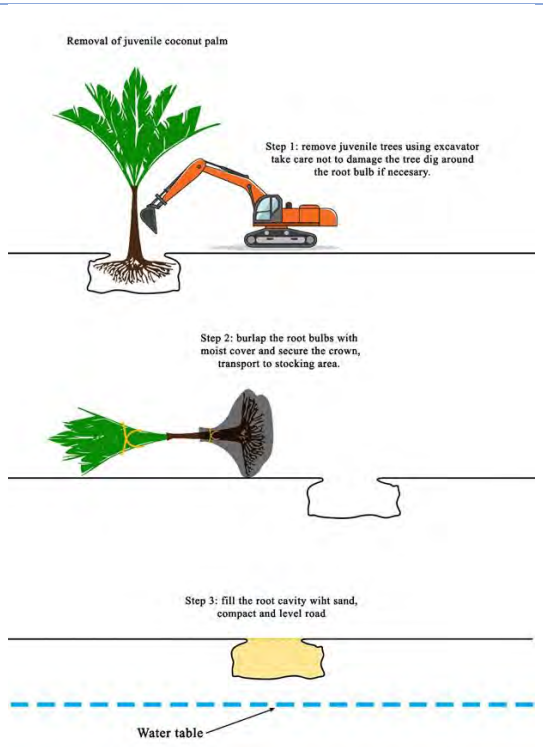
Table 26: Environmental and Social Management Plan for Establishment of IWRMC in M. Mulah

Environmental and Social Management Plan for Construction Phase			
Impact	**Mitigation Measure**	**Responsible Party**	**Cost of Mitigation**
Management of Impacts during Construction Phase			
1. Physical / Chemical			
Note: All construction activities should be undertaken in the presence of an experienced supervisor.			
Contamination of groundwater and soil due to chemical spillage and seepage	Hazardous waste such as waste oil and diesel should be stored in sealed containers and placed on an impermeable surface and transferred to the nearest regional waste management facility for final disposal. Stored containers should be regularly inspected to identify any leakages. Conspicuous warning signs (e.g. 'No Smoking') should also be posted around hazardous waste storage and handling facilities.	P: Contractor S: IC Supervisor	Cost associated with purchasing of containers and transport to RWMF
Noise pollution due to construction activities and use of machinery	Ensure construction activities occur between 8 am and 6 pm. Construction workers should wear ear muffs when using machinery that produce significant noise and while undertaking welding and drilling activities.	P: Contractor	Cost associated with purchasing ear muffs
Negative impact on air quality during transfer of construction materials and progression of works	During transport of construction materials from the harbor to the site, all sand and aggregate should be transported in covered vehicles or wheelbarrows and vehicle movement should be via roots that are well away from community roads where possible. Transportation should be at low vehicular speeds and loading and unloading should be conducted within the site. All vehicles used in the project should have an up to date road worthiness certificate. All vehicles and machinery should be well tuned. Machines should be switched off when not in use. Ensure that construction site is regularly wetted to minimize impact of dust as a result of the project. Materials that are stockpiled at the location for long period of time should be covered to minimize impact of dust generation due to windy conditions. The contractor should not burn any waste.	P: Contractor	No cost involved.

Coastal erosion and loss of beach aesthetics due to sand mining	Ensure that all construction materials including sand are sourced in compliance with the national laws and regulation. Sand should not be sourced from the beach or lagoon of an inhabited island, tourist resort, or any protected island. This includes the area of the island designated by EPA for sand mining of local public use.	P: Contractor	Cost associated with purchasing sand from a reputable source (hardware shops) and transporting to the island.
Waste Management	Construction waste produced should be reused for the construction of the IWRMC as much as possible. The remaining reusable materials such as (metal bars and roofing sheets) should be given to the island community or the island council free of cost. Leaves of felled vegetation is to be sundried and left at the forest area for natural degradation. Any remaining C&D waste shall be disposed at the area designated by the council for C&D waste disposal. The figure below illustrates proposed temporary storage areas for hazardous waste and remains of removed vegetation.	P: Contractor S: Island Council	Cost associated with transport to RWMF

			
Littering and general waste generated by	Place a bin at the site to dispose general waste generated by the workers. Establish procedures for general waste disposal which should include actions to be taken if the procedures are breached.	P: Contractor	Cost associated with

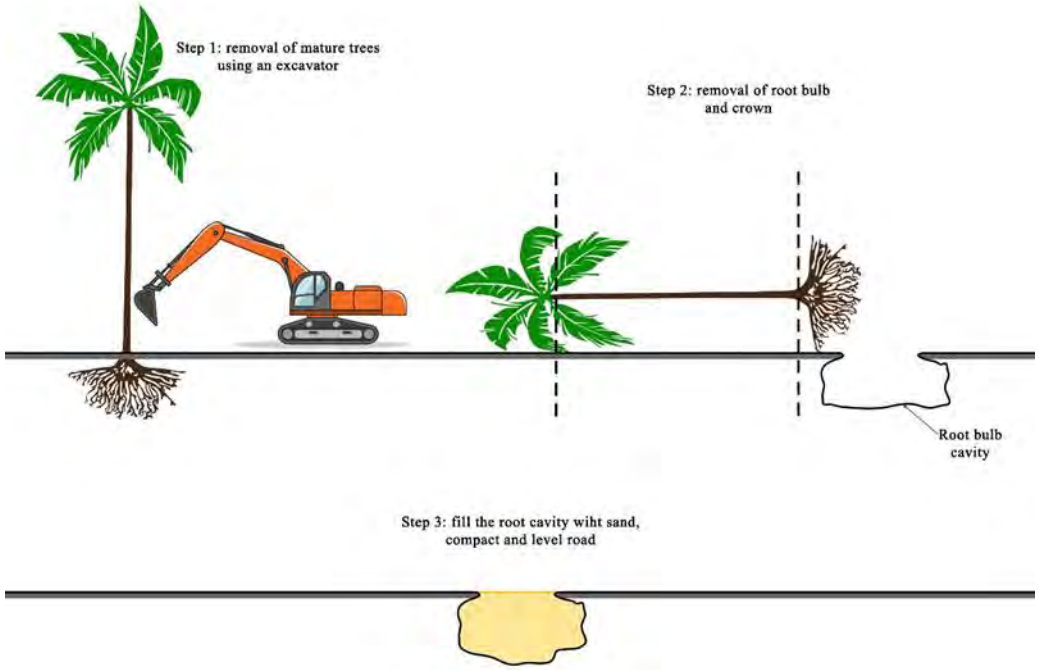
construction workers			purchasing a bin
2. Biological			
Impacts from site clearing and earthworks (terrestrial pollution, vegetation removal)	*Mitigation Measures to Reduce Number of Trees Targeted for Removal* **Site Setting Out** During the initial set out survey, mark the limits of the plot as accurately as possible to avoid damaging or removing trees not intersecting with the plot. In site clearance works the priority shall be given to minimize the trees removed or felled by minor adjustments that could be brought in marking the final boundaries of the plot as well as the road. **Translocation of Juvenile and Small Trees** In the case of those trees that require absolute removal priority shall be given for relocation. Juvenile coconut palms and other trees in the site that can be manually translocated (15ft or less, without the use of an excavator) must be transferred and replanted elsewhere in the islands. Records of replated vegetation (name, date and respective locations with GPS coordinates) should be maintained. The Island Council shall be consulted on potential location for translocation Method: A root ball of shovel-width radius from the trunk should be made and carefully extracted. Prior to digging, the soil around the root system will be thoroughly wetted to help keep the root ball together. Half or more of the older leaves will be removed at the time of digging. The remaining leaves will be tied together in a bundle around the bud with a twine.	P: Contractor	Cost associated with hiring of pickups for transporting to translocation area.



Felling of Trees

Only those trees that cannot be relocated for various reasons should be felled and the trunks stockpiled near the site for reusing in the construction or transferred to a stockpiling area designated by the island council to be given to the island community free of cost. Fronds and root bulb and base of the trunk shall be cut using a chainsaw and only trunks will be transferred to the stockpiling area. Parts of the root bulb will be used for backfilling of the depression created (See Figure for illustration of removal method). All fronds and nuts will be removed from the terminal bulb and piled up separately. Nuts will be given to the community free of cost and fronds will be left to sundry.

The contactor must ensure from the Island Council if compensation was issued for the trees belonging to individuals prior to felling of any such trees.



For each tree that is felled, two new trees shall be planted (not ornamental plants) elsewhere at the island. Mulah island council proposed two area for compensatory planting of trees.

- Open spaces near the vegetation line close to the site.
- Area on the south western side of the harbor.

Disposal at Forest Area

	Considering a tree as waste shall be considered when all the above options have been exhausted. In such cases, leaves and branches must be removed and left for sundry in the forest area and trunks chopped into small piece and left in the forest area for natural degradation.		
Negative impacts to vegetation due to improper handling and driving during material transportation.	Workers will be informed to avoid damaging trees and disturbances to animals and to generally avoid engaging in destructive activities to the environment intentional or unintentional. Avoid roads with significant vegetation during transportation within the island. Avoid bringing heavy vehicles to the island where possible.	P: Contractor	No cost involved
Negative impact on fauna during material transport	Workers will be informed to avoid damaging trees and disturbances to animals and to generally avoid engaging in destructive activities to the environment intentional or unintentional. Materials shall be obtained from the closest source. The materials shall be brought in bulk and transported to the island within a single trip where possible. The materials shall be stored at the project site or in a close proximity to avoid unnecessary movement of vehicles within the island through the construction phase. Ensure that all construction materials imported to the island are free of any alien species or pests. Ensure that oils and paints are properly sealed prior to transportation. Ensure that materials are not kept beyond the height of the sides of the vessels and are properly covered, when transporting via sea.	P: Contractor	Cost associated with purchasing of containers designed for storing hazardous substances.
3. Health and Safety			
Occupational Health and Safety	All workers should be provided with safety gear and should ensure that safety gear is utilized at all times. This includes: safety hats, boots, glasses, masks and gloves. Ear muffs shall be provided where equipment or machinery that emit significant amount of noise is used (welding, drilling etc.). Chemical-Liquid protective gloves should be used when handling any chemicals, waste oil or other liquid waste.	P: Contractor	Cost associated with purchasing safety materials.

	First aid kit must be purchased and kept on site at all times No open electrical wiring or cables should be kept on site. Health and Safety briefing should be given to all construction workers. A safety inspection checklist should be prepared taking into consideration what the workers are supposed to be wearing and monitored monthly and recorded in the monitoring.		
Working Conditions and Labor	The maximum working hours of all construction workers should be 48 hours per week as per the Employment Act of Maldives. Meals should be provided to construction workers 3 times a day. Safe drinking water should be supplied to construction workers and must be made available at the work site and the labor camp. Appropriate sleeping arrangements shall be made for the construction workers. Temporary resting arrangements for the workers shall be facilitated at the work site.	P: Contractor	
Management of COVID19	Travel permit must be taken from HPA for the workers if traveling from Male' or an island placed under COVID19 monitoring. The standard quarantine procedure must be followed as instructed by the authorities. Workers must be briefed about the safety protocols and social distancing measures that has to be enforced. The workers must perform frequent hand hygiene. All workers must wear face masks. The movement of workers must be restricted between the labor camp and work site as much as possible. Daily body temperature of all the workers should be taken and log records maintained. If a worker is having a temperature of 37.8C or above or symptoms of flu that person must not report to work and should be self-isolated and respective authorities notified. Handwashing or hand sanitizing facilities must be established at the work site and the labor camp. Labor camp should facilitate social distancing. The beds should be kept at least 3 – 6 fts apart.	P: Contractor	Cost associated with purchasing soap, hand sanitizers etc. and printing of awareness materials.

	COVID19 awareness materials should be displayed in the worksite and the labor camp. Construction tools should be cleaned using disinfecting solution (1:9 bleach solution) at the end of each day or when changing shifts (if shift-based work methodology is adopted).		
Health and safety of public	Demarcate the site boundary through taping or hoarding. Place sign boards to indicate that only authorized personnel are allowed entry. Make sure that the general public do not have access to the site and its vicinity. Regularly monitor for entrance of residents. Make sure that public chairs are not found at the vicinity of the site.	P: Contractor S: Island Council	Cost associated with designing and printing sign boards.
Fire hazard	Ensure that electrical wires are installed properly by a certified person. Ensure that portable extinguishers are readily available in case of an emergency fire. Flammable hazardous waste such as used oil and diesel must be labeled with hazardous waste and fire hazard signage and regularly inspected to identify any leakages. Conspicuous warning signs (e.g. 'No Smoking') should also be posted around hazardous waste storage and handling facilities. National Fire Code (NFC) shall be strictly followed while handling, transporting and storing fuel. Inflammable goods such as fuel drums, portable fuel containers and cleaning solvents and chemicals will be closed off from public access.	P: Contractor	Cost associated with hiring an expert electrician and purchasing of fire extinguishers
4. Sociological and Cultural			
Legal Issues	All expatriate workers must hold valid work permits	P: Contractor	Work Permit fees
Handling Environmental and Social Issues during Construction	The contractor will appoint a suitably qualified Environmental Officer following the award of the contract. The Environmental Officer will be the primary point of contact for assistance with all environmental issues during the pre-construction and construction phases. He/ She shall be responsible for ensuring the implementation of ESMP. The contractor shall appoint a person responsible for community liaison and to handle public complaints regarding environmental/social related matters. All public complaints will be entered into the Complaints Register. The Environmental Officer will promptly investigate and review environmental complaints and implement the appropriate corrective actions to arrest or mitigate the cause of the complaints. A register of all complaints is to be passed to the Engineer within 24 hrs. They are received, with the action taken by the Environmental Officer on complains thereof; and	P: Contractor	Cost associated with hiring of staff.

	The site supervisor may assume the on-site responsibility of the environment officer and community liaison officer, subject to being adequately trained and having thorough knowledge of the ESMP. Contractor shall prepare detailed Environmental Method Statement (EMS) clearly stating the approach, actions and manner in which the ESMP is implemented.		
Sociocultural conflict due to arrival of expatriate workers	Ensure that local workers are used as much as possible. If expatriate workers are used ensure that they respect the local culture. The contractor in collaboration with the Island Council shall undertake a training to sensitize the labor to the local context and customs. This training should also cover topics related to Gender-based violence. To mitigate conflict that may arise due to the arrival of expatriate workers, the consultant should develop a "Code of Conduct" outlining the set of rules that that the workers have to follow to persevere the social norms and religious values of the society. The Code of Conduct should also specify penalties for breaching these rules and should be thoroughly communicated to workers prior to mobilization.	P: Contractor S: Island Council	Cost associated with hiring staff
Code of Conduct and Communication	The "Code of Conduct" developed should also cover good environmental governance and responsibilities workers have to follow to safeguard the environment. Though the number may be minimal, code of conduct and awareness in HIV related issues need to be considered. The contractor should ensure that all communications to the workers are presented in the local language. If expatriate workers are employed communications should be made in a language that they understand. Information on the project and the GRM should be displayed in the project site board, council noticed board as well as other communal place as much as possible.	P: Contractor P: Island Council S: MCEP	Cost associated with developing materials.
Loss of source of sand for local public use due to sand mining from the area of the lagoon permitted for	Ensure that sand is not taken from the lagoon of the island.	P: Contractor	Cost associated with purchasing sand from a reputable source (hardware shops) and

local public sand mining			transporting to the island.
Grievance Redress Mechanism	The GRM established by the proponent should be implemented at the construction phase. Contact details of focal points of the contactor, Island Council and the proponent should be displayed at the project site in the project board, the Council Office and common places frequented by the public (such as schools, health center etc.). It is recommended to change the first point of contact to the contractor, followed by Island Council and the proponent. The community liaison officer of the contractor must maintain log records of the complains received and subsequent actions taken.	P: Contractor S: Island Council T: Proponent	Cost associated with printing of the GRM board and posters.
Onsite Resting and Sanitary Arrangements	The contractor should identify a toilet that the works can access within 5 mins from the project. This could be via renting a toilet from a nearby utility area / office building / house, installing portable toilets or by making back and forth transport readily available to the accommodation building	P: Contractor	Cost associated with site mobilization and site set-up
5. Economic			
Benefit to local economy	Ensure that construction materials are purchased from the island as much as possible. Preference shall be given to hire local construction workers from the island and the atoll or region.	P: Contractor	Cost associated with material purchase

Management of Impacts during Operational Phase			
1. Physical / Chemical			
Waste processing and storage. **Litter, odor and vector nuisance.**	Waste collection vehicles and transfer vessels must be secured from all sides to prevent spillage. Provide composting training to all laborers and management staff of the facility. 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. • Waste that cannot be managed at island level must be processed (chipped, crushed or compacted) and stored in containers or jumbo bags and kept in the respective bays within the IWRMC for transportation to K. Thilafushi . • The jumbo bags and/or containers must be appropriately labeled to indicate the type of waste they contain. Maintain log records of all outgoing waste either in terms of weight or volume of jumbo bags and/or containers. The log sheets must be provided to the regional collection supervise or vessel caption.	P: Island Council/ IWRMC Manger P: ME S: MCEP P: Island Council / IWRMC Manager	Cost associated with IWRMC operation Cost of providing compost training Cost associated with purchasing jumbo bags and/or containers

Hazardous Waste Management and Transportation	Do not accept medical hazardous waste as it has to be managed by the island health center and incinerated separately. Types of hazardous waste managed at the health center mainly include needles, syringes, expired medicine and contaminated materials (cloth/gauze/disposable gloves). Other types of hazardous wastes generated within the households including small batteries, solvents, paints, used oils, pharmaceuticals and old lights which use mercury shall be managed at the IWRMC. Incoming hazardous waste to the IWRMC should be stored in the hazardous waste storage room and regularly transported to K. Thilafushi. The following measures must be taken during transportation of hazardous waste: • Use containers 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.   Tampons and nappies, while indicated as hazardous wastes in the ESMP, are biodegradable and can be composted. The high temperature of the composting process has been documented to eradicate any harmful pathogens containing potential biohazards.	P: Island Council /IWRMC Manager	Cost associated with purchasing containers designed to store hazardous waste and printing of labels.

Marine Water Pollution and associated impacts to marine organisms due to potential spillage of waste to the sea during transfer of waste from the IWRMC to the K. Thilafushi (loading and unloading)	• The IWRMC operators and the island council should ensure implementation of the following measures prior to regional transfer: • • All outgoing waste from the IWRMC shall be stored in bins or jumbo bags and properly labeled to indicate the type of waste. Below are some examples of the signages that can be used to label bins and jumbo bags: • 	P: Island Council /IWRMC Operators	Cost associated with printing the labels.
	• Maintain log records of all outgoing waste from the IWRMC either in terms of weight or volume of jumbo bags and bins and provide to WAMCO during regional collection.	P: Designated RWMF operator / regional waste collector	
	• Designated RWMF operator / regional waste collector should make sure that the following measures are implemented during loading and unloading of waste into the collection vessel (landing craft) • Provide jumbo bags or bins required for regional collection to the councils.	P: Designated RWMF operator / regional waste collector	
	• Prepare a collection manual that gives instructions related to storage of waste for regional collection and share with the councils. The manual should clearly specify the types of waste that are accepted and not accepted for regional collection, categories to which waste has to be sorted and packaged by the councils (plastics, glass, nappies, metals, hazardous etc.) and any special requirements for packaging waste such as	P: Designated RWMF operator / regional waste collector Manager/Supervisor at K. Thilafushi	

	hazardous waste (sealed containers, proper signage etc.). • Prepare a schedule for regional collection and share with the respective councils. In addition to this, it is recommended to inform the exact date of regional collection to the respective council 3 days prior to arrival of the transfer vessel (landing craft). • Properly label the jumbo bags or bins to reflect the type of waste (if this has not been done by the councils).		
	• Record data of all loaded waste in terms of weight or jumbo bags and bins (volume of the bags and bins must be specified).	P: Collection Supervisor	
	• Waste must not be kept in the open in any circumstance during transfer.	P: Collection Supervisor	
	• Hazardous waste (such as batteries, paint, thinner, fiber glass etc.) should be kept in the landing craft in sealed containers. The containers should be properly labeled with appropriate signs (for example hazardous, flammable, toxic etc.). Hazardous waste should be kept away from flammable waste such as wood, plastic and paper.	P: Collection Supervisor P: Collection Supervisor	
	• All waste loaded to the transfer vessel should be covered from the top to minimize potential for spillage during transport.	P: Collection Supervisor	
	• The height of loaded waste should not exceed the height of sides of the landing craft. In circumstances where excessive waste is absolutely necessary to be loaded, the sides should be lifted to meet this requirement.	P: Collection Supervisor	
	• Log records of all unloaded waste (incoming waste to the K. Thilafushi) should be recorded either in terms of unloaded weight or volume of bins and jumbo bags for different categories of waste.	P: Designated RWMF operator / regional waste collector	
	• Maintaining log records of loaded and unloaded waste quantities are critical and compulsory as it can indicate the amount of waste lost to the sea during transfer (if any).	P: Designated RWMF operator / regional waste collector	
	• Give proper instructions and training to the staffs involved in regional	P: Designated RWMF	

	collection • Loading shall be undertaken under the direct supervision of a qualified responsible staff. This staff or supervisor will monitor all activities related to regional collection and transfer and ensure that environmental compliance is achieved. • The waste transfer vessel must be equipped with firefighting equipment and smoke detectors. • The waste transfer vessel should be equipped with navigational safety equipment such as life vests. • The landing craft should be accompanied by a whaler to be used for accessing islands that do not have harbors.	operator / regional waste collector P: Designated RWMF operator / regional waste collector P: Designated RWMF operator / regional waste collector P: Designated RWMF operator / regional waste collector P: Designated RWMF operator / regional waste collector	 Cost of purchasing safety equipment Cost of purchasing whaler
Noise pollution during waste management	• Depending on availability, battery operated vehicles can be used to provide collection services. • Waste handling works involving operation of machinery shall be undertaken during day time.	P: Island Council S: MCEP (for vehicle	Cost associated with purchasing collection vehicles
Air emissions from MSW collection and transport	• Emissions from on-road vehicles shall be regulated through national and regional programs; • All waste transport vehicles must have up to date road worthiness licenses. • Optimize waste collection routes to minimize distance traveled and overall fuel use and emissions • Drivers shall 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. • When the IWRMC and RWMF becomes operational no open burning shall be practiced.	P: Island Council S: EPA	Cost of training drivers
2. Social and Cultural			

Health and Safety of waste handling staffs	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 such as ear muffs. 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).	P: Island Council	Cost of purchasing safety materials
Fire hazard	Burning of waste at the IWRMC should never be practiced under any circumstances. Naked flames shall not be allowed at the IWRMC. Ensure that waste management staffs are briefed of fire hazard management. Firefighting equipment, including clear aisles among windrows and access to an adequate water supply shall be made available with access to pumps. Smoking should be prohibited inside the premise of the IWRMC, placing awareness signs in the premise. Highly flammable areas such as those area allocated for the storage of paper, wood and cardboards, should be clearly marked with appropriate sign boards indicating the flammable nature of the waste. Installation of cameras, fire alarm system and hiring of security guard for 24hrs surveillance. Fire safety training on how to use the installed equipment and act in case of an emergency fire should be provided to the security guard and all the waste management staffs of the IWRMC	P: Island Council S: MCEP (for sign boards)	Cost of purchasing equipment Cost of printing and placing sign boards included with the overall project budget. Cost of purchasing cameras, alarms. MVR 10,000.00 Salary of security guard (approximately MVR 4000.00 per month)

Sociocultural conflict	Ensure that waste handling staffs are selected from the local community as much as possible. If expatriate workers are used ensure that they respect the local culture. Conduct a training to sensitize the labor to the local context and customs. This training should also cover topics related to Gender-based violence. Develop a "Code of Conduct" outlining the set of rules that that the workers have to follow to persevere the social norms and religious values of the society. The Code of Conduct should also specify penalties for breaching these rules and should be thoroughly communicated to workers prior to mobilization.	P: Island Council	Cost associated with hiring staffs
3. Economic			
Collection Fee	Ensure that the collection fees are feasible for the community. Undertake consultation meetings with stakeholders and set a suitable collection fee acceptable to the community.	P: Island Council	Cost associated with conducing stakeholder sessions
Employment Opportunities	Ensure that waste handling staffs are selected from the local community as much as possible.	P: Island Council	Cost associated with hiring staffs

Proponents commitment to undertake proposed mitigation measures is provided in Annex 03

7.2 The cost of mitigation measures

The following **Table 27** and **Table 28** indicates the cost for implementation of the proposed mitigation measures.

Table 27: Cost estimate for implementation of the proposed mitigation measures (Construction Phase)

#	Item	Responsibility	Cost Estimate (MVR)
1	PPEs required for construction such as hard hats, gloves, safety shoes and safety harness.	Contractor	10,000.00

2	PPEs to mitigate COVID19 such as face masks, antibacterial soap, hand sanitizers, disinfectant cleaning liquid (bleach) and printing of awareness materials etc.	Contractor	5,000.00
3	Hiring of pickups (from the island) to translocate vegetation (MVR 200 per trip is assumed)	Contractor	2,000.00
4	Portable fire extinguisher for site	Contractor	2,000.00
5	Firefighting Equipment for the IWRMC (item included in BOQ): • 50KG DCP Trolley (nos 2) • 50LTR Foam Trolley (nos 1) • Wet Chemical 6Ltr with Cabinet for hazardous waste area (nos 1) • Water 9Ltr with Cabinet for Office Area – Outside (nos 1) • CO2 2KG with Cabinet for Office Area – Outside (nos 1)	Contractor	35,000.00
6	Project board and Construction Safety sign board	Contractor	3,000.00
7	IWRMC name board, cell labels and fire safety sign boards	Contractor	5,000.00
8	Bin for placing general waste	Contractor	1000.00
9	Site demarcation through hoarding	Contractor	1000.00
	Subtotal		**64,000.00**
	Contingency	10% of Sub-Total	6,400.00
	Total		**70,400.00**

Table 28: Cost Estimate for implementation of mitigation measures including trainings during operational phase

#	Item	Responsibility	Cost Estimate (MVR)
1	PPEs required for operations such as gloves, safety shoes and masks.	Island Council	10,000.00
2	Fire safety Training	Island Council	10,000.00
4	Yearly servicing of the firefighting equipment	Island Council	5,000.00
5	Community Mobilization and Awareness and other trainings (Gender, Composting etc)	MCEP	100,000.00
	Subtotal		**125,000.00**
	Contingency	10% of Sub-Total	12,500.00
	Total		**137,500.00**

CHAPTER EIGHT: TRAINING FOR ESMP IMPLEMENTATION

Training is essential for ensuring that the ESMP provisions are implemented efficiently and effectively. MCEP shall therefore ensure that all persons that have roles to play in the implementation of the ESMP are competent with appropriate education, training or experience. Similarly, the contractors shall be required to undertake general HSE awareness for their project workforce and specific training for those whose work may significantly have impact on the environment. The Island Council in collaboration with the MCEP shall also devise and execute training programs targeted for staffs of IWRMC to facilitate effective and sound management of waste during household collection and operations of the center. Furthermore, MCEP and the Island Council shall conduct community mobilization and public awareness programs to enhance knowledge of the community on good waste management practices and to promote implementation of 3R concept.

The following **Table 29** provided the recommended trainings for EMSP implementation.

Table 29: Proposed training recommendations for ESMP implementation

Training Activity	Anticipated Participants	Type of training and main content	Responsibility	Scheduling	Cost Estimate
Strengthening capacity of contractor on reporting and implementation of ESMP	Managing Director and Site Supervisor of Contractor	Meeting Reporting Template	Safeguards Specialist of MCEP	Pre-bid meeting Kick-off meeting	N/A
Strengthening PMU's capacity on compliance monitoring	Assistant Project Coordinators	Safeguards Specialist of MCEP	Safeguards Specialist of MCEP	Construction Phase	N/A
General Awareness Health, Safety and Environment (HSE)	Worker on Site	HSE Introduction / Orientation (site safety rules, PPE, Emergency response etc.) Daily tool box talk for workers at the start of each day's job.	Site Supervisor of Contractor	Preconstruction phase. Construction phase	N/A
Community Mobilization	Waste Management	Introduction to	Communications Specialist of	Preconstruction phase.	Travel cost of facilitators.

	Committee (WMC) Women Development Committee (WDC)	Waste Management Policy Introduction to Waste Management Regulation Roles of WMC Household waste segregation Door to Door campaign	MCEP		Designing and printing of training materials and flyers to be used for door to door campaign Development of audio-visual aids and documentary for training
Compost Training (Training on the composting processing using the compost machine, including its operations, maintenance and servicing)	IWRMC staffs	Introduction to compost preparation using organic waste Step by step guidance using OWC machine for composting	Zone-4 Project Coordinator of MCEP Project Management Unit Waste Management and Pollution Control Department of Ministry of Environment	Prior to commencement of operations	Travel cost of trainer .

			Island Council Communications Specialist of MCEP		
Fire safety training and drills	IWRMC staffs Nearby Residents of IWRMC	Introduction to Fire safety Hands on training of the equipment installed at IWRMC Details of safety procedures and evacuation plan during a fire	Maldives National Defense Force (MNDF) Fire and Rescue Island Council through retired firefighter	Prior to commencement of operations	Cost associated with training hall and refreshments Travel cost of trainer
Women Leadership in SWM training	Women Development Committee (WDC)	Enhancing women's participation in Solid Waste Management (SWM)	Zone-4 Project Coordinator of MCEP Project Management Unit	Zone-4 Project Coordinator of MCEP Project Management Unit	Travelling cost of trainers

CHATER NINE: PROJECT ALTERNATIVES

This section of the report contains the alternative means for the project in terms of Alternative technology options for the treatment of organic waste may include manual composting and anerobic digestion systems. Furthermore, the no project option was also explored in this section.

9.1 No Development Option

In the case of no project option, all foreseeable negative impacts as a result of the construction and operation of the IWRMC can be avoided. However, no project option would also mean continuation of the current state of waste management in the island. The people would continue to engage in unsustainable waste management practices. The island would not have an approved demarcated waste management area, waste would continue to be burned in open areas, and kitchen waste would continue to be dumped on beaches, lagoons and reefs. Allowing existing practices to continue would also mean no resource recovery and ultimately all resources getting lost in the "waste". Allowing open dumping waste with no management would also mean increasing risks to human health, lowering aesthetic qualities and lowered quality of life. The aspiration of the people to move in the path of sustainable development would also be compromised. The positive effects of proceeding with the project far outweighs negative impacts associated with the project which can be managed and kept at an acceptable level. Hence, no development option of the project is rejected. **Table 30** below shows comparison of no development option with the development option at M. Mulah.

Table 30: Comparison of the no development option with development option

Option	Environmental	Social	Economic
No Project Alternative	All negative impacts associated with project avoided, however, the island environment may continue to slowly deteriorate due to pollution as a result of inadequate waste management. Land area will be rendered unusable or will be polluted by the residual waste remaining after burning and burying waste. Seepage of leachate into groundwater film as a result of burying waste in excavated pits. Risk of waste piles sliding as a result of heavy rain or flooding events. Increased pollution of beaches, lowered aesthetic values, pollution of the lagoon and coral reef.	Benefit to the society by the project will be missed and chances of polluting the island is high which could lead to health implications as well as visual negative impacts. Risk of waste coming into direct contact with children. Without a proper waste management system there is a risk of the island turning into a slum as a result of population increase and economic development.	No significant improvement to the local and regional economy. Jobs and income earning opportunities expected as a result of the project will not realize.

Project Alternative			
	The project will result in loss of alternative land use potential for the proposed site All impacts due to construction can be managed and maintained at acceptable level. The project will control and prevent further pollution of the environment, and thereby promote sustainable development of the island.	Increased direct and indirect employment opportunities for the locals during the construction phase in addition to when the IWRMC and waste management system becomes operational. Knowledge transfer and development of technical capacity with regard to waste management and compost making. More resources and manpower to manage the island would become available as a result of the project. The aesthetic qualities of the island would improve and thereby promote healthy and more enjoyable life on the island. During the operational phase of the project, smell, dust and particulate matter especially from composting activities may be emitted from the IWRMC. However due to the isolated nature of the site to the populated area of the island such impacts are not expected to be significant.	Enhanced opportunity for locals to start and diversify tourism related services, since a safe and clean island would facilitate attracting visitors to island. Creation of job opportunities and development of skills. Potential to get income by selling compost etc. which would develop the island's economy.

9.2 Alternative technology options for the treatment of organic waste

9.2.1 Manual Compositing (Windrow Based System)

This type of Composting technology uses the process of the slow decomposition of the organic matter by various microorganisms, in an optimised and controlled process. The process is controlled in terms of parameters such as input materials, temperature, moisture and pH. The finished product of composting can be sold as fertilizer, thus enabling the reuse of the waste collected within the island.

The main constituents of a compost heap include kitchen and garden waste, along with water and air in the pore spaces between the constituent.

9.2.1.1 The Composting Process of Manual Composting

After the incoming waste is properly sorted into compostable wastes and other wastes, mixing of the compostable waste is done. This mixing is done to provide an optimum Carbon-Nitrogen ratio for the process to occur. Prior to mixing, if the waste contains branches, twigs and such, they are fed into a wood chipper to reduce their size. After the mixing is completed, composting process begins on the composting slab as an open windrow compost. After the compost matures, screening is done depending on the particle size of the compost required. This compost is bagged and stored. These steps will be elaborated below.

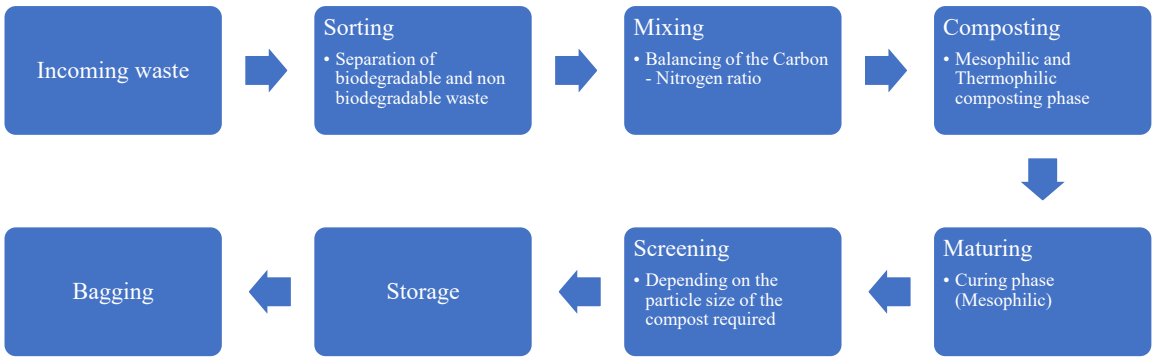


Figure 22: The composting process (adapted from Saleem 2018)

Mixing (Carbon – Nitrogen Ratio)

One of the most important factors in the process of composting being successful is the Carbon – Nitrogen ratio. Carbon is used for energy by the microbes in order to continue with the decomposition, while Nitrogen is needed by the microbes to grow and multiply. The optimum Carbon – Nitrogen ratio is 25 - 30:1 (DEC NSW, 2004). If the ratio is less than 30:1, it would result in the loss of Nitrogen as ammonia gas

which would result in undesirable odours. If the ratio is greater than 30:1, it results in the cooling of the compost and slow degradation of the pile.

Composting and Maturing

Thermophilic composting is the process of composting using thermophilic (heat-loving) bacteria. Thermophilic composting consists of three phases;

Table 31: The phases of composting

Stage	Temperature	Duration	Organisms
Mesophilic	Moderate, up to 40 °C	2 days	Initial decomposition is done by mesophilic organisms that thrive at moderate temperatures
Thermophilic	High, over 40 °C	Few days to several months	Mesophilic organisms become less competitive and replaced by thermophilic heat loving microbes. High temperatures break down proteins, fats, and complex carbs like cellulose and hemicellulose (major structural molecules in plants)
Mesophilic (curing or maturation phase)	Moderate, up to 40 °C	Several months	As the compounds decrease, compost temperature gradually decreases and mesophilic organisms take over again for the final curing of the remaining organic matter.

As seen from the **Table 31**, the composting process can prolong to several months.

9.2.1.2 Proposed Mitigation Measures

The following **Table 32** enlist the proposed mitigation measures for the envisaged impacts of the manual composting.

Table 32: The proposed mitigation measures for the manual composting

Envisaged Impact	Proposed Mitigation Measures
Impacts on health and safety	• handling of compost will be minimized; • compost turning will be done based on temperatures and not on schedules; • compost turning will be done using windrow turning equipment; • adding moisture to the compost to minimize dust; • placing a geo-fabric cover over the compost windrow to minimize release of bio aerosols; and • workers will wear appropriate safety clothing, follow the workplace safety mechanisms and guidelines set by the contractor and practice safety and personal hygiene when handling the compost.
Impacts on groundwater	• The composting area has a dedicated composting slab made of reinforced concrete, along with an HDPE lining between the

	soffit of the slab and the ground. Concrete is an inert and highly impermeable material, and with the combination of HPDE lining, the possibility of leachate leaking directly from the compost slab is low; • The composting slab is designed to have a slope towards the centre from both sides, which will propagate any leachate produced towards the 100 mm PVC pipe, which in turn drains into the leachate collection tank; • Regular turning of the compost pile can help minimise the quantity of leachate produced; and • The leachate collected shall be reused to provide moisture to the compost heaps.
Impacts from Rainfall related leachate production	• A valve is placed at the inlet pipe which can be closed in instances where the leachate tank may overflow from heavy rainfall onto the compost slab; • Compost slab is raised through design, to avoid any ingress of water which may otherwise be possible from puddles and possible inundating due to heavy rain; and • Windrow cover shall be used to mitigate the impacts from rainfall. The cover shall be made of geofabric and allow for the air circulation while protecting the compost. The advantages of the cover include moisture control, which reduces leaching and nutrient loss, as well as reducing water loss from the sun and wind. In order to keep the cover in place during strong winds, weights attached to ropes shall be placed on top of the cover at regular intervals.
Odor Impacts	• Covering of rapidly biodegradable organics. Rapidly biodegradable organics include grass clippings, food and animal organics and organic sludges. The exposure of such organics to the atmosphere should be kept at a minimum. In open air composting such as the proposed technique for the IWMC, piles of compost can be covered by a 15 cm thick layer of fresh compost in the curing stage. The microbes present in this layer of compost help reduce the odour of the compost pile underneath; • Keep the moisture levels of the compost pile optimum, which promotes free airspace and results in aerobic respiration; • Avoid uncontrolled emissions of biogas from the compost pile by keeping the pile well aerated; • Keep the carbon – nitrogen ratio at an optimum level (this is achieved at the mixing stage) to decrease the amount of ammonia produced; and • Keep records of complaints about odours, and correlate with weather conditions and categories of organics used.

9.2.2 Anaerobic Digestion System

The anaerobic digestion system described in this section is Plug Flow Reactor (PFR).

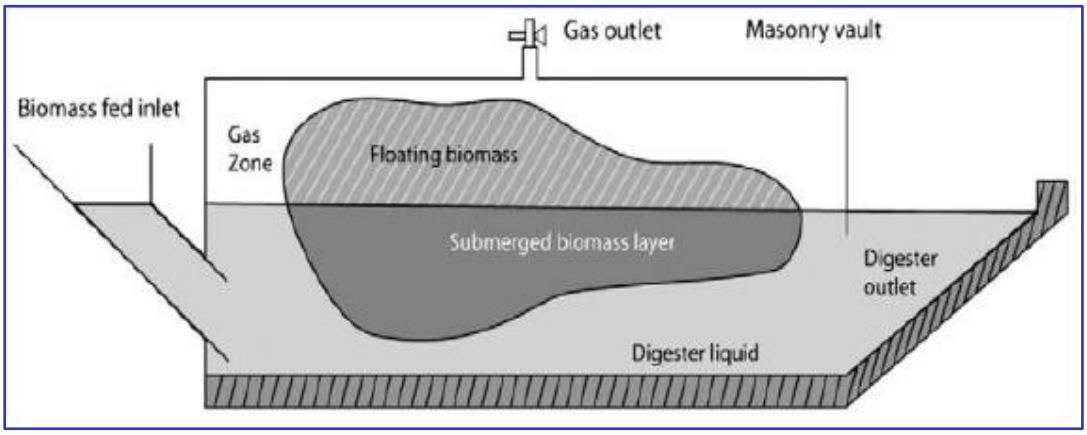


Figure 23: Design of Plug flow type biogas plant

The Plug Flow Reactor (PFR), as shown in the **Figure 23**, is a sealed tank that can be constructed from either:

- Fibre Reinforced Plastic (FRP) – with a 20-year life expectancy and guarantee
- Stainless steel – with a 15-year life expectancy and guarantee; or
- Masonry – with a potential 25-year life.

9.Composting process for anerobic digestion

Having been filled with the required quantity of water, the bacterial inoculum is added and the activation is allowed to complete. Waste can then be added through the inlet. The plant can accept food waste and green waste. If the waste is predominantly food waste, up to 20% green waste can be added. It should be noted that this does not work in reverse. If the waste stream is mainly green waste, food waste cannot be added so the plant becomes suitable only for 100 % green waste. Also, because of the bacterial sensitivity, over-feeding of waste can stop the reaction. Thereafter, the unit will need to be re-set, including being cleaned out and a fresh supply of water and bacterial inoculum added, with 30 days to re-activate the process. It is claimed the system can cope with 15 - 20% non-segregated waste contaminated with glass, plastic and metal (although, it is accepted that metal can destroy the bacteria).

The system relies on the majority of waste floating within the digester liquid, allowing the bacterial decomposition reaction, thereby liberating the biogas. The system maintains a pH of 6.8 to ensure decomposition. In BIOEN's Bio-methanation technology one ton of bio-waste is reduced to less than 100kg in a 30-day retention time. Biogas production is claimed at up 60m3/Tonne Per Day (TPD), depending on the particular waste stream.

The agro-residues and leafy material containing lignin does not get digested completely and comes out of the digester at the end of 30-day retention time. This material can be removed out of the digester and dried to obtain compost of high nutrient value. From 1TPD of biodegradable waste fed into a biogas plant around 30-40kg of wet compost (6-10kg dry) compost can be achieved. The wet compost has to extracted from the vessel with the digester liquid and then requires secondary processing under aerobic conditions.

The digester liquid is also high in nutrients and can be used as fertilizer. The process assumes that the moisture content of the raw waste feed is sufficient to maintain the liquid level in the reactor vessel, thereby allowing digester liquid to be drawn-off for use as a liquid fertiliser.

The biogas produced can be used directly for cooking or can be converted to electricity. Using our highly efficient IR biogas stoves along with a biogas compressor (2-5Kg/cm2) the biogas can be efficiently used as a substitute for LPG. The excess biogas produced can also be converted to electricity through a biogas generator. For each m3 of biogas generated 1-1.5kW of electricity can be generated.

It should be noted that not all food waste – eg: bones, egg shells – decompose in the reactor but sink to the bottom and remain there. This necessitates shutting down the system at 3 – 4-year intervals to clean out the reactor and refresh the system, followed by 30-day re-activation.

The reactor has limited flexibility. It can operate at below its rated capacity without damaging the process, but outputs will be reduced, correspondingly. It cannot operate above its rated capacity. At the point at which a small increase in throughput is required, an additional reactor will be required.

9.2.2.1 Proposed Mitigation Measures

The following Table 33 enlist the proposed mitigation measures for the envisaged impacts of the anaerobic digestion systems.

Table 33: Mitigation measures for Anaerobic Digestion

Envisaged Impact	Proposed Mitigation Measures
Leachate and Runoff	• Maximize recycling of wastewater to the reactor; • 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.
Fire Safety	• 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.

9.2.3 Comparison of alternative technologies

The following **Table 34** provide a comparison between the manual composting, anaerobic digestion system and aerobic OWC technology.

Table 34: Comparison between different technologies for composting of organic waste

Technology for Composting	Advantages	Disadvantages
Aerobic OWC Technology (In vessel Composting)	• Simple and convenient to operate without the need for constant attention; • Short processing times ensures economic in use with low energy consumption; • Requires minimal maintenance;	• Require a significant proportion of organic absorbents such as saw dust or dried leaves. • Requires activation inoculum (bioculum)
Manual Composting	• Does not require any activation inoculum. • Low capital cost	• Require large space for windrow systems; • Composting curing process is very slow require 4 months to get the finished compost. • Piles need to be turned frequently every 5 days, which makes it extremely labor intensive. • The issue of odor, flies and rodents will exist. • High processing time means low changes to generate sufficient income from it. • Generate leachate especially during rainy weather.
Anaerobic Digestion System	• Digester liquid can be utilized as fertilizers • Bio-gas produced can be utilized as a LPG replacement	• High capital cost • Require constant maintenance

		• Not all types of organic waste can be utilized for composting

9.2.4 Justification for the proposed technology

The proposed composting technology of aerobic OWC technology is the most appropriate composting technology for IWRMC in M. Mulah. The technology is simple and convenient and require short processing time so that more compost can be produced and made available for the farming and gardening process in the island.

The Manual Composting requires a large space (including for compost drying) which can be utilized for other waste management activities such as sorting of waste transferred to IWRMC and placement of other waste management equipment. Furthermore, windrow system process is extremely slow which take approximately 4 months for compost maturing.

The anaerobic technology requires significant capital cost and requires constant maintenance. Furthermore, some types of the organic waste cannot be utilized for the composting process.

9.3 Alternative source for power requirement of IWRMC operations

The following **Table 35** discuss the alternative sources of energy for the operations of the IWRMC including power requirement for the composting machine.

Table 35: Comparison of Power Sources to meet the power requirement of IWRMC operations

Type of Power Source	Advantages	Disadvantages	Justification for selection/ rejection
Solar Photovoltaic Cells	• Roof area of IWRMC can be utilized for solar installation. • No GHG emissions • Low maintenance required	• High capital cost • Requires additional technologies such as battery	The capital cost associated with installation of solar photovoltaics is too high and this investment is not within the scope of MCEP.
Stand-alone generator system	• Savings from operational cost.	• An exhaust stack must be constructed. • Localized air pollution and noise pollution • Requires fuel storage area	Due to minimal power requirement for IWRMC operation a stand alone generator system is not justified.

Utilization of the existing grid of the island	• No investment required.	• High operational cost of electricity	Due to minimal power requirement for IWRMC the most preferred option is utilization of the existing grid of the island.

CHAPTER TEN: MONITORING AND REPORTING

This section of the report will provide the institutional arrangement for safeguards monitoring, monitoring regime, reporting procedures, implementation schedule, contractual measures and grievance redress mechanism (GRM).

10.1 Institutional Arrangements for Safeguards Monitoring

The following **Figure 24** illustrates the proposed institutional arrangement for the safeguards monitoring including ESMP implementation. The **Table 36** identifies different roles and responsibilities of the different parties involved in safeguards monitoring.

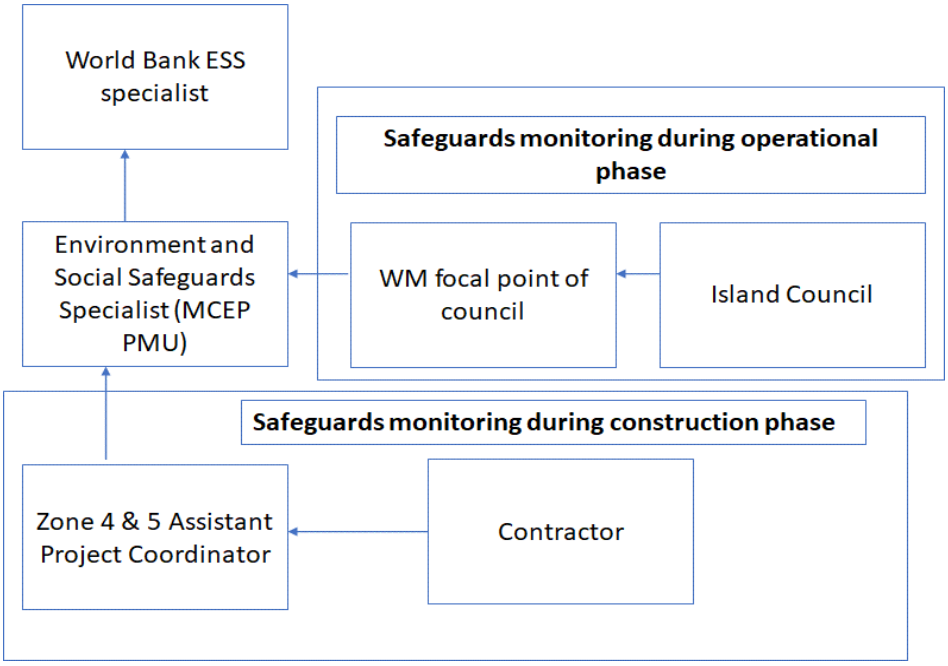


Figure 24: Institutional arrangement for safeguards monitoring

Table 36: Key roles and responsibilities for safeguards monitoring

Entity	Key Roles and Responsibilities
World Bank ESS specialists	1. Guide the ESS specialist of MCEP PMU on safeguard monitoring; 2. Ensure the quality of the monitoring reports 3. Approve the ESMP and monitoring reports.
ESS specialist – MCEP PMU	1. Implementation of Tier 2 of proposed GRM 2. Ensure compliance of the contractor for the proposed ESMP.

	3. Ensure the quality of the monitoring reports submitted by Zone 4 & 5 assistant project coordinator and contract. 4. Train Zone 4 & 5 APC and WM focal point of council and island council on monitoring of safeguards 5. Provide reporting template for the interim and operational phase monitoring reports. 6. Prepare Final monitoring report including all monitoring activities throughout project implementation.
Zone 4 & 5 Assistant Project Coordinator (APC) of MCEP PMU	1. Prepare two interim monitoring report. 2. Verification of accuracy of the monthly progress reports submitted by the contractors.
WM focal point of island council	1. Operational phase monitoring report including activities implemented during operations of the IWRMC.
Contractor	1. Implementation of ESMP prescribed in this report 2. Monthly monitoring progress reports (3 to 6) prepared consistent to the template provide by the ESS Specialist of MCEP
Island Council	1. Assist WM focal point to prepare operational phase monitoring report including activities implemented during operations of the IWRMC. 2. Implementation of Tier 1 of GRM

10.1 Prescribed Monitoring Regime

The inclusion of a monitoring plan in the ESMP is essential to assess the effect of the project on natural and cultural environment. It is a tool used to measure the accuracy of predictions and to determine whether the proposed mitigation measures have been effectively carried out by the proponent as recommended in the ESMP. Another important aspect of environmental monitoring is its capacity to determine unforeseen impacts that have not been predicted during the impact identification stage. It should be noted that adopting of mitigation measures do not guarantee unforeseen impacts.

The main key objectives of the environmental and social monitoring plan are to:

1. determine whether the proposed mitigation measures in this management plan are followed during the construction phase of the project.

2. analyse the effectiveness of the operation of IWRMC in terms of spillage prevention and overall

cleanliness of the island.

The monitoring plan for the ESMP is presented in **Table 37**. Monitoring results shall be documented with preventive/corrective actions to be implemented.

Table 37: Proposed Monitoring Progamme for Establishment of IWRMC in M. Mulah

Aspect	Parameter	Frequency	Responsible Party	Cost of Monitoring (MVR)
Construction Phase				
Implementation of mitigation measures during construction	Records of successful implementation of mitigation measures	Monthly during construction period	Contractor MCEP	18,000 cost of traveling to the island
Groundwater Quality	Visual observations and perceptions of nearby residents. Salinity, smell, color of water of the groundwater well within the IWRMC	Once during mobilization prior to construction and once after completion of the project	Contractor MCEP	9,000 Cost of traveling to the island
Grievance	Log records of number of complaints received and actions taken during construction phase	Throughout construction phase	Island Council MCEP	9000
Operational Phase				
Implementation of mitigation measures during operations of the IWRMCs	Records of successful implementation of mitigation measures.	6 months after commencement of operations	Island Council / IWRMC Operator	Included in the operational cost

Spillage Assessment	Waste Collection Arrangements Littering around the island (Beach, harbor area andother public areas) Spillage during transfer to IWRMC Any Spillage within the IWRMC Proper use of IWRMC Spillage during transfer to regional waste facility	Once when the project is completed and one year after project completion	Island Council / IWRMC Operator Designated RWMF operator / regional waste collector	Included in Operational Cost
Groundwater Quality	Visual observations and perceptions of nearby residents. Salinity, smell, color of water of the groundwater well within the IWRMC.	6 months after commencement of operations	Island Council, IWRMC Operator	Included in Operational Cost
Grievance	Log records of number of complaints received and actions taken during operational phase	Throughout the operational phase	Island Council	Included in Operational Cost

10.2 Reporting Procedures

The reporting procedures presented in **Table 38** have been developed in order to ensure that the proponent is able to receive feedback from the implementation of the ESMP on an ongoing basis and to take rapid corrective actions if there are issues of non-conformance.

Table 38: Proposed reporting arrangement for monitoring of safeguards during construction and operational phase of IWRMC in M. Mulah

Phase	Prepared By	Approved By	Deliverable	Accountability
Construction	Contractor	Zone 4 & 5 Assistant Project Coordinators ESS Specialist – MCEP PMU	Monthly monitoring progress reports (3 to 6) prepared consistent to the template provide by the ESS Specialist of MCEP. These reports should indicate the level of implementation of mitigation measures and must be accompanied	Contractor. To be attached with interim payment claims made by the contractor. Payments to be released subject to timely submission of the monitoring reports.
	Zone 4 & 5 Assistant Project Coordinators	ESS Specialist – MCEP PMU	Two (2) interim reports prepared consistent to the template provide by the ESS Specialist of MCEP. Verification of accuracy of the monthly progress reports submitted by the contractors.	MCEP PMU APC should submit report to ESS Specialist for review and verification.
Completion of Construction and demobilization of contractor from site	ESS Specialist – MCEP PMU	World Bank ESS specialists Submitted to EPA for their perusal	Final monitoring report including all monitoring activities throughout project implementation.	MCEP PMU. Report to be submitted to the World Bank and EPA.
6 months after commencement of operations	WM focal point of council	Island Council ESS Specialist – MCEP PMU	Operational phase monitoring report including activities implemented during operations of the IWRMC.	Island Council. Report to be submitted to EPA.

		Submitted to EPA for their perusal		

10.2 Implementation Schedule

The activities related to environmental management and monitoring have to be integrated in the overall construction schedule. The project construction phase is estimated to be completed in 3 months. The implementation schedule is presented in **Table 39**.

Table 39: Implementation Schedule for Safeguards Monitoring and Reporting

Activity	Responsible Party	Pre-construction phase (Weeks)						Construction phase (Months)			Operational Phase (Months)					
		1	2	3	4	5	6	1	2	3	1	2	3	4	5	6
Clearance and formal disclosure of ESMP	MCEP PMU															
Inclusion of ESMP in bid document	MCEP PMU															
Finalization of Engineering Designs	MCEP PMU															
Inclusion of ESMP in the contract document	MCEP PMU															
Disclosure of GRM in project sites	MCEP PMU/ Island Council															
ESMP briefing to Contractor at kickoff meeting	MCEP PMU															
Contractor's ESMP monitoring reports	Contractor															
Compliance check / Interim monitoring reports (3 nos)	MCEP PMU															
Preparation and submission of consolidated monitoring report	MCEP PMU															
Preparation and submission of operational phase ESMP report	Island Council															

10.3 Contractual Measures

Implementing the mitigation measures are an obligation of the contractor during the construction phase of the project. The EPA and World Bank approved ESMP should form part of the contract and the mitigation matrix shall be extracted from the ESMP and reflected as an appendix to the contract. In addition to this, the following clauses should be incorporated into the contract document of the selected contractor as condition of the contract to ensure effective, timely and stringent implementation of the ESMP.

1. Retention payment will be released after defects are rectified and compensating for any significant environmental and social safeguards violations.

2. Payment claims made by the Contractor should be accompanied by progress reports that reflect works completed and Environmental and Social mitigation measures implemented. Payments will only be released after verifying the authenticity of these reports.

3. The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract. Fundamental breaches of Contract shall include, but shall not be limited to, the following:

- If the Contractor fails to implement the mitigation measures proposed in the ESMP of the project.
- If the Contractor fails to submit staff list and valid work permits of the expatriate staffs within 10 days of signing the agreement.

10.4 Grievance Redress Mechanism (GRM)

Based on the ESAMF, MCEP has formulated a Grievance Redress Mechanism (GRM). GRM is established to receive and facilitate grievances of the affected persons during the implementation of the project.

Island Councils were consulted on the progress regarding setting of focal points and availability of the GRM forms at the Council. M. Mulah Council stated that the Council would make the forms available physically at its office as well as publicly displayed. The Council has nominated a waste management focal point for this purpose (Abdulla Majid 9682182). Mulah Council does not have a website, although work is underway on creating a Facebook page, in which a link to the GRM forms will also be provided.

Following are the details of the GRM developed by the MCEP. GRM at tier 2 will be managed by the ESS Officer of MCEP. Tier 2 GRM forms will be made accessible from the respective council office and Ministry of Environment front office and is published in Ministry of Environment website. Below are the links.

English page:

http://www.environment.gov.mv/v2/en/download/7189

Dhivehi page:

http://www.environment.gov.mv/v2/dv/download/7191

The following **Table 40** provides detail information of the Grievance Redress Mechanism for MCEP.

Table 40: Details of the Grievance Redress Mechanism developed by the MCEP

Tier of Grievance Mechanism	Nodal Person for Contact	Contact Communication and other facilitation by the project	Timeframe to address grievance
First Tier: Island Council	Island Council will be the first point of contact for any grievances. The staff designated as the waste management focal point by the island council will manage grievances on behalf of the council.	GRM should be publicly displayed in the construction site as well as the council office. GRM should also be outlined in official website and/or social media pages of Council, MEE (and/or the project), including contact details of the nodal person in each tier. Grievances can be addressed informally by contacting the council through email / telephone / in person. If the grievance cannot be resolved informally, an aggrieved party must submit a complaint on the Tier I Complaint Form. A copy of the form (with the council seal) should be provided to the aggrieved party as evidence of receipt. Electronic version of the complaint form should be available from the websites and/or social media pages of MEE and the council. Physical copies of the form should be available from the council front office. Council will provide assistance to fill the form for those who cannot write. The council should keep separate registries for informal and formal complaints and maintain records of all complaints received. The council will discuss the matter with the Women's Development Committee and	15 working days

		other relevant stakeholders (Farmers, Fishermen, School, Health Center etc.), where deemed necessary and attain views of them. If such meetings are arranged, the date, time, location or venue, list of participants (with contact details) and a summary of the main outcome of the consultation must be annexed to the written decision issued by the council. If the complaint is resolved within 15 working days, the council must communicate the decision to the aggrieved party in writing. The aggrieved party must acknowledge the receipt of decision and submit their agreement or disagreement with the decision within 10 working days. If no acknowledgement is submitted from the aggrieved party within this period, then the decision will be considered as accepted. If a complaint requires more time to address, this requirement must be communicated to the aggrieved party in writing and the aggrieved party must consent and sign-off the request for the extension to take effect. An extension can be made to an additional 15 working days. The staff designated as the waste management focal point by the island council will manage and provide feedback for grievances submitted to the council.	
Second Tier: Ministry of Environment (ME)	Environmental and Social Safeguards officer at the Project Management Unit (PMU) will be the focal point.	If the grievance cannot be resolved through Tier 1 to the satisfaction of the aggrieved party or if the issue is outside the jurisdiction of the council	15 working days

		(issues related to RWMF), an aggrieved party may submit a complaint on the Tier 2 Complaint Form. A copy of the form (with MEE seal) should be provided to the aggrieved party as evidence of receipt. Electronic version of the complaint form should be available from the websites and/or social media pages of MEE and the council. Physical copies of the form should be available from the council and MEE front office. A copy of the Tier 1 Complaint Form should be submitted with the Tier 2 Complaint Form. MEE will forward the grievance to PMU. PMU screens the grievance and determine if its related to MCEP. If it is unrelated, the aggrieved party must be notified in writing and the way forward must be outlined to them including the necessary government institutions to follow up. Environment and Social Safeguards Officer at the PMU will be the contact person in processing a grievance through the Second Tier. PMU will discuss the matter with EPA and other relevant institutions, where deemed necessary and attains views of them. PMU will also arrange site visits and hold onsite discussions and meetings if necessary. The PMU will be responsible to ensure that there is no cost imposed on the aggrieved person, due to the grievance mechanism at the second tier.	

		If the complaint is resolved within 15 working days, the PMU must communicate the decision to the aggrieved party in writing. The aggrieved party must acknowledge the receipt of decision and submit their agreement or disagreement with the decision within 10 working days. If no acknowledgement is submitted from the aggrieved party, then the decision will be considered as accepted. If a complaint requires more time to address, this requirement must be communicated to the aggrieved party in writing and the aggrieved party must consent and sign-off the request for the extension to take effect. An extension can be made to an additional 15 working days. If the grievance is not resolved to the satisfaction of the aggrieved party within 15 working days of submission of the grievance to tier 2 then the aggrieved party may notify the MEE, in writing, of the intention to move to tier 3.	
Third Tier: Judiciary **Power / Assistance to Vulnerable Persons beyond the Project's Grievance Redress Mechanism**	Judiciary system is an option for an aggrieved person and/or community in case that the other tiers have not been effective	The legal system is accessible to all aggrieved persons. Assistance from the PMU of MCEP is available only for vulnerable person(s)* as per this grievance mechanism. In cases where vulnerable person(s) are unable to access the legal system, the Attorney General´s office will provide legal support to the vulnerable person(s). The PMU must assist the vulnerable person(s) in getting this support from Attorney General´s Office. PMU must also ensure that there is	As per established Judicial Procedure

		no cost imposed on the aggrieved person if the person belongs to the vulnerable groups. The list of vulnerable groups is as defined in the footnote but may be further defined by MEE. The verdict of the Courts will be final.	

*Vulnerable person(s): A vulnerable person(s) for the purpose of this project is a person who is poor, physically or mentally disabled/handicapped, destitute, and disadvantaged for ethnic or social reasons, an orphan, a widow, a person above sixty years of age, or a woman heading a household.

CHAPTER ELEVEN: GENDER ANALYSIS AND GENDER ACTION PLAN

This section of the report will describe the gender analysis and main barriers which may prevent women getting the intended benefits of the proposed project. Due to lack of site-specific data from M. Mulah, general data for Maldives will be utilized for this gender analysis.

10.1 Gender Analysis and Barrier faced by Women

The prime legislature which is aimed to ensure the gender equality and women's empowerment in the country is Gender Equality Act (2016) which came into force in 2017. The main aim of this legislation is to eliminate discrimination based on sex or gender, including ending violence against women. The Act promoted gender equality in all aspects of public and family life. It also outlined duties and responsibilities on State and private parties, prohibited victimization and introduced remedies for gender-based discrimination. A national gender policy was developed in 2019 which includes five strategic goals; 1) Leadership and Governance; 2) Economic Empowerment, 3) Institutional Gender Mainstreaming 4) Gender Based Violence and 5) Access to Justice (Ministry of Gender, Family and Social Services 2020). The Strategic Action Plan (SAP) 2019-2023 included a "Gender Equality" subsector under the "Good Governance" sector. It recognized that "despite advancements in legal and policy framework including the passage of a domestic violence, a sexual harassment act and gender equality law, administrative, budgetary and human resource constraints restrict the implementation of these laws to achieve gender equality". The policy priorities of the Gender Equality subsector focused on "increasing women's representation in decision-making, minimizing sexual harassment, domestic violence, eliminating barriers for women to participate in economic activity including cultural barriers by promoting shared care work and household responsibilities.

Maldives is a signatory to the Convention on the Elimination of all forms of Discrimination Against Women (CEDAW) which was ratified in 1993. In a Global Ranking on gender gap issues, the Maldives is ranked number 113 out of a total of 149 countries, according to the World Economic Forum's Global Gender Gap Report 2018.

In the Maldives, the labor force participation rate of women was 42.2% when compared with men (75.1%) in 2019 (National Beuarea of Statistics 2019) The women's share in wage employment was 39% and majority of the women work as employees (69%) and entrepreneurs (26%). In 2018, the Gender Parity Index (GPI) for found to be 0.93 for pre-primary level enrollment, 0.95 for primary level enrollment, 1.19 for upper secondary level enrollment and 0.89 for lower secondary level enrollment indicating a disparity in the favor of boys in all enrollment level except for the upper secondary level enrollment. However, one in every four women has experienced some form of violence in Maldives indicating gender-based violence is prevalent in the country.

The ESMF of MCEP consist an Gender Development Plan which identifies the following Gender Issues, Strategies and Proposed activities relevant to the project. The following **Table 41** provides the Gender Development Plan for MCEP.

Table 41: Gender Development Plan for MCEP

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.

10.2 Gender Action Plan

The following gender action plan (**Table 41**) has been proposed based on the gender development plan of the MCEP. All the cost involved in implementation of Gender Action Plan has been considered in the cost estimates for the trainings.

Table 42: Proposed Gender Action Plan

Gender Activities/ Action	Indicators/Targets	Responsible Agency for implementation	Timeline
Ensure that women benefit from expanded and improved SWM collection, transfer and disposal services	At least 614 women (census 2014) have access to the improved SWM facility.	MCEP PMU	Operational Phase
Carry out meetings and interaction program with and orientation to women in the community. **Inform women groups regarding proposed construction works.**	05% of the female population of the island are consulted.	P: Communications Specialist of MCEP S: ESS Specialist of MCEP	Pre-construction Phase

Develop audio-visual aids and documentary for training programs about the project for illiterate women groups.	Two audio-visual aids developed for compost and fire safety training.	Communication Specialist of MCEP PMU	Monitoring trips
Conduct leadership training for women members of community groups.	One leadership training conducted for WDC on SWM.	P: Communications Specialist of MCEP PMU. S: ESS Specialist of MCEP PMU	Monitoring trips
Identify women interested to Work; assess their skills and involve them as per their capabilities.	20% of staff employed in IWRMC are female particularly waste collection and transport.	Island Council/ Ministry of Environment	Operational Phase

CHAPTER TWELVE: STAKEHOLDER CONSULTATIONS

12.1 Introduction

Involvement of stakeholders is crucial for the effective implementation of the proposed project. An integral part of this ESMP has been consultation with all relevant parties including public consultation, and relevant government authorities. This chapter aims to summarize the stakeholder consultations that were conducted for this ESMP.

12.2 Summary of Stakeholder Consultations

All the meetings for this ESMP, was undertaken virtually due to COVID-19. The main findings from the stakeholder consultations are summarized in below **Table 43** and **Error! Reference source not found.**.

Table 43: Summary of the main findings of the consultation with island council

Items	Description
Date of Consultations	7 January 2021 (Thursday) 1100 – 1200
Venue	Online Platform (google meet)
Name of Stakeholders	▪ President of the Island Council, Mr. Mohamed Ibrahim ▪ Abdulla Majid
Language of communication	Dhivehi
Introduction	The objective of this meeting was to inform and undertake consultation on the current waste management practices on the islands and including endorse the IMWC proposed under the project.
Summary of discussion	**General Waste Management Issues in the island:** ▪ Council outlined that waste management issue is one of the problem that island is facing over the last decade. The island council have undertaken all the necessary preparatory work in order to facilitate the implementation of the IWMC at the island. These include clearance of the access road facilities and preparation of lighting poles for the access road. ▪ The council have also prepared a Waste Management Plan which and approved by EPA. The Waste Management Plan set out clear strategy on how to mange waste on the island, including a monthly fee collection system. The council is proposing MRV 150 per month from each household for waste management services. ▪ The rationale for allocating land for the waste management is distanced from the residential area which would not cause any significant impact to the communities during waste management sites. **Removal of Vegetation from the site** ▪ The council estimates that there is approximately 40 large coconut palms that needs to be removed or relocated within the IWMC site. Furthermore, since the designated area is previously

	used as an agricultural land there are few fruit trees such as Guava. The council indicated these trees are weak and are not large trees that would not require significant replantation. ▪ The access roads are cleared, however the coconut palms located at the site would be removed by the contractor and the contractor would provide compensation to the owners of the palms. This compensation may be facilitated by the council as these types of compensation are usually facilitated by the council in most cases. ▪ The council propose two sites (near ice plant facility as well as the football ground) to replant the coconut palms. **Figure 5**, shows these locations. This replantation would enable greater protection of island as well as increase resilience of the vegetation line (buffer zones). **Proposed composting technology.** ▪ The council welcome the proposed technology by the Project Proponent as it would enable production of an usable material (compost) from the otherwise not usable waste material.

Table 44: Summary of the main findings of the consultation with FENAKA Corporation

Items	Description
Date of Consultations	7 January 2021 (Thursday) 1100 – 1200
Venue	Online Platform (google meet)
Name of Stakeholders	Fenaka
Language of communication	Dhivehi
Introduction	The objective of this meeting was to inform and undertake consultation on the current waste management practices on the islands and including endorse the IMWC proposed under the project.
Summary of discussion	**Electricity connection** ▪ FENEKA officials indicated that as of now there is not connection to the proposed waste management site or the access roads. However, FENAKA would be providing connection to the during construction and operational phase of the IWMC. ▪ Provision of electricity requirements to the IWMC site during construction and operational phase.

12.3 Household Perception Survey

The public consultations were conducted through an questionnaire sent to the council, as no physical survey was undertaken due to COVID-19. The questionnaire is annex in Appendix 05 along with the respondent sheets. Approximately 15 household were surveyed in accordance with the ToR. The findings from the survey are discussed below.

12.3.1 Demographical Characteristics

Even though the survey is done at household level, demographic information of individuals were taken. It was noted that represented households comprise of 35 females, 40 males and 29 children. **Error! R eference source not found.** shows the households represented in the way. It is also noted that majority of the forms were filled by females.

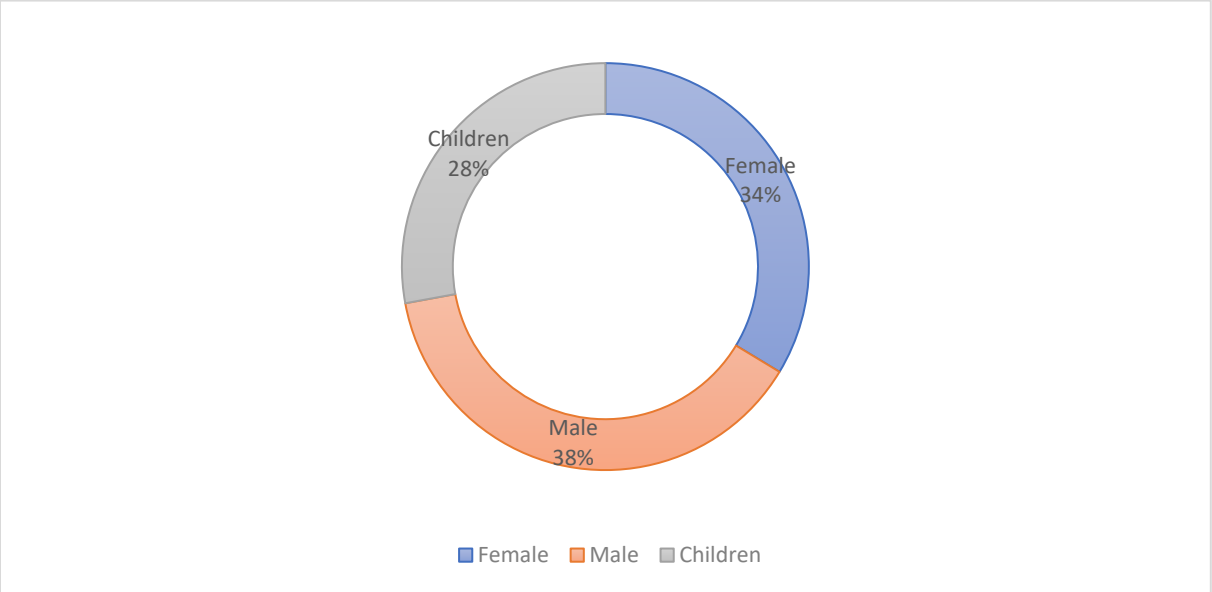


Figure 25: Demographic characteristic of the survey

12.3.2 Waste generation and collection pattern

It is observed from the survey that approximately 1 to 2 kilogram of organic waste is generated from individual household. Similarly, 2 kilogram of inorganic waste is generated. The organic waste stream of the community can be estimates as 20 – 30% of the waste volume. The residential community does not undertake any form of waste segregation at household level. Hence most of the waste is dumped at random sites individually by islanders. The main containers that are used in the waste collection ranges from dustbins to plastic containers to nylon or cloth sac bags. Each individual household take their daily waste generated to the site individually as there is no system established.

12.3.3 Waste Management practice

Currently all the waste that is generated from the households are dumped at the site with no adequate waste management. Even though council have designated an area for dumping waste, council does not have significant role in this area. Given that there is no existing waste collection system on the island, the households dump or discard their waste individually at their own convenience.

According to the household survey, there is no designed waste collection system. The current waste dumping site is located near the harborside of the island. Communities have indicated that they are not satisfied with the current location. The main reasons associated with this dissatisfaction includes, increasing level of unhygienic environment at harbour side. Furthermore, significant amount of waste leachate is causing harmful impact to the marine environment and nearby reef system.

12.3.4 Satisfaction over the existing waste management

According to the household survey, there is no designed waste collection system. The current waste dumping site is located near the harborside of the island. 100% of the residents that were surveyed during the Household survey have indicated that they are not satisfied with the current location. The main reasons associated with this dissatisfaction includes, increasing level of unhygienic environment at harbour side. Furthermore, significant amount of waste leachate is causing harmful impact to the marine environment and nearby reef system.

12.3.5 Composting Technology and compost demand

The communities are aware of the benefits associated with the composting technology that is to be installed at their IWRMC. Some residents have indicated waste management machineries they would require to improve on effective management of waste in the island. Furthermore, during the stakeholder consultation with council, they noted that composting would enhance proper waste management of the organic waste.

12.3.6 IWRMC Needs or requirement

Most of the community household indicated that they would require waste transport services such as pick-up or lorry in addition to equipping the IWMRC with other waste management machineries.

CHAPTER THIRTEEN: RECOMMEDATIONS AND CONCLUSION

The construction and development of the IWRMC at M. Mulah is a much-needed project to provide waste management services to the island. The IWRMC will be an improvement to the current waste disposal practices conducted in the island, while reducing the environmental pollution and providing health and economic benefits to the island.

Although the project is perceived to yield significant environmental and human health benefits and contribute towards achieving sustainable development goals, it should be understood that these benefits as outcomes would depend on smooth operations of the waste management system as a whole. In order for the system to function sustainably adequate resources in particular financial resources shall be made available. Part of the required funding could be obtained through introducing a fee structure for the service and sale of metals and compost. However these revenue sources are not likely to be adequate enough for the entire operation. Hence, support from the government will be critical to maintain the system functional. Unavailability of the funds could mean breakdown of the transport system which could ultimately collapse the waste management service. Regular removal of residual waste from the island will have to be ensured as a key aspect of the project implementation. A RWMF and a regional collection and transport system in Zone 4&5 will be established under MCEP. Regional collection and sea transport will be through WAMCO in agreement with the Council once the regional system is established. Location and technology used for RWMF will be determined through the Feasibility Study and BPEO Study.

Based on past experiences gained from projects of similar nature, it is also important to undertake a one off clean up activity of the island that includes removal of existing stockpile of waste. Failing to undertake this could lead to overloading of the waste management centre resulting failure to carry out the operational activities in the planned manner.

The construction and operational impacts that might arise from the project should be managed, mitigated and monitored on a continuous basis and should adhere to the EIA regulation all throughout the construction and operation of the project. Strict considerations are to be given to the pollution control as well as health and safety measures

The main recommendations for the project include:

- Plan a one off clean up activity prior to the official opening of the waste management centre;
- plan and have in place a sea transfer arrangement to remove residual waste from the site on a regular basis;
- carryout necessary training for the waste management personnel in particular in the area of composting;
- adequate awareness raising of the general public on the operation and functioning of the new waste management centre and sensitising the public on the rules and procedures that would come into effect with regards to the new waste management system;
- implementing fee for service system;
- strengthening enforcement capacity of the local authorities;
- provision of adequate financial and technical support at least for the initial 3 years into the project implementation to the island council;

- determine an operational plan for the centre that takes into account details of all aspects of operating, managing and sustaining the service;
- conduct supervision and monitoring of the project works by the Proponent;
- enforcement agency to make an effort to make at least one visit to the project site during the construction phase to ensure environmental compliance of the project activities; and
- proponent appoints a focal point to coordinate activities relating to monitoring and reporting.

This ESMP has looked into the key factors that need to be considered during construction and operational stage and identified all likely environmental impacts. Among other temporary and highly localised minor negative environmental impacts, the study has identified the following unavoidable moderately negative terrestrial impacts due to proposed development works:

- Almost an irreversible change the overall terrestrial environment as a result of the placement of the IWRMC footprint;
- loss of mature 65 mature coconut palms and 5 other types of mature trees as a direct result of placing the footprint of the IWRMC and loss of 107 coconut trees and 6 other types of types indirectly as a result of clearing of access road vegetation from the project site (assuming no mitigation); and
- generation of yard waste as a result of site clearing (assuming no mitigation).

The study also found that through the implementation of the proposed practical and cost effective mitigation measures almost all identified impacts can be brought to an acceptable level. The study found no evidence of the project resulting loss of endangered or protected species or habitat.

Thus based on the findings, it is concluded that the benefits on the environment and human health greatly outweighs the negative effects resulting from the implementation of the project.

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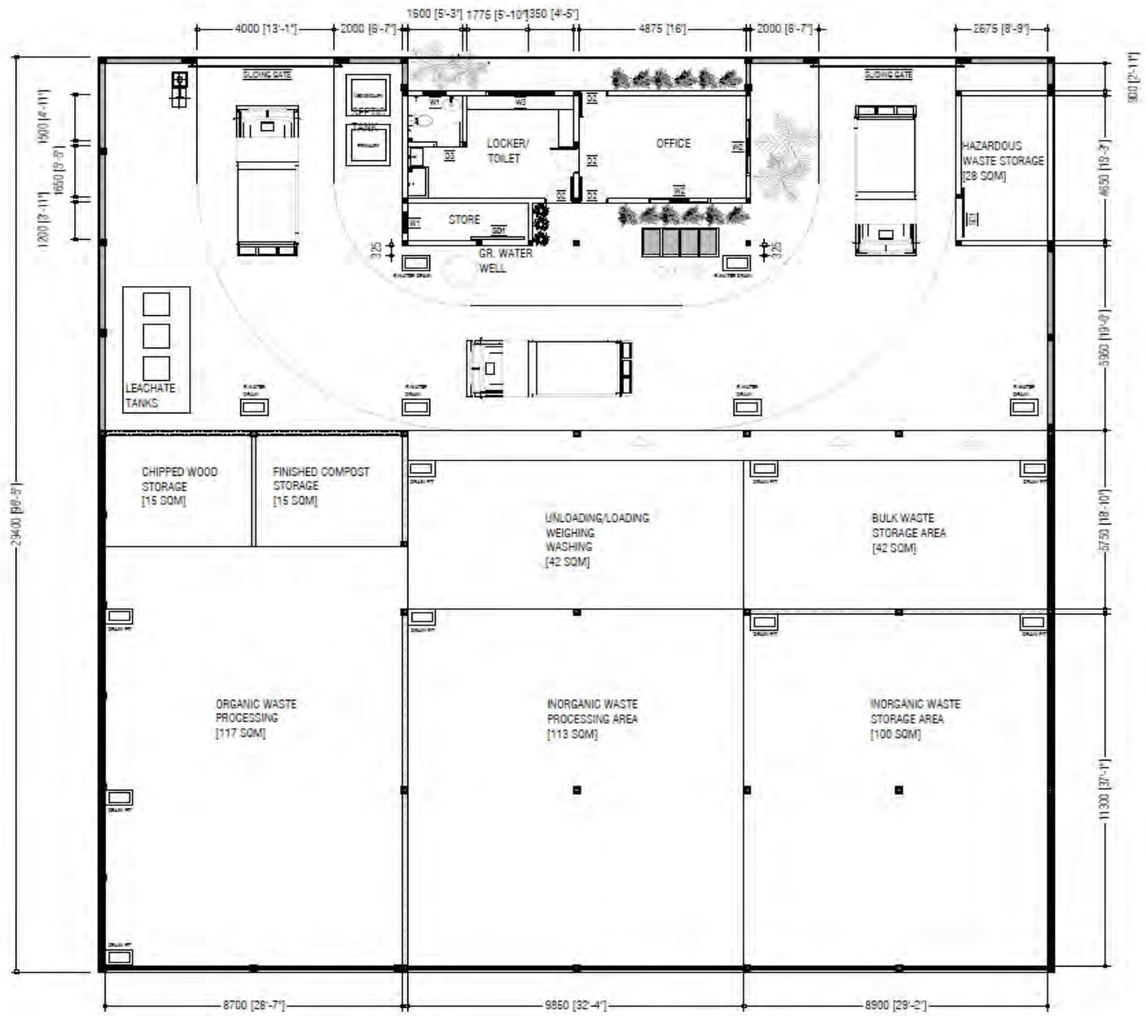
ANNEX 1: SITE PLAN



NOTE:

- 2500mm HEIGHT WALL
- 1500mm HEIGHT WALL
- OFFICE / HAZARDOUS WASTE BUILDING WALLS
- 2500mm HEIGHT MASONRY WALL + CLADDING ON TOP
- 2500mm HEIGHT MASONRY WALL + LOUVERS ON TOP
- BOUNDARY FENCE

PREPARED BY	PROJECT	DESIGN BY	NOTES / AMENDMENTS
MCEP MINISTRY OF ENVIRONMENT GREEN BUILDING, HANDHUVAREE HIGUN, MAAFANNU, MALE' (20392), REPUBLIC OF MALDIVES. TEL: +960-3018431, +960-3018300, FAX: +960-328901	CONSTRUCTION OF ISLAND WASTE MANAGEMENT CENTRE M. MULAH	AFRAZ	MECHANICAL COMPOSTING FOR ORGANIC WASTE MANAGEMENT
	TITLE FLOOR PLAN	STRUCTURE BY AFRAZ	
	CLIENT DEPARTMENT WMPC DEPARTMENT	DRAWN BY AFRAZ	
	PAPER SIZE A3 PAGE NO. 02	SCALE 1:150 DWG NO. MULA-A1-02	
		DATE 15.10.2020	

ANNEX 2: A3 LOCATION PLAN

ANNEX 3: PROPONENT DECLARATION AND COMMITMENT LETTER

بسم الله الرحمن الرحيم

Ministry of Environment
Male', Republic of Maldives.

ދިރާސާ ތަކާ ބަންދަރުތަކުގެ ވަޒާރާ،
ދިވެހިރާއްޖެ،

ދިރާސާ ތަކާ ބަންދަރުތަކުގެ ވަޒާރާ - ދިވެހިރާއްޖެ ކަނޑުދަރިއާ

Date: 18 January 2021

No: 438-WMPC/203/2021/14

Mr. Ibrahim Naeem,
Director General,
Environmental Protection Agency,
Green Building, Handhuvaree Hingun, Maafannu,
Male', 20392, Maldives.

Dear Sir,

Sub: Commitment to undertake Mitigation and Environmental Monitoring

The Environmental and Social Management Plan (ESMP) prepared for the proposed establishment of the Island Waste and Resource Management Centre (IWRMC) in M. Mulah has been prepared in accordance with the EIA Regulations 2012 and its amendments, issued by the Ministry of Environment.

We would like to confirm our commitment to the proposed mitigation measures and the monitoring programme that has been highlighted in the ESMP report prepared for the above referenced project.

Sincerely,

Amru Adam,
Assistant Director

Green Building, Handhuvaree Hingun,
Maafannu, Male', 20392, Republic of Maldives.
+(960) 301 8300
www.environment.gov.mv

ގްރީން ބިލްޑިން، ހަންދުވަރ ހިންގުން،
ދާނާގަ، ފިލާ، 20392، ދިވެހިރާއްޖެ
secretariat@environment.gov.mv
www.twitter.com/ENVgovMV
www.facebook.com/environment.gov.mv

ANNEX 4: TRANSLATION OF ESMP MATRIX TO DHIVEHI LANGUAGE

ތިމާވެށީގެ މެނޭޖްމަންޓް ޕްލޭން			
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1. ވިޒިއަލް/ އެސްތެޓިކް			
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އިމާރާތްކުރުމުގެ ވަގުތުގައި ޑެސިބަލްސް ބާރުންކުރުވުމުގެ ސަބަބުން އަޑުގަދަވުން	އިމާރާތްކުރުމުގެ މަސައްކަތް ކުރަންވާނީ ހެނދުނު 8 އާއި ހަވީރު 6 އާއި ދެމެދު. އަޑުގަދަ މެޝިން ބޭނުންކުރާ މުއްދަތު ކުޑަކުރުން، ޓްރަކުތަކާއި ވެލެއިޒަރު ކުރެންފަދަ މެޝިނަރީ ބޭނުންކުރާއިރު މަސައްކަތްކުރާ ވަގުތުތަކުގައި ކަންފަތް އުނގުޅި ބޭނުންކުރުން.	ބީ. ކޮންޓްރެކްޓަރ	ކަންފަތް އުނގުޅި ގަތުމަށް ހިނގާ ޚަރަދު
މަސައްކަތް ހިންގުން ދިޔުމާއި އާއި މަސައްކަތާއި ގުޅުންހުރި	މަސައްކަތަށް ބޭނުންވާ ސާމާނު ބަރަކަތް ސައިޓަށް ގެންދިއުމުގައި އާއްމުން ބޭނުންކުރާ މަގުތަކާއި ތިމާވެށް ދުރުމަގެއް ހޮވުން ބޮޑެތި، އިންޖީނުގެ ކުދަނދުގައި ވަޅުފަށް ހިމެނޭ އެފަދަ ސާމާނު ނަގައިދޭތަން	ބީ. ކޮންޓްރެކްޓަރ	ނުހިމެނޭ

ދުދާ އުފެދުމުގެ ސަބަބުން ވައި ތަޣައްޔަރުވުން ކުރާ ނޭދެވޭ އަސަރު	އުފެދުން ނުވާގޮތަށް ބަލާ ގާޑިއަކުގައި އުފުލުން، ސާމާނު އުފުލާ އުޅަނދު ދުއްވަންވާނީ ވީހާވެސް މަދު ސްޕީޑެއްގައި އަދި ސާމާނު ބަހުލާނު ބާރަށްވާނީ މަސައްކަތްތަކާ ސަރަޙައްދު އިރުން އެތެރޭގައި. މަސްތޫރުގައި ބޭނުންކުރާ ހިރާ އެއްގަމު އުފަދުއްގެ ރޯޑްވޭރިޔަސް ސަބްފިނާޓީގެ އަދާހަމަކަން ކަށަވަރުކުރުން. މަސްތޫރުގައި ބޭނުންކުރާ ހިރާ އުފަދުއްތަކާއި މުށިހުނުގެ ރަނގަޅަށް ބިއްސުންކުރުން، އަދި ބޭނުން ނުކުރާ ވަގުތު ތަކެތި ނިއްވާލާފައި ބެހެއްޓުން. މަސްތޫރު ކުރިއަށްގެންދާ އަދި ހިދުމަތާއި ކުރިޔެއްނުން ކުރެވޭނެ މަސައްކަތްތަކާ ސަރަހައްދުގެ ޒަވާއިދުން ފެންބޭހުން ވިސްނުވަރުގެ ބަރަށް ކޮންސްޓްރަކްޝަން ސާމާނު ފިނިޖެހޭ ސަބަބުން އުފެދޭ ހިރުވަރުން ސަލާމަތްވުމަށް އެފަދަ ސާމާނު ފިނިކުރުގައި ސަލާމަތީ ނިވައިއަރުގައި ބެހެއްޓުން. ކޮންޓްރެކްޓަރ އެއްފަދަ ޖަވާބުދާރީ ކުރެވޭނެ ނިޒާމުހަދުން.		
ޓްރެފިކް ވިލި ދެކުމުގެ ސަބަބުން ޓްރެފިކް ފުރުބަލި ރިޢާޔަތް ގެއްލުމާއި ޓްރެފިކް ޖެހުން	މަސައްކަތް ކުރުމަށް ހޯދާ ކޮންސްޓްރަކްޝަން ސާމާނު (ވެލި ހިލަނޑުން) ދިވެހިރާއްޖޭގެ ޓްރާންސްޕޯޓް ފަރާތްތަކުން އެއްގަމުން ޓްރެކްޓަރުގެ ސާމާނުކަން ކަށަވަރުކުރުން. މަސައްކަތް ކުރުމަށް ގެންނަ ވެއްޔާ ހިލަ ދިރިއުޅޭ ރަށުގެ ޓްރެފިކް ނުވާގޮތަށް ވަގުން ނުވާގޮތަށް ޓްރެކްޓަރު ނޭސްފާއަށް ހިމާޔަތް ކޮށްގެން ރަނގަޅަށް ބެއްލަން ވެގެން ނުވާނެ. މިގޮތުން ބޭނުންގައި ރަށުގެ ރައްޔިތުންގެ އާންމު ބޭނުންތަކަށް ފިހިނުގެ ހުއްދަ އީ.ޕީ.އޭ ގެ ޓްރާންސްޕޯޓް ދިރިއުޅޭ ސަރަހައްދުތަކުން ހިނގާ.	ރ. ކޮންޓްރެކްޓަރ	ހުއްދަ އޮތް ފަރާތްތަކުން (ހެވީވެހިކަލް ދުއްވާ) ވެލި ގެނައުމާއި ރަށަށް ގެންދިއުމަށް ހިނގާ ހަރަދު

ކުނި މެނޭޖްކުރުން	އިމާރާތްކުރުމުގެ ތެރޭގައި އުފެދޭ ކޮންސްޓްރަކްޝަން ކުނި ރަނގަޅު ކުނި މެނޭޖްކުރާ ސެންޓަރު ގާއިމުކުރުމުގައި ވީހާވެސް ބޭނުން ބޭނުން ކުރެވޭތޯ ބަލަން. އަދި އިތުރުވާ މި ބާވަތުގެ ކުނި (ދަގަނޑު ގޮނޑުއަޅި ފަދަ) ރަނގަޅަށް ރައްކާތެރިކޮށް ސޯޓުކޮށް ރަށު ކައުންސިލަށް އަގެއް ނުލައި ހަވާލުކޮށްދިނުން. ކަނޑާލާ ގަސްގަހާގެއްސާއި ފަތްފަތް އަލިފާނުގައި ރޯނުކޮށް، އެތަކެތި އަދިއްޔާ ގޮތުގައި ފަސްފުރުން ރަށުގެ ވަށްފަށުގައި ދޫކޮށްލުން. އިމާރަތް ހުރި ކޮންސްޓްރަކްޝަން ކުނި އުކާލަންވާނީ ކައުންސިލުން އެކަމަށް ކަނޑައަޅާފައިވާ ތަނަކަށް. ކުނިބަންގާއި ކަނޑާލާ ގަސްގަހުގެ ބައިތައް ވަގުތީގޮތުން ބެހެއްޓުމަށް ކަނޑައެޅިފައިވާ ހިސާބު ތަންތަން ދައްކާގޮތް ކުރެހުމުގައި ފާހަގަ ކުރެވިފައި.  	ޖ: ކޮންޓްރެކްޓަރ ސ: ރަށު ކައުންސިލް	ސަރަހައްދީ ކުނި މެނޭޖްކުރާ ސެންޓަރަށް ގެންދިއުމަށް ހިނގާ ޚަރަދު
ކުނި ޖަމާކުރުން، އިމާރާތް ކުރުމުގައި ހަރަކާތްތެރިވާ	އިމާރާތް ކުރުމުގައި ހަރަކާތްތެރިވާ މަސައްކަތްތެރިންގެ ސަބަބުން އުފެދޭ އާންމު ކުނިބުނި އެއްވަރަށް ބަލައި މަސައްކަތް ސައިޓުގައި ކުނި ވަކި ބެހެއްޓުން.	ޖ: ކޮންޓްރެކްޓަރ	ކުނިއަޅާފޮށި ގަތުމަށް ހިނގާ ޚަރަދު

މަސައްކަތްތެރިންގެ ސަލާމަތާއި އުފެދޭ އާންމު ކުރިމަތި	ސައިޓުގައި އުފެދޭ އާންމު ކުރިމަތި އުނިކުރުމަށް އުސޫލުތައް އެކުލަވާލުން، އަދި އެ އުސޫލުތައް އަމަލު ކުރުމަށް ފަރާތްތަކާއި ގުޅިގެން އިޖުރާއާތު އުސޫލުގައި ހިފެހެއްޓުން.		
2. ބައިލޮޖިކަލް			
ސައިޓު ސާފުކުރުމާއި ބިންގަނޑު ކޮނުމުގެ ސަލާމަތް ދިމާވާ މައްސަލަތައް (ސަރަހައްދު ތަޣައްޔަރުވުން/ ގަސްގަހަ ނެތުން)	<u>އުފެދުމަށް ކަނޑައަޅާ ގަވާއިދުތަކުގެ މަސްލަހަތު ރައްކާތެރިކުރުން އަގާން ފިޔަވަޅުތައް</u> **ސަރަހައްދު ފޮރަގަ ކުރުން** ޕްރޮޖެކްޓް ފޯރަމަށް ކުރަމުން ހަދާ ފުރަތަމަ ސާރވޭ ހެދުމުގައި ޕްރޮޖެކްޓުގެ ދިން ފޯރަމަކުރުމުގައި ސީމާ އިން ފޯރަމަކޮށް، ކަނޑަން ޖެހޭ ގަހުގެ އަދަދު މަދުކުރުން. ސައިޓު ސާފުކުރުމުގެ މަސައްކަތުގައި އިން ކަނޑައެޅުމާއި މެދު ކަނޑާލުމުގައި ކަނޑަންޖެހޭ ބޮޑެތި ގަސްތައް ފުރިހަމަ ޖެހޭ ބޮޑުގަހުގެ އަދަދު މަދު ކުރުމަށް ކުރިއަށް ބަލައި ގެންގުޅުން އިސްކަންދިނުން. **ގަ ބޮޑުތަކާއި ކުޑަ ބޮޑުގަސް އެހެން ސަރަހައްދުތަކަށް ބަދަލުކުރުން.** ކޮންމެހެން އުވާލަންޖެހޭ ގަސްތަކާއި އުވާލުމުގައި އެހެން ސަރަހައްދަކަށް އެފަދަ ގަސްތަކާއި ބަދަލުކުރުމަށް އިސްކަންދިނުން. މިސިންތަކުގެ އަގުއާއި ނުލައި އެހެން ސަރަހައްދަކަށް ބަދަލުކުރެވޭ ސައިޒުގެ ކުޑަ ބޮޑާއި ގަސްތައް (15 ފޫޓާއި އުސްމިނުގެ ތިރި، އެކަސްކަމަށްޓަކައި ބޭނުންކުރަނީ ގޮންޑުވާ) ރަށުގެ އެހެން ސަރަހައްދަކަށް ބަދަލުކުރުން. މިގޮތަށް ބަދަލު ކުރާ ގަސްތަކުގެ އެސްޓޮކް ބެޑް (ނަރަސް، ޝޯރިން، ބަދަލުކުރެވުނު ސަރަހައްދު ޗެކްޕޮއިންޓް ވެރިފިކޭޝަން އެބަ) ބެލެހެއްޓުން. މިގޮތަށް ބަދަލުކުރުމުގައި ގަސްތައް ބަދަލުކުރާނީ އާންމު ރަނގަޅު ސަރަހައްދުތައް ކަނޑައެޅުމުގައި ކައުންސިލްގެ ލަފާ ހޯދުން. ހަރާންގެތި: ފަޅުރާ ތިލަފުށިގެ ޖުރާމިންގައި ގަހުގެ ވަރައިގެން، ފަރުވާތެރިކަމާއެކު ގަހުގެ މުޅިންވެ ހިމެނޭ ފަސްގަނޑާއެކު ކޮންމެވެސް ނުވެސް. މިގޮތަށް ނަގާފައި ކުރިން ގަހުގެ ފަރާއިގެންވާ ފަސްގަނޑު ރަނގަޅަށް ބެހެއްޓުމަށް ސަމާލުކަން ދިނުން. އެރުން މުޅިންވެއަޔި އެކު ފަސްގަނޑު ހަރުވާލައި ހުރުމަށް ބެލުވޭނެ.	ޕީ: ކޮންޓްރެކްޓަރ	ގަސްތަކާއި އެހެން ސަރަހައްދުތަކުގައި އަޅުން އިންދުމަށް ގެންދިއުމުގައި ހިނގާ ޚިލާފު ޚަރަދު

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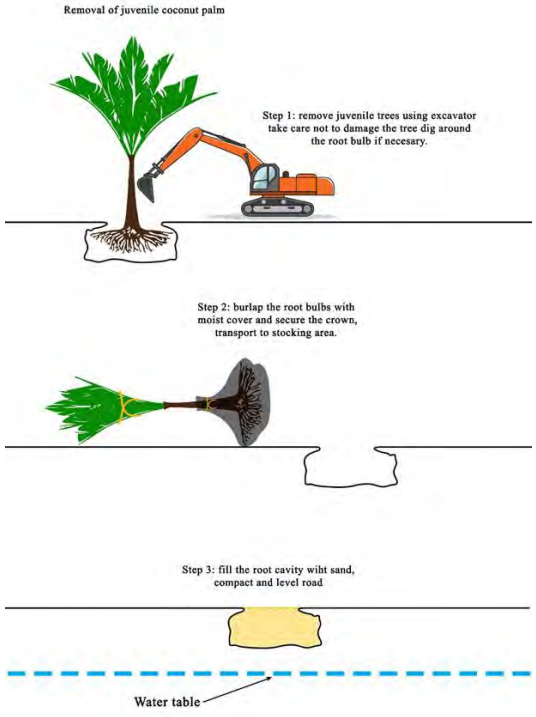
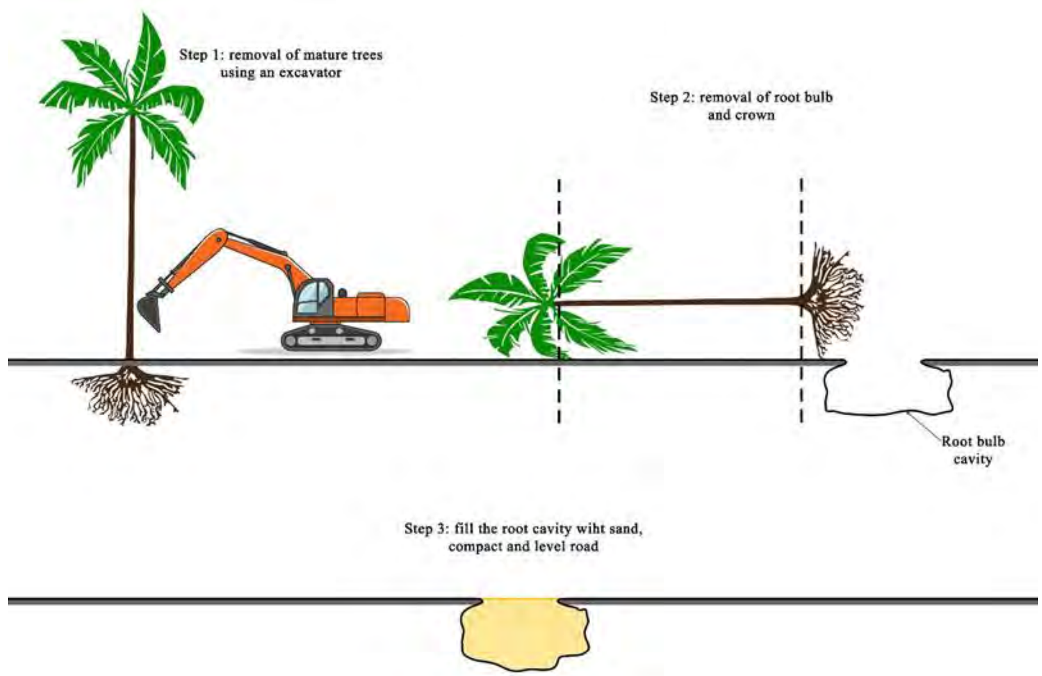
ކެނޑުގެ ކުށްތަކުގައި ހަލާކުވާ ގަސްތަކާއި ގަހާނަތައް ދެއްކުމަށް ކުރިއަށް ގެންދާ ކަންތައް. ތަކެއް ހާސިލުކުރުމަށް ކެނޑުގެ ކުށްތަކުގައި ކުރިއަށް ގެންދާ ކަންތައް ބަލައި ގެންދާ ގޮތް.



ގަސް ކާންދިނުން

ގަސްފުސް ދެއްކުމަށް ކުރުމުގެ ކުރިން ގަސްތަކަށް ދަތުރުކުރާ ފަރާތްތަކުން ގަސްތަކަށް ކާންދިނުމަށް، ގ ގަސްތަކުގެ ދަށުގައި ހިލަ ފަދަ ކުރިޔަށް ދާ ކަންތައް ކުރުމަށް ގަސްތަކަށް ކާންދިނުން ކުރުމަށް. ތަކެއް ގަސްތަކުގެ ދަށުގައި ކުރިޔަށް ގެންދާ ކަންތައް ބަލައި ގެންދާ ގޮތް. ތަކެއް ގަސްތަކަށް ކާންދިނުމަށް ގަސްތަކުގެ ދަށުގައި ކުރިޔަށް ގެންދާ ކަންތައް ބަލައި ގެންދާ ގޮތް. ތަކެއް ގަސްތަކަށް ކާންދިނުމަށް ގަސްތަކުގެ ދަށުގައި ކުރިޔަށް ގެންދާ ކަންތައް ބަލައި ގެންދާ ގޮތް.

		ރިޓެއިން ވަކިކުރުމަށްފަހު، ގަސްގަސްދޭ އެހެން. ގަހުގެ ބޭގަސްދޭ ބޭނުންކުރާނީ ގަސް އުފުރާލުމުން ވެލިގަސްދޭ ބުޑުގެ ފަސްގަނޑާ އެއްޗަކާ ކުރުމަށް. (ގަސް ނަގާނެގޮތުގެ ކުރެހުމުގައި ދައްކާފައިވާގޮތަށް)، ގަހުގެ ފަންޑުކާއި މަތިވަރު ގަނޑު ވަކިކޮށް އެތަކެތި ބައިބަދަލު އެކުލަވާލުމަށް މަތިވަރުން ބޭނުންނުކޮށް ތަކެތި، އެއްވެސް ރަގަޅަށްގުޅޭގޮތަށް ނުލައި ރަނގު ރައްދުކުރާނަން ދިނުން. ފަންޑުކާއި ފަތްތައް އަލިފައި ހިއްކާން. ވަކިވަކި ފަރުދުންނަށް ނިސްބަތްވާ ރުއްގަސް ކެނޑުމުގެ ކުރިން އެފަދަ ގަސްގަހަކަށް ދަންނަވާ ބަދަލު ދެވިދާނެގޮތެއް ކައުންސިލުގެ ފަރާތުން ކޯޑިނޭޓުކުރަން ކަނޑައެޅުން ކުރަން  	

	ކަނޑާ ކޮންމެ ގަހަކަށް 2 (ދޭއް) ގަހެއްގެ (ބޮޑީ ގަސް ނޫން) ރަށުގެ އެހެން ސަރަހައްދުތަކުގައި އިންދުން. މިގޮތުން އިންދާ ގަހެއްގަސް އިންދުމަށް އެންމެ އެކަށޭނަ ސަރަހައްދުތައް ކަނޑައަޅުމަށް ކައުންސިލްގެ ލަފާއާއި މަޝްވަރާ ހޯދުން. ކަނޑާ ގަސްތަކުގެ ބަދަލުގައި އިންދާ ގަސްތައް އިންދުމަށް ހުށަހަޅާ ސަރަހައްދު ތިރީގައިވާ ކުރެހުމުގައި (ގަސްކަނޑައިގެ ކައިރީގައިވާ ހުސް ސަރަހައްދު) އެވަނީ ފެހި ކުލަ ކޮށްފައި. ގަސްތައް އިންދަންވާނީ ރަށުގެ ކައިރި މާހައުލާ ސޯނބަރުގެ ވަރައިގެން، މަދުވެގެން 5 މީޓަރު ދުރުމިނުގައެވެ.  Legend Road network Area for compensatory replanting IWMC Access road Existing dumpsites Wetland Vegetated areas Shore Reef **ވަލުޖަނަވާރު އުކާލުން** ގަހެއް ކަނޑާގެ ގޮތުގައި ކަނޑައެޅިގެންވާނީ މަތީގައި ބޮޑެތިގަސް ހުރިހާ ހާލަތްތަކުގައި ރިއާއަތްކުރަންވާނެ. މިގޮތަށް ހާލަތްތަކުގައި ގަހުގެ ބޭރުގައި ފަތްތައް ވަލުޖަނަވާރުގެ އެކަނި ހޯދުމަށް ހަމަ ބަލާނެގައި ބެހެއްޓުމަށް ގަސްގެ މައިގަނޑު ބެރިބަދި ކުރުމަށްފަހު އެބަލާލީގެ އަމިއްލަ ޖާގައި ފަސޭހަކަމާއެކު ވަލުޖަނަވާރު ދޫކޮށްލުން.		
މަސައްކަތުގައި ބޭނުންވާ ސާމާނު ސަޕްލައިޗޭން ގެންދިއުމުގެ ތެރޭގައި	މަސައްކަތުގައި ހަރަކާތްތެރިވާ ފަރާތްތަކުން ގަސްތަކަށް ގެއްލުން ދިނުމާއި ވަލުޖަނަވާރު ދިރުންތަކަށް ނުރައްކާ އަސަރުކުރާނެ ފަދަ ކަންކަން ނުކުރުމަށް އެފަރާތްތަކަށް އަންގައި، ގަސްތަކާއި ވަލުޖަނަވާރުތަކުގެ މުހިއްމުކަން އެކަމުގެ ސަބަބުން ނުރައްކަލެއް ނުވާނެ ފަދަ ކަންކަމުން ދުރުހެލިވުމަށް ބަލާ އެންގުން.	ބީ: ކޮންޓްރެކްޓަރ	ޚަރަދެއް ނުހިމެނޭ

ގަސްގަހާގެހިސަރަ ބިމާ ގެއްލުން	އެއްގަމު ދިރުންތަކުގެ ތަނުގެ ގަސްބޮ މަގުތަކަށް ނުރައްކާވުން. ބަރުއަލަކުޅުނަސް ބަދަލު ގެއްލުން ވިލާތަކަށް މަގުފަހިވުން		
މަސައްކަތަށް ބޭނުންވާ ސާމާނު ސައިޓަށް ގެނައުމުގެ ތެރޭގައި ސްޓޮކްޕައިލް ގެއްލުންތިބުން	މަސައްކަތުގައި ހަރަކާތްތެރިވާ ފަރާތްތަކުން ގަސްތަކަށް ގެއްލުން ދިނުމާއި ވަލުތަކާ ދިރިއުޅޭ ދިރުންތަކަށް ނުރައްކާ އަސަރުކުރާނެ ފަދަ ކަންކަން ނުކުރުމަށް އެފަރާތްތަކަށް އެންގުމާއި، ގަސްތަކާއި ދިރުންތަކާ ގުޅޭ ހޭލުންތެރިކަމުގެ ޕްރޮގްރާމްތައް ހިންގުން. އެކަމުގެ ސަބަބުން ނާޖާއިޒު ގޮތުގައި ކަންކަމުން ދުރުހެލިވާ މިންވަރު އެންގުން. މަސައްކަތަށް ބޭނުންވާ ސާމާނު އެއްވެސް ކަހަލަ ތަނަކަށް ހޮވުން. މަސައްކަތަށް ބޭނުންވާ ސާމާނު ގެނައުމަށް، އެއްގަމުގެ ރަށްތަކުން ގެންދާނީ އެގޮތަށް ހުއްދަދީފައިވާ ތަންތަނުން. މަސައްކަތް ހިނގާ ހިސާބުގައި އެއްގަމުގެ ބިންގަލުގައި ބަރުވެ ކުރާ ބަދަލުތަކަށް ބަލައި، ސާމާނު ހުރި ތަންތަނުގައި ވިލާވެސް ކަމަށް ސަރަހައްދުތަކުގައި ބަހައްޓަން. ދިމާވާ ކަންތައްތަކާ ބޭނުމަށް ބަދަލު އަދި ސާމާނުގައި ބަރު ގުރުއްޕުގެ ބިޔަރޕަރި ސްޓޮކްޕައިލް ނެތޮކަން ކަށަވަރުކުރުން. ތެލާއި ކުނިއެގޮ ބާވަތްތަކާ އުފެދޭހިނދު އުތުރާ ތަނަކަށް ބަނދަރު ކަރަންޓު ކަށަވަރުކުރުން. ކަނޑުގަދަވެ ސާމާނު އުދުހިއެނުގެ އުފައްދާ ފުރަތަމަ ފޮތިތަކެއް އުސްކޮށް ސާމާނު ބަރުހިނގާ ތިބޭ ސާމާނުގައި ސަލާމަތުގައި ބަދަލުކުރުން ހިފައިކުރާ ކަންތައްތަކަށް ކަށަވަރުކުރުން.	މ: ކޮންޓްރެކްޓަރ	ނުރައްކާތެރި ކެމި އެޖެންސީ ބާއްޖެ ތަރާއި (އާރްޓީ، ޕްލާންޓްބާޓީ) ގުޅުގައި ދޫކުރާ ޕްރޮސެޖަރ ހިނގާ ޒަރީއާ
3. ސިއްޙަތާއި ރައްކާތެރިކަން			
މަސައްކަތުތެރިންގެ ސިއްޙަތާއި ރައްކާތެރިކަން	ހުރިހާ މަސައްކަތުތެރިންނަށް ސަލާމަތީ ވަސީލަތްތަކާ ފުރުސަތުދިނުމާއި މަސައްކަތްތަކުގެ ވަގުތުގައި އާ ތަކެތި ބޭނުންކުރާނަން ކަށަވަރުކުރުން. މިގޮތުގައި ބޫޓާއި ސަލާމަތީ ގޮތި، ހެލްމެޓް، ގްލައުސް ހިމެނޭ، މާސްކް، ކަން ބަންދު. ހަދާދަރު މެޑިކަލް (ފުރުޞަތު، ތަމްރީނު ފަދަ) ބޭނުންކުރާ މަސައްކަތުތެރިންނަށް ކަށަވަރު ކުރެވޭނެ ހިމެނުން.	މ: ކޮންޓްރެކްޓަރ	ސަލާމަތީ ޢާއްމުކަން ގޮތުގައި ހިނގާ ޒަރީއާ

		އުކާލާ ތަނެއް، ދިރާ ކުނި ގެންގުޅުމުގައި ދިރާ ކުލިކަލުން ރައްކާތެރިކޮށް އަންގި ބޭނުންކުރުން. "ފުރަތަމަ އެހީ ފޮށި" އަބަދުވެސް ސައިޓުގައި ބެހެއްޓިފައި ހުރުން. އެއްވެސް ކަރަންޓް ކޭބަލެއް ނުވަތަ ވަޔަރެއް ރައްކާތެރިކަމެއް ނެތްގޮތަކަށް ދޫކޮށްލާފައި ނުބެހެއްޓުން. ސުޕަރވައިޒަރ ރައްކާތެރިކަމުގެ ގޮތުން ފުރުސަތުދޭންޖެހޭ ގައިޑްލައިނަށް ހުރި މަސައްކަތްތެރިންނަށް ދިނުން. ރައްކާތެރިވުމުގެ ގޮތުން އަގުހުރި ފިޔަވަޅުތައް ބޭނުމީ ފާހަގަކުރެވުނު ކަންކަން ހިމެނޭ ޓެކްނިކަލް ގައިޑްލައިނެއް ތައްޔާރުކޮށްގެން އެއީ. މި ޓެކްނިކަލްގައި މަސައްކަތްތެރިންނަށް މަސައްކަތުގައި އޮޕަރޭޓް ކުރުން އަދާކުރާ ގޮތުން އެނގޭނެހެން އެކުލަވާލުން މަގުމަތީ ކެރިޔަރު ޓްރެއިނިންގ ކުރުން.	
	ބ: ކޮންޓްރެކްޓަރ	ރާއްޖޭގެ މަސައްކަތްތެރިންގެ ޤާނޫނާއި އެއްގޮތަށް، ހަފްތާއަކު 48 ގަޑިއިރަށްވުރެން އިތުރުނުވާނެހެން މަސައްކަތްތެރިއެއް ލައްވާ މަސައްކަތް ކުރުވުން. ކޮންސްޓްރަކްޝަން މަސައްކަތްތެރިންނަށް ދުވާލަކު 3 އިރު ކެއުން ފުރުސަތުދިނުން. މަސައްކަތު ސައިޓުގައި ބޯފެނާ ކައްކަން ސާފު ބޯފެން ލިބޭނެ އިންތިޒާމް ހަމަޖެއްސާފައި ހުރުން. ކޮންސްޓްރަކްޝަން މަސައްކަތްތެރިންނަށް ނިދާނެ އިންތިޒާމު އެކަށީގެންވާ ފެންވަރެއްގައި ހަމަޖެހިފައި ހުރުން. މަސައްކަތްތެރިންނަށް ފެނުގެ ގޮތުން އަރާމުކޮށްލެވޭނެ ތިބޭނެ އިންތިޒާމް މަސައްކަތު ސައިޓުގައި ހަމަޖެހިފައި ހުރުން. ފެސިލިޓީން ހިންގައި ބެލުން ދުރުމިންގެ ތެރޭގައި، މަސައްކަތްތެރިންނަށް ފާހާނާކުރެވޭނެ އިންތިޒާމް ހަމަޖެހިފައި ހުރުން.	މަސައްކަތު މާހައުލުގެ ހާލަތާއި މަސައްކަތްތެރިން

ކޮވިޑް19 މުސީބާތުން	ކޮވިޑް19 ގެ ޕޮސިބިލިޓީސްޓްރާފަރިވާ ސަބަބުން ނުރައްކާ މާޙައުލުން ފުރާ މަސައްކަތްތެރިންނަށް ބޭނުންވާ ދަތުރުކުރުމުގެ ހުއްދަ އެކްސްޕޯޓުގެ ފަރާތުން ހޯދުން. ހެލްތުގައި ގައިދުރުކުރާ ބަޔަކާއި ކަރަންޓީންގެ ހާލަތުގައި ރިފަރެންސްގެ ގޮތުން ބޭނުންކުރުމަށް މަސައްކަތްތެރިން ދިރިއުޅޭ ތަން. މަސައްކަތްތެރިން އަވަސް އަވަހަށް އަތް ދޮވުން ނުވަތަ ސެނިޓައިޒު ކުރުން. ހުރިހާ މަސައްކަތްތެރިން މާސްކު އެޅުން. ޚިޔާލު ކުރާއިރު މަސައްކަތް ސައިޓްގައި ދުރުމިން، މަސައްކަތްތެރިން އެއްބަޔަކު އަނެއްބަޔަކާ ދިމާނުވާ ގޮތަށް މަސައްކަތް ރާވާ، ވިޔަފާރި މަސައްކަތުގެ ވަގުތު. މަސައްކަތްތެރިންގެ ހަށިގަނޑުގެ ފިނިހޫނުމިން ކަށަވަރު ކުރުން ދުވާލަކު ދެފަހަރު ބަލާފައި ރެކޯޑްކުރުން. އެއްވެސް މަސައްކަތްތެރިއެއްގެ ހަށިގަނޑުގެ ފިނިހޫނުމިން 37.8C އަށްވުރެ މަތިވެއްޖެނަމަ ނުވަތަ ބަލީގެ އެހެން އަލާމާތްތަކެއް ފާޅުވެއްޖެނަމަ ވަގުތުން އެމަސައްކަތްތެރިއަކު ހުއްޓުވުން. އަދި އެހެން މީހުންގެ ކިބައިން ވަކިކޮށް ހިފެހެއްޓުމަށްފަހު ހެލްތް އޮތޯރިޓީއަށް އަންގާ ފަރުވާދިނުން. މަސައްކަތު ސައިޓާއި ގުދާނާއި އެއް ތަނަކަށް އިންސާނުންގެ ނުވަތަ ސާމާނުގެ ކުރެވޭ އިންތިޤާލު ހަމަޖެހިފައި ހުރުން. ގުދާނާއި ކަމާއި ގުޅޭ ތަކެތިން ނުވަތަ ހުރިހާ ސާމާނެއްގެ ޑިސްއިންފެކްޝަން 3 - 6 ގަޑިއިރު ފަހުން ކުރުން. ކޮވިޑް19 އަށް ހާސްކޮށްދޭ ފޯރުކޮށްދީ ސާމާނު ކުރުމުގެ މަސައްކަތް ސައިޓުގައި ހިންގާ ދިނުން.	ބޭ: ކޮންޓްރެކްޓަރ	ސަޕްލިކާ، ހެލްތު ސަރވިސަސް ފުރިހަމަ ތަކެތި މަސައްކަތްތެރިން އެކުލަވާލުމަށް ބޭނުން ކުރާ ހާލަތު ވަކި ފުރިހަމަ ކުރުމަށް ޓީމް ހެދުން

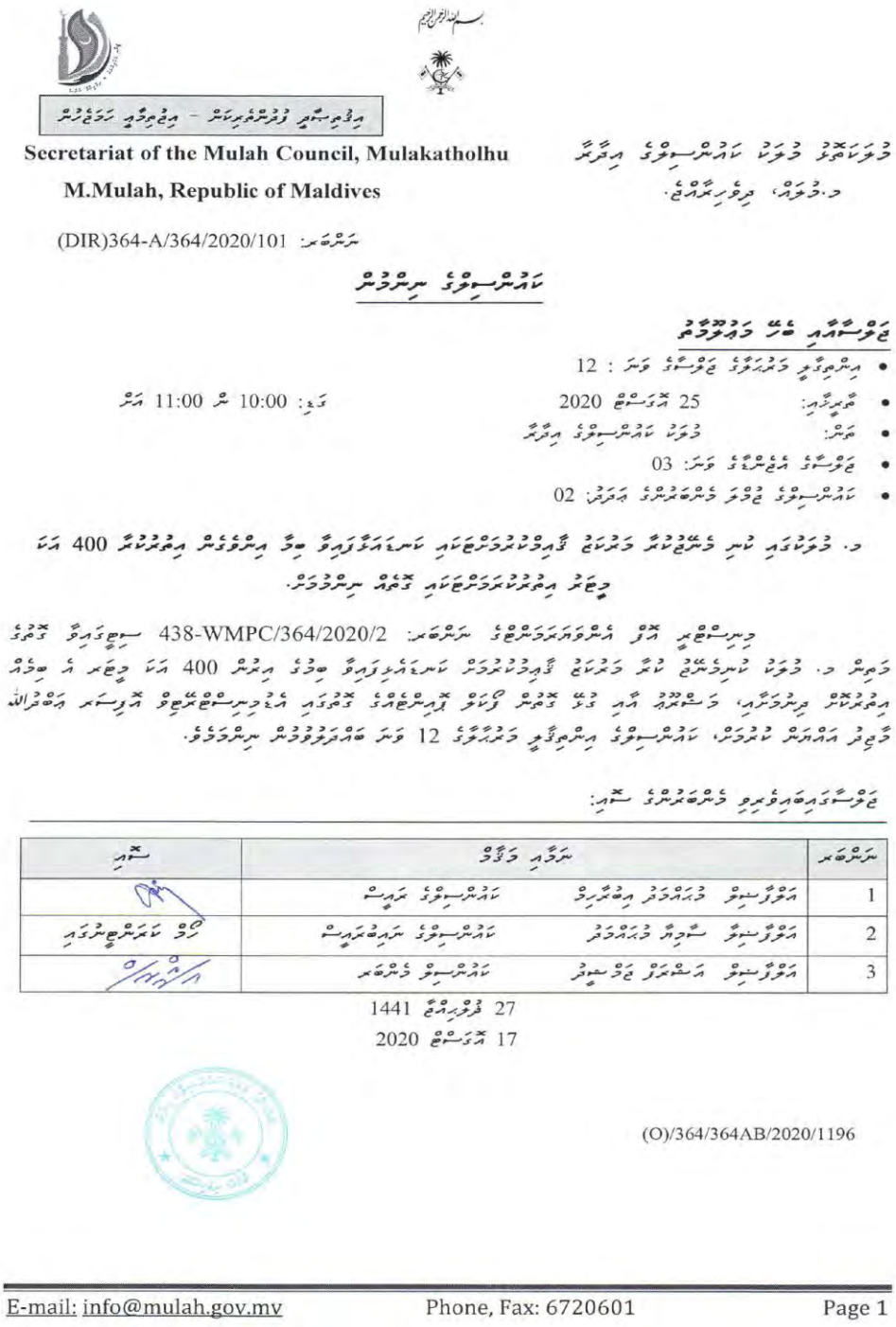
		ކޮންމެ ދުވަހެއްގެ މަސައްކަތް ނިމުމުން ނުވަތަ ކޮންމެ ދަންފަޅިއަކަށްފަހު (ދަންފަޅި ބަހައިގެން މަސައްކަތް ކުރާނަމަ) ބްލީޗްގެން (9 ބައި ފެނަށް 1 ބައި ބްލީޗް) ފަދަ ޑިސްއިންފެކްޓެންޓް ސޮލިއުޝަނަކުން ކޮންސްޓްރަކްޝަން މަސައްކަތުގައި ބޭނުންކުރާ އާލާތްތައް ދޮވެ ސާފުކުރަން.	
އެންމެންގެ ސިއްހަތާއި ރައްކާތެރިކަން	ސައިޓް ފޯރމަނުން ވަރަށް ގިނަ ދުވަހު ސަރަހައްދުގެ ސާފުތާހިރުކަން ނުވަތަ ބޭސް ބެލެހެއްޓުން ސަރަހައްދަށް ވަދެވޭނީ އެކަމަށް ހުއްދަ ލިބިފައިވާ ފަރާތްތަކަށް ކަމަށް އިންގިރޭސި ބަހުން ބޯޑު ބެހެއްޓުން އެންމެނަށް މަސައްކަތު ސަރަހައްދުގައި ވަރަށް ސަރަހައްދުތަކުން ނުވަތަ ރަށްތަކުން ކަރަންޓު ވަޔަރުތަކާއި، އެންމެން ވަރަށްގިނަ ފަރާތްތަކުން ބޭނުން ކުރާ ބޯޑު. އެންމެ ގާތުގައި ބަލަހައްޓަން ވަރަށް ސަރަހައްދު ހުސްކޮށް ކަރަންޓް ކަނޑާލުން.	ޖ: ކޮންޓްރެކްޓަރ ސ: ކައުންސިލް	ސައިޓް ބޭގު ޕީޕީއީ ހިންގުމުގައި ޕްރޮޖެކްޓު ބަޖެޓުން ހިނގާ ޚަރަދު
އަލިފާނުގެ ނުރައްކާ	ކަރަންޓު ވައިރިންގކުރުމާއި ބެލެހެއްޓުން، ކަމުގެ ތަޖުރިބާކާރެއްލައި ކަރަވަރުކުރުން. އަލިފާނުގެ ހާދިސާއެއް ހިނގައިފިނަމަ ބޭނުންކުރުމަށް، ވަސީލަތްތައް އަބަދުވެސް ރިސެޕްޝަނުގައި އަލިފާން ނިއްވާ (ފަޔަރ އެކްސްޓިންގުއިޝަރ) ބެހެއްޓުމާއި ހުރިހާ ކަރަވަރުކުރުން. ވަސީލަތްތައް ހުރިހާ ހިސާބެއްގައި އެއްވެސް ބޭފުޅަކަށް ފެންނާނެ ގޮތަށް ބަހައްޓާ، "ހުރިހާ ދިމާ ތަކެތި" ނުވަތަ "ނުރައްކާ ހުރި" ފަދަ އިންޒާރުދޭ ސައިން ބޯޑުތައް ތަރުތީބުކޮށް ބެހެއްޓުން. އަދި އެފަދަ ތަކެތި ރައްކާކުރާ ތަނުގައި ބަލަހައްޓާ މީހުން. މިގޮތުން، ވަރަށްގިނަ ބޭރުގެއްލުންތައް ދިމާވާނެ މިގޮތުގެ ބޭރުގައި ސަރަހައްދު ފެނިގެންދާނެ "ދުންފަތުގެ އިސްތިއުމާލު ކުރުން މަނާ" ނުވަތަ "އަލިފާން ގެންގުޅުން މަނާ" ފަދަ އިންޒާރުދޭ ސައިން ބޯޑުތައް ހަރުކުރުން. ވެލްޑިންގ ކުރުމާއި މުރަކުމާއި ގުޅޭ މަސައްކަތްތަކުގައި ބޭނުންކުރާ ފަރާތް ދޭ (އެސްއީއޯ) އަދި ތަނުގެ އަމަލުކުރުން. ފަސޭހަކަމާއި ހުރިހާ ތަކެތި ވިޔާއި ވެލް އެތެރެ ބޭނުންކުރާ ބޭރުގައި ސާފުކުރާ ބޭނުންކުރާ ހުރިހާ ތަކެތި ދިމާ ކަރަންޓުގެ ކާރިސާތައް ހުރިހާ މަސައްކަތުގައި އެހެންމީހުން އަރައިގަތުމަށް ރައްކާތެރިވުމަށް.	ޖ: ކޮންޓްރެކްޓަރ	ތަޖުރިބާކާރު އިލެކްޓްރިޝަނެއް ނެގުމަށާއި އަލިފާން ނިއްވާ ގަމުދަން ހިނގާ ޚަރަދު

4. އިޖްތިމާޢީ އަދި ސަޤާފީ އަސަރުތައް			
ޢާއްމު މައްސަލަތައް	ހިރާ ބިދޭސީ މަސައްކަތްތެރިންގެ އަތުގައި މުއްދަތު ހަމަނުވާ ވިސާ ޕާސްޕޯޓް އޮތުން.	ޖ: ކޮންޓްރެކްޓަރ	ވޯކް ޕާރމިޓް ދީ
ކޮންސްޓްރަކްޝަން ހިނގަމުންދާއިރު ދިމާވާ އިޖްތިމާޢީ އަދި ތިމާވެށީގެ މައްސަލަތައް ހައްލުކުރުން	މަސައްކަތް ހަވާލުކުރުމުގެ ކުރިން ފާހަގަ "އެންވަޔަރަންމަންޓް ރެޖިސްޓަރ" އެއް ކޮންޓްރެކްޓަރ ބަލަހައްޓަން ޖެހޭނެ. ކޮންސްޓްރަކްޝަން ފޭސްގެ ކުރިންނާއި ކޮންސްޓްރަކްޝަން ހިނގަމުންދާއިރު ތިމާވެށްޓާއި ގުޅޭ އެންމެހައި މައްސަލަތަކާއި އަރިހުގައި ފޯރުކޮށް އެންމެ ފަސް ޚިދުމަތް އެންވަޔަރަންމަންޓް ރެޖިސްޓަރ. އިޖްތިމާޢީ އަދި ތިމާވެށީގެ ކަންތައްތަކާއި ގުޅޭ ކުރެވޭ ޝަކުވާ ހުށަހެޅުމާއި އެންވަޔަރަންމަންޓް ރެޖިސްޓަރގައި ބަޔާންކުރަން ޖެހޭނެއެވެ. ކޮންސްޓްރަކްޝަން ހިނގަމުންދާއިރު ދިމާވާ އިޖްތިމާޢީ އަދި ތިމާވެށީގެ މައްސަލަތައް ހައްލުކުރުމުގެ ގޮތުން ރަށުގެ އާންމުންނަށް މައުލޫމާތު ދިނުމާއި ޝަކުވާ ހުށަހެޅުމުގެ ނިޒާމް އެކުލަވާލަން. ޕްރޮޖެކްޓް މޭނޭޖްމަންޓް ޔުނިޓުން ދިމާވާ ޝަކުވާތައް، ހުށަހަޅާ ހުރިހާ ޝަކުވާތަކެއް ދިރާސާކޮށް ހައްލުކުރަން. އަދި ސަރުކާރުގެ ދަފްތަރުގައި ހިމެނޭ މިފަދަ ޝަކުވާތައް ބަލައި ބަލަހައްޓަން. އެންވަޔަރަންމަންޓް ރެޖިސްޓަރ ބަލައި އެ ޝަކުވާތަކާ ގުޅޭގޮތުން ހަމަޖެހޭ ގޮތަށް ކޮންޓްރެކްޓަރ ކަނޑައަޅަން. ހުށަހެޅޭ ހުރިހާ ޝަކުވާތައް ހިފެހެއްޓޭ ދަފްތަރު 24 ގަޑިއިރު ތެރޭގައި އިންޖީނިއަރަށް ފޮރުވާލަދިނުން. މިގޮތުން ފޮރުވާލާފައި ވާގޮތަށް ހުށަހެޅުނު ޝަކުވާތަކާއި ދިމާވާ ކަންތައް ފިޔަވަޅުތައް ބަލައިލާފައި ހުރިހާ މިފަދަ ކުރިއަށް ބެލެހެއްޓުން. އެންވަޔަރަންމަންޓް ރެޖިސްޓަރ ފިޔަވަޅު އެޅުން މިގޮތުގެ އަދި އިޖްތިމާޢީ ކަންތައްތަކާއި މަސައްކަތް ކުރުމަށް ޓަކައި ބޭނުންވާ ތަރުތީބު ހަމަޖެހޭ ތަރުތީބުތައް އެކުލަވާލުމަށް ފަރާތްތަކުން އެދެވޭނެ. އިޖްތިމާޢީ ކަންތައްތަކުގެ ގޮތުން، އާންމު ފިޔަވަޅުތަކާއި އަރައިގަތުމުގެ ބަލަހައްޓާ ޕްރޮގްރާމް އެންވަޔަރަންމަންޓަލް މޮނިޓަރިންގ (އިއެމްއެސް) އެއް ކޮންޓްރެކްޓަރ ތައްޔާރުކުރުން.	ޖ: ކޮންޓްރެކްޓަރ	މުވައްޒަފުންނަށް ހިނގާ ހަރަދު
ބިދޭސީ މަސައްކަތްތެރިން ގެންގުޅޭ ސަބަބުން ދިމާވާ އިޖްތިމާޢީ މައްސަލަތައް	ވިޔަފާރިން ދިވެހިންނަށް ވަޒީފާދިނުން، ބޭރުމީހުން ގެންނައިރު އެމީހުން ދިވެހިންގެ ސަގާފަތަށް އަހުލުވެރިކުރުވުން. ކޮންޓްރެކްޓަރާއި ރަށު ކައުންސިލް ގުޅިގެން ހުރިހާ މުވައްޒަފުން ރަށުގެ ސަގާފަތާއި ގުޅޭގޮތުން އަހުލުވެރިކުރުވުމުގެ ގޮތުން ތަމްރީން ދިނުން، މިގޮތުން ތެރޭގައި ޖިންސީ އަނިޔާގެ މައްސަލަތަކަށް ރައްކާތެރިކުރުން.	ޖ: ކޮންޓްރެކްޓަރ ސ: ކައުންސިލް	މުވައްޒަފުން ހިނގާ ހަރަދު

	ބިދޭސީ މަސައްކަތްތެރިން ގެނައުމުގެ ސަބަބުން ދިމާވެދާނެ އިޖުތިމާއީ މައްސަލަތައް މަދުކުރުމުގެ ގޮތުން "މަސައްކަތްތެރިންގެ ސުލޫކު" ކޮންސްޓްރަކްޝަން ތަޢާރަފުކުރެވޭނެ. މިގޮތުގައި ދިވެހިންގެ އާދަކާދައާއި ދީނީ ފުށުނާރާ ދިރިއުޅުމުގެ ތަކަށް މުވައްޒަފުން ތަބާވާންޖެހޭ ގަވާއިދުތަކެއް ހިމަނައި މި ގަވާއިދުތަކާ ހިލާފުވެއްޖެނަމަ ދޭނެ އަދަބު ހިމެނުން. އަދި ވަޒީފާއަށް ނުކުތުމުގެ ކުރިން " މަސައްކަތްތެރިންގެ ސުލޫކު"އަށް ހުރިހާ މުވައްޒަފުން އެއްބަސްވުން ކުރުވުން.		
މަސައްކަތްތެރިންގެ ސުލޫކާއި މުއާމަލާތްކުރުން	ތަޢާރަފުކުރެވޭ "މަސައްކަތްތެރިންގެ ސުލޫކު" ގައި ޖިންސީ ހިރާސާކުރުމާ ގުޅޭ ކަންތައްތައް މަސައްކަތްތެރިންގެ ޖިންސީ ފިދުނާ ދެކޮޅަށް ހަރަކާތްތެރިވުމަށް މަސައްކަތްތެރިންނަށް މަޢުލޫމާތު ދިނުން. އަދި މަސައްކަތްތެރިންގެ ސުލޫކާ ބެހޭ ހޭލުންތެރިކަން ކޮންސްޓްރަކްޝަން ތަކުގައި ހިންގުން. މަސައްކަތްތެރިންނަށް މުއާމަލާތް ކުރުމުގައި ދިވެހި ޤާނޫނު ހަރުދަނާކުރުމުގެ ކޮންޓްރެކްޓަރގެ ޒިންމާއެއް. ބިދޭސީ މަސައްކަތްތެރިން ގެންގުޅޭ ފަރާތްތަކުން މުއާމަލާތްކުރުމުގައި ޤާނޫނާ އެއްގޮތަށް ކަންކުރުން. މަޝްރޫއާބެހޭ މައުލޫމާތު ހުށަހަޅާ ސިޔާސަތު ޤާނޫނީ ގޮތުން ބަލަހައްޓާ މަޢުލޫމާތު ސަރަހައްދު ބޭނުން ހަރުދަނާކުރުން. މިގޮތުގައި ހަދާ ކައުންސިލާއި އާންމުން އެއްބަސްވެފައިވާ ސަރަހައްދުތައް މަޢުލޫމާތު ބޭނުން ކުރުން.	ޖ: ކޮންޓްރެކްޓަރ ސ: ކައުންސިލް ސ: އެލެސްޖް	ހޭލުންތެރިކުރުވުން ތައާރަފުކުރާ ސާމާން ތައާރަފުކުރުން
ރަށުގެ ރައްޔިތުންގެ އާންމު ބޭނުންތަކަށް ވެލިނަގުމުގެ ހުއްދަ އީ.ޕީ.އޭ ގެ ފަރާތުން ދީފައިވާ ސަރަހައްދުތަކުން (ފަޅުތެރިން ކަނޑައަޅާފައިވާ ސަރަހައްދުތައް) ވެލި ނަގުމުގެ ސަބަބުން ރައްޔިތުންނަށް ބޭނުމާވަރަށް ވެލި ނުލިބުން	ރަށުގެ ފަޅުން ވެލި ނަގަންވާކަން ކަނޑައެޅުން.	ޖ: ކޮންޓްރެކްޓަރ	ހުއްދަ އޮތް ފަރާތަކުން (ހާރބަރ ފިޔަރާ) ވެލި ގެނައުމާއި ރަށަށް ގެންދިއުމަށް ހިންގާ ހަރަދު
ޝިކާޔަތު ހުށައަޅާ މަންސަ	މަޝްރޫޢު ހިންގާ ފަރާތުން ގާއިމުކުރާ ޝިކާޔަތު ހުށައަޅާ މަންސަ (ޖީއާރުއެމް) ކޮންސްޓްރަކްޝަން މަރުހަލާގައި ތަޢާރަފު ކުރުން.	ޖ: ކޮންޓްރެކްޓަރ ސ: ކައުންސިލް ބ: މަސައްކަތް ހިންގާ ފަރާތް	ޖީއާރުއެމް ބޭއްވުމާއި ކޮމިޓީ ބޭނުންކުރުމަށް ހިންގާ ހަރަދު

	ކޮންޓްރެކްޓަރގެ ފަރާތުން ޖަވާބުދާރީވާނެ ފަރާތަށް ގުޅޭނެ މައުލޫމާތު، ކައުންސިލް އިދާރާއަށް ގުޅޭނެ މައުލޫމާތު، މަޝްވަރާ ހިންގާ ފަރާތަށް ގުޅޭނެ މައުލޫމާތު މަސައްކަތު ސައިޓުގައި ބޯޑެއްޖަހައި ހުށަހަ މަޝްވަރާގެ ބޭނުގައި ކައުންސިލް އިދާރާގެ ނަންބަރު ބޭނުގައި ރައްދުދިނުމަށް އެކުލަވާލާ ފޯނު ނަންބަރު ތަރުތީބުކުރުމަށް ހުށަހަޅައި ބޯޑެއްޖަހަން. ސަރުކާރު ހިންގުމުގެ ގޮތް ތަފާސީލު؛ ޝަކުވާތަ ކޮންޓްރެކްޓަރ، އެއަށްފަހު ކައުންސިލް، އެއަށްފަހު މަޝްވަރާ ހިންގާ ފަރާތް މިޒަމާން ބޭނުން ކުރާނެ [illegible] އެދުމެއް ބަލައިގަންނާނެއެވެ. ދަށުވެސް ހުށަހަޅާ ޝަކުވާތަކާ ގުޅޭން އެޕް ދިރާސާތަކުގެ ރިކޯޑު ބެލެހެއްޓުމަކީ ކޮންޓްރެކްޓަރ އަށްފަރުވާ "ކޮމިއުނިޓީ ލިއެޒަން އޮފިސަރ" ގެ ޒިންމާއެއް.	
ސައިޓުގެ އިންތިޒާމުތައް ހަމަޖެއްސުމަށް ހިންގާ ހަރަދު	ބ: ކޮންޓްރެކްޓަރ	ފަސްމިނެޓުން ހިނގާފައި ދުރުން ދުރުމިނުގެ ތަނަވަސް، މަސައްކަތުގެ ސަރަހައްދާއި ވާހަކަދެކުން އިންތިޒާމު ހަމަޖެހުމަށް ކޮންޓްރެކްޓަރ ހުރިން. އެހެންނަމަ، ރުޅިވެރި ހިތްހަމަނުޖެހޭ ސަރަހައްދަށް ނުވަތަ އާދަމީ ނިޒާމަށް ނުވަތަ ގެއަށް ފާހާނާ ކުރުމަށް ނުވަތަ ފަތުރު ފާހާނާ ތަކުގެ ނުވަތަ އަތުރުކާރުން ނިޒާމަށް ފަސޭހައިން އައިސްކްރީމް ފުކަމް އުފެއްދުން ބާއްވަން	ސައިޓުގައި އަދާކުރަންޖެހޭ ފާހާނާކުރުމުގެ އިންތިޒާމު
5. އިމަރޖެންސީ			
ރަނގަޅު ގެއްލުން ހިނގާ ފަރާތު	ބ: ކޮންޓްރެކްޓަރ	ރަނގަޅު ލިބޭންދެން، އިމަރޖެންސީ ޕްލޭނެއް ސަރުކާރު ރަނގަޅު ގޮތުގައި އިސްކާރުކުރުން. ކޮންސްޓްރަކްޝަން މަސައްކަތްތަކުގައި ދެމިގެން ރާއްޖެ އެންމެ ސަރަހައްދުގެ ރައްކާތެރިކަން އިސްކާރުކުރުން.	ރަނގަޅު އިމަރޖެންސީތަކުން ކުރާނެ ފައިދާ ރަނގަޅު ރައްކާތެރިކަން ލިބޭނެ މާދި ފައިދާ ފައިދާ

ANNEX 5: LAND APPROVAL LETTERS



بسم الله الرحمن الرحيم

ދިވެހިރާއްޖެ ފުވާމުލަކުއަތޮޅު - ދިގުމަސްވެރި ކައުންސިލް

Secretariat of the Mulah Council, Mulakatholhu
M.Mulah, Republic of Maldives

ފުވާމުލަކުއަތޮޅު ކައުންސިލްގެ ދިވެހިރާއްޖެ
ދ.ފުވާމުލަ، ދިގުމަސްވެރި.

(DIR)364-A/364/2020/101 :ނަންބަރ

ކައުންސިލްގެ ނިންމުން

ގެންނަން ބޭނުންވާ ބަދަލުތައް

- ދިގުމަސްވެރި ފަންނުގެ ގެންނަން ވަނަ : 12
- ތާރީޚް: 25 ނޮވެމްބަ 2020 ގަޑި: 10:00 ން 11:00 ގެ ތެރޭ
- ތަން: ފުވާމުލަކުއަތޮޅު ދިވެހިރާއްޖެ
- ގެންނަން ބޭނުންވާ ވަނަ: 03
- ކައުންސިލްގެ ލިޔުންތެރި ތަނުގެ ތެރެއިން: 02

ދ. ފުވާމުލަ ކައުންސިލްގެ ފުރަތަމަ ފާހަގަކުރާ ދައުރުގެ ތެރެއިން ކައުންސިލްގެ ތަކެތި ގެންނަން ބޭނުންވާ 400 ގަބަ ފިޔަރ ތަކެތި ގެންނަން ކައުންސިލްގެ ކުރިން ހުއްދަ ނެގުމަށް ކައުންސިލްގެ ނިންމުން.

ފިނިވިލާ ތާއަ ތަކެތި ގެންނަން ބޭނުންވާ ކުންފުނީގެ ނަން: 438-WMPC/364/2020/2 ހުށަހެޅިފައި ވާ ފަދައިން ދ. ފުވާމުލަ ކައުންސިލްގެ ފުރަތަމަ ފާހަގަކުރާ ދައުރުގެ ތެރެއިން ކައުންސިލްގެ ތަކެތި ގެންނަން ބޭނުންވާ 400 ގަބަ ފިޔަރ ތަކެތި ގެންނަން ކައުންސިލްގެ ކުރިން ހުއްދަ ނެގުމަށް ފިނިވިލާ ތާއަ ކުންފުނީގެ ފަރާތުން ކައުންސިލްގެ ކާނާ ދިނުމުގެ ތެރެއިން ކައުންސިލްގެ ކައުންސިލަރުންނަށް ދެވޭ ކާނާ ދިނުމަށް ކައުންސިލްގެ ނިންމުން ކަނޑައަޅާ ފަދައިން، ކައުންސިލްގެ ދިގުމަސްވެރި ފަންނުގެ ގެންނަން ވަނަ 12 ގަބަ ބައްދަލުވުމުގައި ނިންމުން.

ގެންނަން ބޭނުންވާ ތަކެތީގެ ލިސްޓް:

ނަންބަރ	ތަކެތީގެ ގަޑިވަރ		ސޮއި
1	ތަކެތިކުރުމުގެ ދަތުރުގައި ބޭނުންކުރާ	ކައުންސިލްގެ ކާރު	
2	ތަކެތިކުރުމުގެ ސަރުވާ ދަތުރުގައި	ކައުންސިލްގެ ކާރު ބަދަލުކުރުން	ކާރ ކައުންސިލްގެ
3	ތަކެތިކުރުމުގެ ކަންތައްތަކުގައި	ކައުންސިލްގެ ފޯނު	

27 ފެব්රުވަރީ 1441
17 ނޮވެމްބަ 2020

(O)/364/364AB/2020/1196

E-mail: info@mulah.gov.mv Phone, Fax: 6720601 Page 1


100'.00"
100'.00"
43'.00"
60'.00"

ANNEX 6: QUESTIONNARE USED FOR HOUSEHOLD SURVEY

މ. މުލަކު ކުނި މެނޭޖްކުރާ މަރުކަޒު އަޕްގްރޭޑްކުރުމުގެ މަޝްރޫޢު

އާންމުން ދެކޭގޮތް ދެނެގަތުމުގެ ސަރވޭ

6 ޖެނުއަރީ 2021

ތައާރަފު: މިސަރވޭއަކީ މިނިސްޓްރީ އޮފް އެންވަޔަރަންމަންޓްގެ ފަރާތުން މ.މުލަކުގެ ކުނި މެނޭޖްކުރާ މަރުކަޒު އަޕްގްރޭޑްކުރުމުގެ މަޝްރޫޢާއި ގުޅޭގޮތުން އާންމު ރައްޔިތުންގެ ހިޔާލުފާޅު މަރުކަޒު މަރާމާތުކުރާއިރު ހިމަނަން މުހިންމު ކަންކަން ދެނެގަތުމުގެ ގޮތުން ކުރާ ސަރވޭއެކެވެ. މިސަރވޭއިން ދެނެގަނެވޭ ކަންކަން މަޝްރޫޢުގެ ތިމާވެށީގެ މެނޭޖްމަންޓް ޕްލޭނާއެކުލަވާލާއިރު ހިމެނުމަށް ވަނީ ހަމަޖެހިފައެވެ.

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1. ގޭބިސީންގެ އަދަދު:

☐ އަންހެން ☐ ފިރިހެން ☐ ކުޑަކުދިން

2. ދުވާލެއްގެ މައްޗަށް އުފެދޭ ކުނި (ބަރުދަން / ވޮލިއުމް / ގޭބިސީންގެ އަދަދުން)

☐

☐

3. އުފެދޭ ކުންޏާއި ގުޅޭ މިހާރު އަމަލުކުރަމުންދާ ގޮތް

ފަސާދާ ޖާތީގެ ކުނި

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ފަސާނުދާ ޖާތީގެ ކުނި

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ANNEX 7: SCREENING DECISION FROM EPA

Environmental Protection Agency EPA

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މާލެ، ދިވެހިރާއްޖެ

Environmental Protection Agency
Green Building, 3rd Floor, Handhuvaree Hingun
Male', Rep. of Maldives, 20392
+960 333 5949 +960 798 0379 secretariat@epa.gov.mv www.epa.gov.mv

ANNEX 8: SUPPLEMENTARY ESMPs FOR WORLD BANK, ADDITIONAL INFORMATION REQUEST AND DECISION STATEMENT FROM EPA

ADDITIONAL INFORMATION (WORLD BANK SAFEGUARDS REQUIREMENTS)

UPDATED ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN FOR ESTABLISHMENT OF ISLAND WASTE RESOURCE MANAGEMENT CENTRE IN M. MULAH

PREPARED FOR

MINISTRY OF ENVIRONMENT

PREPARED BY

HAMDHOON MOHAMED

FEBRUARY 2021

Table of Contents

1. Amount of coconut palms require uprooting

The total number of coconut trees which require uprooting 65 coconut trees and 5 other tress. The access road has been already cleared by the M. Mulah island council. The following are the details of the compensation rates for the vegetation to be removed from the project location.

Quantity	Type of Tree	Size	Rate (MVR)	Total (MVR)
5	Other Trees		2205.00	2205.00
25	Juvenile Coconut palm	Small	30.00	750.00
8	Juvenile Coconut palm	Large	75.00	600.00
12	Mature Coconut palm	Inferior	150.00	1800.00
5	Mature Coconut palm	Ordinary	250.00	1250.00
7	Mature Coconut palm	Good	500.00	3500.00
8	Mature Coconut palm	Superior	700.00	5600.00
Total				15,705.00

2. Minor resettlement impacts

The project will involve minor resettlement impacts such as loss of trees which will have minor impact on incomes of affected parties.

The following are the revised Table 19, Table 20 and Table 25 of the initial ESMP.

Table 1: Impact Identification matrix for proposed establishment of IWRMC in M. Mulah

	Natural Environment				Social Environment			
Project Activities	**Reef and Coastal Environment**	**Soil and groundwater**	**Lagoon and seawater**	**Air/Noise**	**Services and Infrastructure**	**Health and Safety**	**Employment**	**Costs to consumer/tax payer**
Construction Phase								
Influx and settlement of workers for the project construction activities (flora and fauna, resource use and sociocultural impacts)	Waste produced by the workforce may be affect reefs if not properly disposed via existing solid waste management regime. However, this impact is anticipated to be short term and work force will be few expatriate workers due to small nature of the project.	Increased burden on groundwater resources since workforce will utilize groundwater for various purposes. However, this impact is anticipated to be short term and work force will be few expatriate workers due to small nature of the project.	No significant impact	No significant impact	The expatriate workers and workers from other islands will relay of the existing services and infrastructure to meet their basic needs hence extra burden of the existing services and infrastructure. However, this impact is anticipated to be short term and work force will be few expatriate workers due to small nature of the project.	No significant impact	Expatriate workers and workers from other island will decrease the chance of employment for residents of M. Mulah	No significant impact

Transportation of materials. (climate impacts, and impacts on roads)	Potential oil spill from the cargo boat and during transport of material.	Operation of vehicles on unpaved road may lead to soil compaction.	Potential oil spill from the cargo boat and during transport of material.	GHG emissions from the transportation processes and operation of vehicles may deteriorate air quality for short period of time.	Unpaved roads in the island may be affected due to operation of vehicles and harbour will be utilized for unloading the construction material.	Temporary deterioration of air quality to operation of vehicles.	No significant impacts	Remediation of road may require public finance but heavy vehicles will not be used for construction phase.
Site demarcation and clearance (Impacts on flora and fauna)	No significant impacts	Removal of vegetation may cause temporary flooding at the project site during rainy season.	No significant impacts.	No significant impact.	No significant impact	No significant impact.	No significant impact	Compensation will be provided to any plant removed in the project site. 65 coconut palm and 5 other trees.
Impacts from construction works (air quality, noise and vibration, accidents and injuries, pollution from material storage)	Minor vibrations are anticipated due to construction activities, however, the project locations is far	Oil spill during from vehicles and maintenance works may affect the groundwater quality.	No significant impact	Utilization of vehicles and tools which uses fossil fuel is expected to deteriorate the air quality at	Minor vibrations near the project site.	Noise pollution at the project site and residential areas in close vicinity to	No significant impact	No significant impact

	from the house reef of the island.	Pollution from material storage may affect the groundwater quality		the vicinity of the project site.		the project site.		
Terrestrial pollution from construction waste generation	No significant impact	Potential contamination of groundwater due to construction waste generated.	No significant impact	No significant impact	Since there are no established IWRMC in the island the construction waste will be managed on site at project location.	No significant impact	No significant impact	No significant impact
Impacts from resource use	No significant impact	Water used for construction works will be rain harvested or obtained from the existing resources in the island hence no impact on groundwater quality is anticipated	No significant impact	Electricity will be obtained from the existing grid of the island hence increase of GHG emission due to increase in power demand.	Electricity and water will be obtained existing systems in the island which may increase the burden of the existing system of the island.	No significant impact	No significant impact	No significant impact
Operational Phase								
Waste collection and transportation (Climate impacts,	Establishment of waste collection	Seepage of leachate from existing dump	Establishment of waste collection	The air quality of the island is	IWRMC will be additional infrastructure	Beneficial health impact	The IWRMC would employ	The council intends to collect a fee

air quality, amenity impacts)	bins, collection service and transportation will decrease dumping of waste to lagoon environment.	sites will be prevented and is expected to improve groundwater quality at the dumping sites over time.	bins, collection service and transportation will decrease dumping of waste to lagoon environment.	expected to improve due to reduce open burning and accidental fires at dump sites.	contributes to the island development. The amenity of the island will improve due to lack of dumping sites around the island.	due to improved air quality and reduces pests such as rodents	locals for its operation. More farmers could utilize the compost prepared in the IWRMC	for sustainable operation of IWRMC
Waste management activities (Public health, noise, groundwater, fire, accidents, odour impacts)	No significant impact	Public health impacts may be localized due to increase in house flies and rodents near the project area.	No significant impact	Temporary air quality deterioration due to accidental fires. Odour impacts may be felt at the vicinity of the project site.	Waste collection and transportation may affect other services if collection is done during the day.	Public health impacts may be localized due to increase in house flies and rodents near the project area.	Compost generated from OWC machines can be used readily for gardening and farming purposes.	Compost generated from IWRMC will be sold.
Waste generation (terrestrial pollution, groundwater contamination)	No significant impact.	Leachate may seep and contaminate groundwater during a flooding event. The leachate tank will prevent this in	No significant impact	No significant impact	No significant impact	Indirect impacts of groundwater contamination	No significant impact	No significant impact

		normal circumstances. If not properly de-slugged the sewerage may seep into group water and lead to groundwater contamination.						
Resource consumption (water and electricity)	No significant impact	Groundwater may be utilized for the operational purposes which will have impact on the contribute to saltwater intrusion to groundwater lens.	No significant impact	No significant impact	The electricity required for IWRMC operations will be obtained from the existing electricity grid of the island which put additional burden on the power needs of the island.	No significant impact	No significant impact	No significant impact

Table 2: Main anticipated impacts for Establishment of IWRMC in M. Mulah

Phase of the project	Natural Environment	Social Environment
Construction Phase	• Influx and settlement of workers for the project construction activities (Negative Impacts) • Transportation of materials. (Negative Impacts) • Site demarcation and clearance (Negative Impacts) • Impacts from construction works (Negative Impacts) • Terrestrial pollution from construction waste generation (Negative impacts) • Impacts from resource use (Negative impacts)	• Influx and settlement of workers for the project construction activities (Negative Impacts) • Transportation of materials. (Negative Impacts) • Site demarcation and clearance (Negative Impacts) • Impacts from construction works (Negative Impacts) • Terrestrial pollution from construction waste generation (Negative impacts) • Impacts from resource use (Negative impacts) • Social Impacts due loss of income due loss of tree.
Operational Phase	• Waste collection and transportation (Positive and Negative Impacts) • Waste management activities (Negative and Positive impacts) • Waste generation - terrestrial pollution, groundwater contamination (Negative impacts) • Resource consumption (water and electricity) (Negative impacts)	• Waste collection and transportation (Positive and Negative Impacts) • Waste management activities (Negative and Positive impacts) • Waste generation - terrestrial pollution, groundwater contamination (Negative impacts) • Resource consumption (water and electricity) (Negative impacts)

Table 3: Impact Analysis Matrix for proposed establishment of IWRMC in M. Mulah

Project Activity/ Impact	Extent	Duration	Intensity	Likelihood	Significance	Color Scale
Construction Phase						
Influx and settlement of workers for the project construction activities	Local	Short-term	Low	Likely	Minor	
Transportation of materials	Local	Short-term	Medium	Definite	Moderate	
Impacts from construction works	Local	Short-term	Low	Likely	Minor	
Terrestrial pollution from construction waste generation	Onsite	Short-term	Medium	Likely	Moderate	
Impacts from resource use	Local	Short-term	Medium	Definite	Moderate	
Social Impacts due to loss of income due to removal of trees	Local	Short-term	Medium	Definite	Moderate	
Operational Phase						
Waste collection and transportation	Local	Long-term	Medium	Definite	Moderate	
Waste management activities	Local	Long-term	Medium	Definite	Moderate	
Waste generation - terrestrial pollution, groundwater contamination	Local	Long-term	Medium	Definite	Moderate	
Resource consumption	Local	Long-term	Low	Likely	Minor	

3. Implementation Schedule

The following is a revision of the Table 39 on the implementation schedule for monitoring and reporting of safeguards.

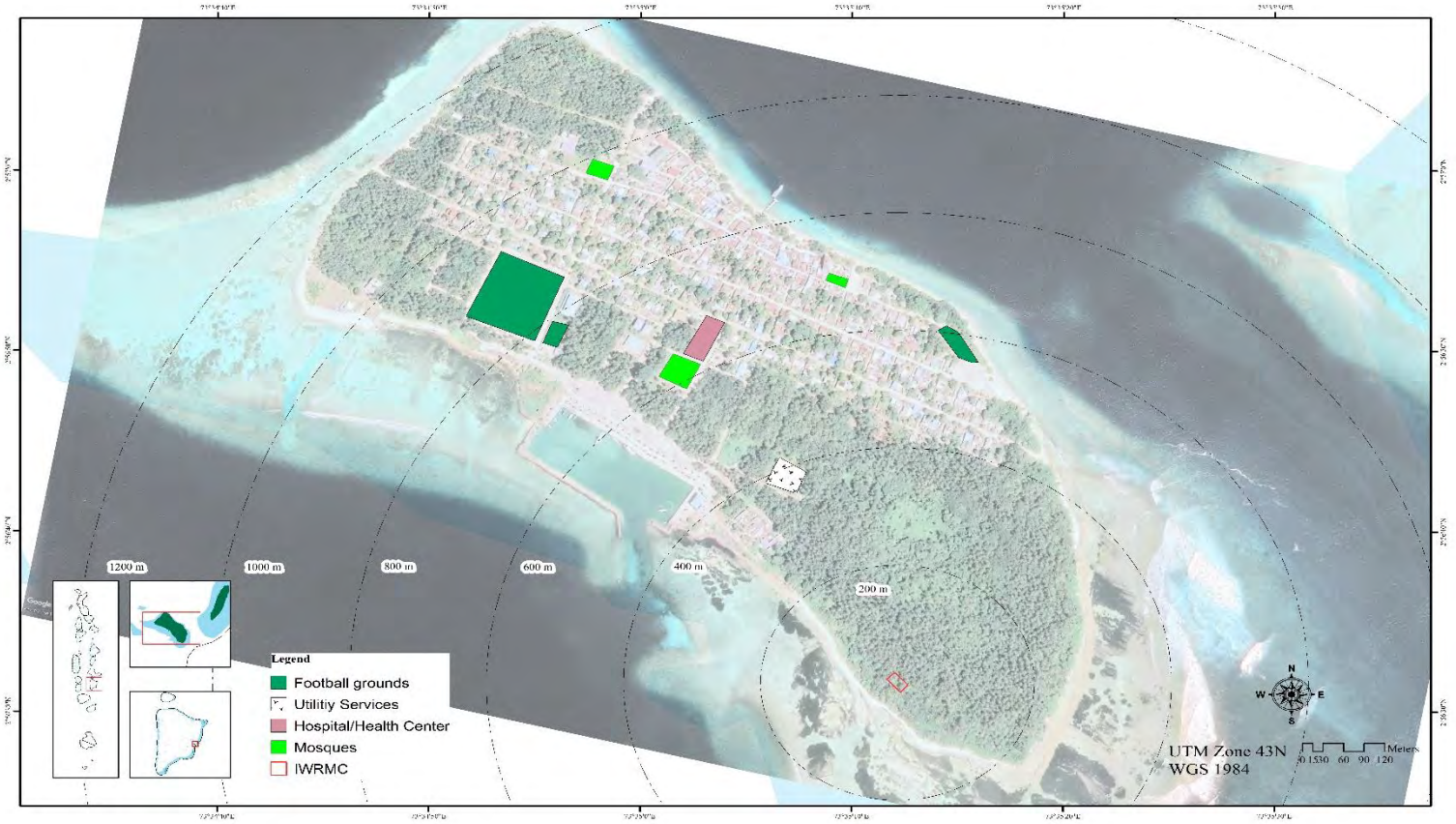
Activity	Responsible Party	Pre-construction phase (Weeks)						Construction phase (Months)			Operational Phase (Months)					
		1	2	3	4	5	6	1	2	3	1	2	3	4	5	6
Clearance and formal disclosure of ESMP	MCEP PMU															
Inclusion of ESMP in bid document	MCEP PMU															
Finalization of Engineering Designs	MCEP PMU															
Inclusion of ESMP in the contract document	MCEP PMU															
Disclosure of GRM in project sites	MCEP PMU/ Island Council															
ESMP briefing to Contractor at kickoff meeting	MCEP PMU															
Identification of tree owners & payment of compensation	Contractor/Island Council															
Payment of the compensation to tree owners	Contractor/Island Council															
Contractor's ESMP monitoring reports	Contractor															
Compliance check / Interim monitoring reports (3 nos)	MCEP PMU															
Preparation and submission of consolidated monitoring report	MCEP PMU															
Preparation and submission of operational phase ESMP report	Island Council															

4. Revised ESMP with cost of compensation

1. Sociological and Cultural			
Legal Issues	All expatriate workers must hold valid work permits	P: Contractor	Work Permit fees
Handling Environmental and Social Issues during Construction	The contractor will appoint a suitably qualified Environmental Officer following the award of the contract. The Environmental Officer will be the primary point of contact for assistance with all environmental issues during the pre-construction and construction phases. He/ She shall be responsible for ensuring the implementation of ESMP. The contractor shall appoint a person responsible for community liaison and to handle public complaints regarding environmental/social related matters. All public complaints will be entered into the Complaints Register. The Environmental Officer will promptly investigate and review environmental complaints and implement the appropriate corrective actions to arrest or mitigate the cause of the complaints. A register of all complaints is to be passed to the Engineer within 24 hrs. They are received, with the action taken by the Environmental Officer on complains thereof; and The site supervisor may assume the on-site responsibility of the environment officer and community liaison officer, subject to being adequately trained and having thorough knowledge of the ESMP. Contractor shall prepare detailed Environmental Method Statement (EMS) clearly stating the approach, actions and manner in which the ESMP is implemented.	P: Contractor	Cost associated with hiring of staff.
Sociocultural conflict due to arrival of expatriate workers	Ensure that local workers are used as much as possible. If expatriate workers are used ensure that they respect the local culture. The contractor in collaboration with the Island Council shall undertake a training to sensitize the labor to the local context and customs. This training should also cover topics related to Gender-based violence. To mitigate conflict that may arise due to the arrival of expatriate workers, the consultant should develop a “Code of Conduct” outlining the set of rules that that the workers have to follow to persevere the social norms and religious values of the society. The Code of Conduct should also specify penalties for breaching these rules and should be thoroughly communicated to workers prior to mobilization.	P: Contractor S: Island Council	Cost associated with hiring staff
Code of Conduct and Communication	The “Code of Conduct” developed should also cover good environmental governance and responsibilities workers have to follow to safeguard the environment. Though the number may be minimal, code of conduct and awareness in HIV related issues need to be considered.	P: Contractor	Cost associated with

	The contractor should ensure that all communications to the workers are presented in the local language. If expatriate workers are employed communications should be made in a language that they understand. Information on the project and the GRM should be displayed in the project site board, council noticed board as well as other communal place as much as possible.	P: Island Council S: MCEP	developing materials.
Loss of source of sand for local public use due to sand mining from the area of the lagoon permitted for local public sand mining	Ensure that sand is not taken from the lagoon of the island.	P: Contractor	Cost associated with purchasing sand from a reputable source (hardware shops) and transporting to the island.
Grievance Redress Mechanism	The GRM established by the proponent should be implemented at the construction phase. Contact details of focal points of the contactor, Island Council and the proponent should be displayed at the project site in the project board, the Council Office and common places frequented by the public (such as schools, health center etc.). It is recommended to change the first point of contact to the contractor, followed by Island Council and the proponent. The community liaison officer of the contractor must maintain log records of the complains received and subsequent actions taken.	P: Contractor S: Island Council T: Proponent	Cost associated with printing of the GRM board and posters.
Onsite Resting and Sanitary Arrangements	The contractor should identify a toilet that the works can access within 5 mins from the project. This could be via renting a toilet from a nearby utility area / office building / house, installing portable toilets or by making back and forth transport readily available to the accommodation building	P: Contractor	Cost associated with site mobilization and site set-up
Loss of Income due to loss of trees	The Island Council should identify and compensate all the tree owners whose trees are removed during the site clearance for establishment of the IWRMC in M. Mulah, prior to handing over the site to the contractor for the intended civil works. The Island Council should share all the details of the compensation with the PMU and the PMU should reimburse the Island Council with the total cost of compensation, after verification of the documents provided by the Island Council.	P: Island Council S: PMU	MVR 15,705.00

5. Culturally Sensitive Areas



6. Stakeholder Consultation

12.3.4 Satisfaction over the existing waste management

According to the household survey, there is no designed waste collection system. The current waste dumping site is located near the harborside of the island. 100% of the residents that were surveyed during the Household survey have indicated that they are not satisfied with the current location. The main reasons associated with this dissatisfaction includes, increasing level of unhygienic environment at harbour side. Furthermore, significant amount of waste leachate is causing harmful impact to the marine environment and nearby reef system.

12.3.5 Composting Technology and compost demand

The communities are aware of the benefits associated with the composting technology that is to be installed at their IWRMC. Some residents have indicated waste management machineries they would require to improve on effective management of waste in the island. Furthermore, during the stakeholder consultation with council, they noted that composting would enhance proper waste management of the organic waste.

12.3.6 IWRMC Needs or requirement

Most of the community household indicated that they would require waste transport services such as pick-up or lorry in addition to equipping the IWMRC with other waste management machineries.

12.3.6 Selection of the site for IWRMC

The community consultations were conducted by the island council during selection of the local of IMRMC and consensus of the island community was obtained prior to approval of the location by Maldives Land Survey Authority (MLSA) and incorporation into Land Use Plan of the island.

7. Labor Management Guidelines and Code of Conduct for the Contractor

The following is an additional chapter of the ESMP which describes the Labor Management Plan for the proposed project of establishment of IWRMC in M. Mulah. The Code of Conduct is Annex 8 of the report.

CHAPTER FOURTEEN: LABOR MANAGEMENT PLAN

The project anticipates some environmental and social impacts due to influx of Labor hence, the following Table 45 prescribes the labor management guidelines for the contractor. However, the anticipated number of the labor for the project is approximately 15 – 20 workers.

Aspect	Prescribed Guidelines	Implementation Responsibility	Monitoring Responsibility
Terms and Conditions	• List of workers to be utilized in relation to the project, with proof of employment will be required to be submitted to PMU by all investors/contractors. • Construction work can only commence once the following conditions are met: o Toolbox training completed by all staff employed by the contractor o All the required Personal Protective Equipment are acquired by the contractor for all workers •Any newly employed party by the contractor will be required to complete the toolbox prior to commencing any physical work. •As per the provisions of the employment, all parties employed by any contracted party will be above 16 years of age. For those	P: Contractor	MCEP PMU

	between 16 to 18 years of age, consent of the parent will be required as per the Employment Act. In addition, all other provisions of the act highlighted previously regarding employment of a minor will apply. • All contractors and investors will be required to provide document evidence (passport, identity card or birth certificate) confirming age of employees to MCEP PMU prior to involving them on activities of the project. In addition, for minors consent of the parent will be provided in writing together with evidence of legal guardianship. • Maximum working hours for staff will not exceed the maximum limit set in the employment act, i.e. 48 hours a week. To confirm this, monthly attendance and duty sheets need to be submitted to PMU during the construction phase. • An internal transparent and accountable system will be established within the company to tackle issues of sexual harassment, physical and psychological harassment and workplace bullying. Details of this system will be shared with PMU prior to signing any contracts or agreements. • The leave policy of the company will be shared and confirmed that it is in line with national laws and regulations. • All foreign parties employed by all contractors/investors will have valid work permit. The work permit details will be shared with MCEP PMU. •All vehicles used by any contractor/investor for the purpose of the project will have valid registration, insurance and road worthiness.		

	•All contracted staff will be made aware of grievance redress mechanism available for the staff specified under this LMP.		
Working and Living Condition	• Entry and exit from site/workplace will be strictly controlled. • Separate male and female toilet facilities will be provided at all project offices, field/construction sites. • Potable drinking water and handwashing facilities will be available at all project offices and field/construction sites. • All provisions that are required under Health and Safety Regulation for Construction Industry (2019/R156) will be strictly adhered to. • Working environment will be clean, hygienic and safe. All project offices will be free of pests. Where pests are detected pest control measures will be taken immediately. o Fire detection and firefighting equipment will be available at all project offices. o Emergency evacuation plan will be established for all project offices and staff will be made aware of the plan and periodic simulation exercises that needs to be implemented. o Adequate safety signs will be installed at the work site giving clear direction. These will be provided in addition to English in the language of the workforce. • Construction work site will be demarcated & fenced, and warning signs will be displayed both in English and Dhivehi. • When procuring sea-vessels for travelling, in addition to cost, safety considerations will be given a priority, including the size of the vessels, and only sea-vessels that have lifejackets available, will be procured.	P: Contractor	Island Council

	o Some form of identification will be there identifying the staff belonging to project when attending meetings and sites. o Work tasks will be rearranged or numbers of workers on the worksite will be reduced to allow social/physical distancing, or rotating workers through a 24-hour schedule o		
COVID19 Impacts	• Adequate PPE will be provided to workers, including: o Facemasks, gloves, etc., if possible, to prevent COVID-19 spread o Lifejackets to workers when travelling by sea. o Hard hats (through contractors, investors or project directly) o Enclosed shoes will be worn by all staff (safety shoes are preferable). o Safety harness will be provided (through contractors, investors or project directly) when climbing heights at project sites.	P: Contractor	COVID19 Taskforce of Island
Worker Accommodation	• Accommodation arrangements will be reviewed, to see if they are adequate and designed to reduce contact with the community • Male and Female workforce will be housed separately • Constant and reliable electricity supply will be made available. In addition, sufficient lighting and cooling systems will be established	P: Contractor	Island Council

	• Shower and toilet facilities will be available at the accommodation site. A minimum ratio of 01 toilet/shower per 20 workers will be maintained. Separate facilities will be provided for men and women. • Toilet and drainage will be connected to local sewer system, where not available septic tanks will be used for treatment prior to disposal. • Individual bedding will be provided to all workers. o Storage space for individual belongings will be provided for all workers. • Designated locations for waste disposal with clearly marked bins will be established. Bins will be emptied daily and the site will be cleaned daily. • Meals to the site will be prepared from a Health Protection Agency (HPA) certified facility (whether food is prepared on site or offsite) o Monthly inspection to determine pest infestation on the site will be carried out.		

ANNEX 8: SAMPLE CODE OF CONDUCT FOR CONTRACTOR

CODES OF CONDUCT

Three Codes of Conduct are presented below:

i. **Company Code of Conduct:** Commits the company to addressing EHSH, OHS and GBV issues;
ii. **Manager's Code of Conduct:** Commits managers to implementing the Company Code of Conduct, as well as those signed by individuals; and,
iii. **Individual Code of Conduct:** Code of Conduct for everyone working on the project, including managers.

Company Code of Conduct
Implementing ESHS and OHS Standards
Preventing Gender Based Violence

The company is committed to ensuring that the project is implemented in such a way which minimizes any negative impacts on the local environment, communities, and its workers. This will be done by respecting the environmental, social, health and safety (ESHS) standards, and ensuring appropriate occupational health and safety (OHS) standards are met. The company is also committed to creating and maintaining an environment where children under the age of 18 will be protected, and where Sexual Exploitation and Abuse (SEA) and sexual harassment have no place. Improper actions towards children, SEA and sexual harassment are acts of Gender Based Violence (GBV) and as such will not be tolerated by any employee, sub-contractors, supplier, associate, or representative of the company.

Therefore, to ensure that all those engaged in the project are aware of this commitment, the company commits to the following core principles and minimum standards of behavior that will apply to all company employees, associates, and representatives, including sub-contractors and suppliers, without exception:

General

1. The company—and therefore all employees, associates, representatives, sub-contractors and suppliers—commits to complying with all relevant national laws, rules and regulations.
2. The company commits to full implementing its 'Contractors Environmental and Social Management Plan' (C-ESMP) as approved by the client.
3. The company commits to treating women, children (persons under the age of 18), and men with respect regardless of race, color, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status. Acts of GBV are in violation of this commitment.
4. The company shall ensure that interactions with local community members are done with respect and non-discrimination.
5. Demeaning, threatening, harassing, abusive, culturally inappropriate, or sexually provocative language and behavior are prohibited among all company employees, associates, and its representatives, including sub-contractors and suppliers.
6. The company will follow all reasonable work instructions (including regarding environmental and social norms).
7. The company will protect and ensure proper use of property (for example, to prohibit theft, carelessness or waste).

Health and Safety

8. The company will ensure that the project's OHS Management Plan is effectively implemented by company's staff, as well as sub-contractors and suppliers.
9. The company will ensure that all persons on-site wear prescribed and appropriate personal protective equipment, preventing avoidable accidents, and reporting conditions or practices that pose a safety hazard or threaten the environment.
10. The company will:

i. prohibit the use of alcohol during work activities.
ii. prohibit the use of narcotics or other substances which can impair faculties at all times.

11. The company will ensure that adequate sanitation facilities are available on site and at any worker accommodations provided to those working on the project.
12. The company will not hire children under the age of 18 for construction work, or allow them on the work site, due to the hazardous nature of construction sites.

Gender Based Violence

13. Acts of GBV constitute gross misconduct and are therefore grounds for sanctions, which may include penalties and/or termination of employment and, if appropriate, referral to the Police for further action.
14. All forms of GBV, are unacceptable, regardless of whether they take place on the work site, the work site surroundings, at worker's camps or within the local community.
15. Sexual harassment of work personnel and staff (e.g. making unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature) are acts of GBV and are prohibited.
16. Sexual favors (e.g. making promises of favorable treatment such as promotions, threats of unfavorable treatment such as losing a job, payments in kind or in cash dependent on sexual acts) and any form of humiliating, degrading or exploitative behavior are prohibited.
17. The use of prostitution in any form at any time is strictly prohibited.
18. Sexual contact or activity with children under 18—including through digital media—is prohibited. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not a defense or excuse.
19. Unless there is full consent[1] by all parties involved in the sexual act, sexual interactions between the company's employees (at any level) and members of the communities surrounding the work place are prohibited. This includes relationships involving the withholding/promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex (including prostitution). Such sexual activity is considered "non-consensual" within the scope of this Code.
20. In addition to company sanctions, legal prosecution of those who commit acts of GBV will be pursued if appropriate.
21. All employees, including volunteers and sub-contractors are highly encouraged to report suspected or actual acts of GBV by a fellow worker, whether in the same company or not. Reports must be made in accordance with project's GBV Allegation Procedures.
22. Managers are required to report and act to address suspected or actual acts of GBV as they have a responsibility to uphold company commitments and hold their direct reports responsible.

Implementation

[1] **Consent:** refers to when an adult makes an informed choice to agree freely and voluntarily to do something. There is **no** consent when agreement is obtained through the use of threats, force or other forms of coercion, abduction, fraud, manipulation, deception, or misrepresentation; the use of a threat to withhold a benefit to which the person is already entitled, or; a promise made to the person to provide a benefit. In accordance with the United Nations Convention on the Rights of the Child, the World Bank considers that consent cannot be given by children under the age of 18, even if national legislation of the country into which the Code of Conduct is introduced has a lower age. Mistaken belief regarding the age of the child and consent from the child is not a defense.

To ensure that the above principles are implemented effectively the company commits to:

23. Ensuring that all managers sign the project's 'Manager's Code of Conduct' detailing their responsibilities for implementing the company's commitments and enforcing the responsibilities in the 'Individual Code of Conduct'.
24. Ensuring that all employees sign the project's 'Individual Code of Conduct' confirming their agreement to comply with ESHS and OHS standards, and not to engage in activities resulting in GBV, child endangerment or abuse, or sexual harassment.
25. Displaying the Company and Individual Codes of Conduct prominently and in clear view at workers' camps, offices, and in in public areas of the work space. Examples of areas include waiting, rest and lobby areas of sites, canteen areas and health clinics.
26. Ensuring that posted and distributed copies of the Company and Individual Codes of Conduct are translated into the appropriate language of use in the work site areas as well as for any international staff in their native language.
27. Ensuring that an appropriate person is nominated as the company's 'Focal Point' for addressing GBV issues, including representing the company on the GBV Complaints Team (GCT) which is comprised of representatives from the client, contractor(s), the supervision consultant, and local GBV Service Provider.
28. Ensuring that an effective GBV Action Plan is developed in consultation with the GCT which includes as a minimum:
    i. **GBV Allegation Procedure** to report GBV issues through the project Grievance Redress Mechanism (Section 4.3 Action Plan);
    ii. **Accountability Measures** to protect confidentiality of all involved (Section 4.4 Action Plan); and,
    iii. **Response Protocol** applicable to GBV survivors and perpetrators (Section 4.7 Action Plan).
29. Ensuring that the company effectively implements the agreed final GBV Action Plan, providing feedback to the GCT for improvements and updates as appropriate.
30. Ensuring that all employees attend an induction training course prior to commencing work on site to ensure they are familiar with the company's commitments to ESHS and OHS standards, and the project's GBV Codes of Conduct.
31. Ensuring that all employees attend a mandatory training course once a month for the duration of the contract starting from the first induction training prior to commencement of work to reinforce the understanding of the project's ESHS and OHS standards and the GBV Code of Conduct.

I do hereby acknowledge that I have read the foregoing Company Code of Conduct, and on behalf of the company agree to comply with the standards contained therein. I understand my role and responsibilities to support the project's OHS and ESHS standards, and to prevent and respond to GBV. I understand that any action inconsistent with this Company Code of Conduct or failure to act mandated by this Company Code of Conduct may result in disciplinary action.

Company name: _____

Signature: _____

Printed Name: _____

Title: _____

Date: _____

Manager's Code of Conduct

Implementing ESHS and OHS Standards

Preventing Gender Based Violence

The company is committed to ensuring that the project is implemented in such a way which minimizes any negative impacts on the local environment, communities, and its workers. This will be done by respecting the environmental, social, health and safety (ESHS) standards, and ensuring appropriate occupational health and safety (OHS) standards are met. The company is also committed to creating and maintaining an environment where children under the age of 18 will be protected, and where Sexual Exploitation and Abuse (SEA) and sexual harassment have no place. Improper actions towards children, SEA and sexual harassment are acts of Gender Based Violence (GBV) and as such will not be tolerated by any employee, sub-contractors, supplier, associate, or representative of the company.

Managers at all levels have a responsibility to uphold the company's commitment. Managers need to support and promote the implementation of the Company Code of Conduct. To that end, managers must adhere to this Manager's Code of Conduct and also to sign the Individual Code of Conduct. This commits them to supporting the implementation of the Contractor's Environmental and Social Management Plan (C-ESMP), the OHS Management Plan, and developing systems that facilitate the implementation of the GBV Action Plan.

Managers need to maintain a safe workplace, as well as a GBV-free environment at the workplace and in the local community. Their responsibilities to achieve this include but are not limited to:

Implementation

1. To ensure maximum effectiveness of the Company and Individual Codes of Conduct:
    i. Prominently displaying the Company and Individual Codes of Conduct in clear view at workers' camps, offices, and in public areas of the work space. Examples of areas include waiting, rest and lobby areas of sites, canteen areas and health clinics.
    ii. Ensuring all posted and distributed copies of the Company and Individual Codes of Conduct are translated into the appropriate language of use in the work site areas as well as for any international staff in their native language.
2. Verbally and in writing explain the Company and Individual Codes of Conduct to all staff.
3. Ensure that:
    i. All direct reports sign the 'Individual Code of Conduct', including acknowledgment that they have read and agree with the Code of Conduct.

ii. Staff lists and signed copies of the Individual Code of Conduct are provided to the OHS Manager, the GBV Complaints Team (GCT), and the client.
iii. Participate in training and ensure that staff also participate as outlined below.
iv. Put in place a mechanism for staff to:
    (a) report concerns on ESHS or OHS compliance; and,
    (b) confidentially report GBV incidents through the Grievance Redress Mechanism (GRM)
v. Staff are encouraged to report suspected or actual ESHS, OHS, GBV issues, emphasizing the staff's responsibility to the Company and the country hosting their employment, and emphasizing the respect for confidentiality.

4. In compliance with applicable laws and to the best of your abilities, prevent perpetrators of sexual exploitation and abuse from being hired, re-hired or deployed. Use background and criminal reference checks for all employees nor ordinarily resident in the country where the works are taking place.
5. Ensure that when engaging in partnership, sub-contractor, supplier or similar agreements, these agreements:
    i. Incorporate the ESHS, OHS, GBV Codes of Conduct as an attachment.
    ii. Include the appropriate language requiring such contracting entities and individuals, and their employees and volunteers, to comply with the Individual Codes of Conduct.
    iii. Expressly state that the failure of those entities or individuals, as appropriate, to ensure compliance with the ESHS and OHS standards, take preventive measures against GBV, to investigate allegations thereof, or to take corrective actions when GBV has occurred, shall not only constitute grounds for sanctions and penalties in accordance with the Individual Codes of Conduct but also termination of agreements to work on or supply the project.
6. Provide support and resources to the GCT to create and disseminate internal sensitization initiatives through the awareness-raising strategy under the GBV Action Plan.
7. Ensure that any GBV complaint warranting Police action is reported to the Police, the client and the World Bank immediately.
8. Report and act in accordance with the agreed response protocol any suspected or actual acts of GBV.
9. Ensure that any major ESHS or OHS incidents are reported to the client and the supervision engineer immediately, non-major issues in accordance with the agreed reporting protocol.
10. Ensure that children under the age of 18 are not present at the construction site, or engaged in any hazardous activities.

Training

11. The managers are responsible to:
    i. Ensure that the OHS Management Plan is implemented, with suitable training required for all staff, including sub-contractors and suppliers; and,
    ii. Ensure that staff have a suitable understanding of the C-ESMP and are trained as appropriate to implement the C-ESMP requirements.
12. All managers are required to attend an induction manager training course prior to commencing work on site to ensure that they are familiar with their roles and responsibilities in upholding the GBV elements of these Codes of Conduct. This training will be separate from the induction training course required of all employees and will provide managers with the necessary understanding and technical support needed to begin to develop the GBV Action Plan for addressing GBV issues.
13. Managers are required to attend and assist with the project facilitated monthly training courses for all employees. Managers will be required to introduce the trainings and announce the self-evaluations, including collecting satisfaction surveys to evaluate training experiences and provide advice on improving the effectiveness of training.

14. Ensure that time is provided during work hours and that staff prior to commencing work on site attend the mandatory project facilitated induction training on:
    i. OHS and ESHS; and,
    ii. GBV required of all employees.
15. During civil works, ensure that staff attend ongoing OHS and ESHS training, as well as the monthly mandatory refresher training course required of all employees to on GBV.

Response

16. Managers will be required to take appropriate actions to address any ESHS or OHS incidents.
17. Regarding GBV:
    i. Provide input to the GBV Allegation Procedures and Response Protocol developed by the GCT as part of the final cleared GBV Action Plan.
    ii. Once adopted by the Company, managers will uphold the Accountability Measures set forth in the GBV Action Plan to maintain the confidentiality of all employees who report or (allegedly) perpetrate incidences of GBV (unless a breach of confidentiality is required to protect persons or property from serious harm or where required by law).
    iii. If a manager develops concerns or suspicions regarding any form of GBV by one of his/her direct reports, or by an employee working for another contractor on the same work site, s/he is required to report the case using the GRM.
    iv. Once a sanction has been determined, the relevant manager(s) is/are expected to be personally responsible for ensuring that the measure is effectively enforced, within a maximum timeframe of 14 days from the date on which the decision to sanction was made by the GCT.
    v. If a Manager has a conflict of interest due to personal or familial relationships with the survivor and/or perpetrator, he/she must notify the Company and the GCT. The Company will be required to appoint another manager without a conflict of interest to respond to complaints.
    vi. Ensure that any GBV issue warranting Police action is reported to the Police, the client and the World Bank immediately
18. Managers failing address ESHS or OHS incidents, or failing to report or comply with the GBV provisions may be subject to disciplinary measures, to be determined and enacted by the cCmpany's CEO, Managing Director or equivalent highest-ranking manager. Those measures may include:
    i. Informal warning.
    ii. Formal warning.
    iii. Additional Training.
    iv. Loss of up to one week's salary.
    v. Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months.
    vi. Termination of employment.
19. Ultimately, failure to effectively respond to ESHS, OHS, and GBV cases on the work site by the company's managers or CEO may provide grounds for legal actions by authorities.

I do hereby acknowledge that I have read the foregoing Manager's Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to ESHS, OHS, and GBV requirements. I understand that any action inconsistent with this Manager's Code of Conduct or failure to act mandated by this Manager's Code of Conduct may result in disciplinary action.

Signature: _____

Printed Name: _____

Title: _____

Date: _____

Individual Code of Conduct
Implementing ESHS and OHS Standards
Preventing Gender Based Violence

I, _____, acknowledge that adhering to environmental, social, health and safety (ESHS) standards, following the project's occupational health and safety (OHS) requirements, and preventing Gender Based Violence (GBV) is important.

The Company considers that failure to follow ESHS and OHS standards, or to partake in activities constituting GBV—be it on the work site, the work site surroundings, at workers' camps, or the surrounding communities—constitute acts of gross misconduct and are therefore grounds for sanctions, penalties or potential termination of employment. Prosecution by the Police of those who commit GBV may be pursued if appropriate.

I agree that while working on the project I will:

1. Consent to Police background check.
2. Attend and actively partake in training courses related to ESHS, OHS, and GBV as requested by my employer.
3. Will wear my personal protective equipment (PPE) at all times when at the work site or engaged in project related activities.
4. Take all practical steps to implement the contractor's environmental and social management plan (C-ESMP).
5. Implement the OHS Management Plan.
6. Adhere to a zero-alcohol policy during work activities, and refrain from the use of narcotics or other substances which can impair faculties at all times.
7. Treat women, children (persons under the age of 18), and men with respect regardless of race, color, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status.
8. Not use language or behavior towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
9. Not sexually exploit or abuse project beneficiaries and members of the surrounding communities.
10. Not engage in sexual harassment of work personnel and staff —for instance, making unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature is prohibited. E.g. looking somebody up and down; kissing, howling or smacking sounds; hanging around somebody; whistling and catcalls; in some instances, giving personal gifts.
11. Not engage in sexual favors —for instance, making promises of favorable treatment (e.g. promotion), threats of unfavorable treatment (e.g. loss of job) or payments in kind or in cash, dependent on sexual acts—or other forms of humiliating, degrading or exploitative behavior.
12. Not use prostitution in any form at any time.

13. Not participate in sexual contact or activity with children under the age of 18—including grooming, or contact through digital media. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not a defense or excuse.
14. Unless there is the full consent[2] by all parties involved, I will not have sexual interactions with members of the surrounding communities. This includes relationships involving the withholding or promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex (including prostitution). Such sexual activity is considered "non-consensual" within the scope of this Code.
15. Consider reporting through the GRM or to my manager any suspected or actual GBV by a fellow worker, whether employed by my company or not, or any breaches of this Code of Conduct.

With regard to children under the age of 18:

16. Bring to the attention of my manager the presence of any children on the construction site or engaged in hazardous activities.
17. Wherever possible, ensure that another adult is present when working in the proximity of children.
18. Not invite unaccompanied children unrelated to my family into my home, unless they are at immediate risk of injury or in physical danger.
19. Not use any computers, mobile phones, video and digital cameras or any other medium to exploit or harass children or to access child pornography (see also "Use of children's images for work related purposes" below).
20. Refrain from physical punishment or discipline of children.
21. Refrain from hiring children for domestic or other labor below the minimum age of 14 unless national law specifies a higher age, or which places them at significant risk of injury.
22. Comply with all relevant local legislation, including labor laws in relation to child labor and World Bank's safeguard policies on child labor and minimum age.
23. Take appropriate caution when photographing or filming children (See Annex 2 for details).

Use of children's images for work related purposes

When photographing or filming a child for work related purposes, I must:

24. Before photographing or filming a child, assess and endeavor to comply with local traditions or restrictions for reproducing personal images.
25. Before photographing or filming a child, obtain informed consent from the child and a parent or guardian of the child. As part of this I must explain how the photograph or film will be used.
26. Ensure photographs, films, videos and DVDs present children in a dignified and respectful manner and not in a vulnerable or submissive manner. Children should be adequately clothed and not in poses that could be seen as sexually suggestive.
27. Ensure images are honest representations of the context and the facts.
28. Ensure file labels do not reveal identifying information about a child when sending images electronically.

[2] **Consent** is defined as the informed choice underlying an individual's free and voluntary intention, acceptance or agreement to do something. No consent can be found when such acceptance or agreement is obtained using threats, force or other forms of coercion, abduction, fraud, deception, or misrepresentation. In accordance with the United Nations Convention on the Rights of the Child, the World Bank considers that consent cannot be given by children under the age of 18, even if national legislation of the country into which the Code of Conduct is introduced has a lower age. Mistaken belief regarding the age of the child and consent from the child is not a defense.

Sanctions

I understand that if I breach this Individual Code of Conduct, my employer will take disciplinary action which could include:

1. Informal warning.
2. Formal warning.
3. Additional Training.
4. Loss of up to one week's salary.
5. Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months.
6. Termination of employment.
7. Report to the Police if warranted.

I understand that it is my responsibility to ensure that the environmental, social, health and safety standards are met. That I will adhere to the occupational health and safety management plan. That I will avoid actions or behaviors that could be construed as GBV. Any such actions will be a breach this Individual Code of Conduct. I do hereby acknowledge that I have read the foregoing Individual Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to ESHS, OHS, GBV issues. I understand that any action inconsistent with this Individual Code of Conduct or failure to act mandated by this Individual Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____

Printed Name: _____

Title: _____

Date: _____

Revised Information Lacking in the EMP for the proposed establishment of an IWRMC at Mulah, Meemu Atoll

As per the requested through your letter 203-ECA/438/2021/30 (dated: 14 February 2021) regarding the additional information for the ESMP for proposed establishment of Island Waste Resources Management Centre at M. Mulah, please find the information below;

1. **In table 6, (project inputs), the consultant mentions that the water for construction (200-1000 liters per day) will be obtained by island groundwater. Firstly, please inform how the demand requirement was calculated. Secondly, please confirm whether groundwater could be utilized for construction projects as per Water and Sewerage Act (Law No: 8/2020)**

The anticipated water demand will be 200 litres per day and will be only used only for concrete mixing on during the concrete works which is expected to be 90 days.

The Clause 19 (c) of the Water and Sewerage Act prohibits utilization of groundwater for any industrial use hence, the water required for construction will be obtained by the contractor by purchasing the desalinated water generated by the existing piped water network in the island.

2. **The introduction or executive summary does not mention why the ESMP needs to be updated and technology change from manual composting to machine composting technology**
    a. **need to give justification based on environmental social and economic considerations for changing the waste management technology.**

Technology for Composting	Advantages	Disadvantages
Aerobic OWC Technology (In vessel Composting)	• Simple and convenient to operate without the need for constant attention; • Short processing times ensures economic in use with low energy consumption; • Requires minimal maintenance;	• Require a significant proportion of organic absorbents such as saw dust or dried leaves. • Requires activation inoculum (bioculum)
Manual Composting	• Does not require any activation inoculum. • Low capital cost	• Require large space for windrow systems; • Composting curing process is very slow require 4 months to get the finished compost. • Piles need to be turned frequently every 5 days, which makes it extremely labor intensive.

		• The issue of odor, flies and rodents will exist. • High processing time means low changes to generate sufficient income from it. • Generate leachate especially during rainy weather.
Anaerobic Digestion System	• Digester liquid can be utilized as fertilizers • Bio-gas produced can be utilized as a LPG replacement	• High capital cost • Require constant maintenance • Not all types of organic waste can be utilized for composting

b. need to include means for managing hazardous wastes generated form the project.

Stage	Output	Source / Type	Amount	Means of managing
Construction	Land plot for IWRMC	Cleared land for construction of IWRMC	750 m^2	N/A
	Removed Coconut palms		65 (for site)	
	Removed mature trees (other than coconut)		5 (for site)	
	Soil	Excavation for substructure	8.30 m^3	To be used back in the levelling and backfilling of site.
	Construction Waste	Construction works	Moderate amount of construction waste	Transfer all waste to nearest Waste management facility
	Yard waste from site clearance	Yard waste While a great Emphasis is placed on relocating, trees some trees and branches may have to be removed and preferably used as timber or discarded as yard waste.	Approximately 5-10 tons	
	Hazardous waste	Construction and clearing of vegetation	Moderate amount of hazardous waste	
	Municipal waste	Workers	346.5 kg	
	Dust	Excavation	Moderate amount of dust	
		Cement mixing	Moderate amount of dust	
	Greenhouse gases	Machinery	Moderate amount of GHG from direct and indirect emissions	

		Concreting works	Moderate amount of GHG from direct and indirect emissions	
		Reinforcement	Moderate amount of GHG from direct and indirect emissions	
		PVC Pipes	Moderate amount of GHG from direct and indirect emissions	
Operation (based on presumption the IWRMC will be fully functional without major issue)	Compost	In-vessel Composting	39 m^3 of compost per full batch	Sold as fertilizer
	Green waste	Residual		
	Crushed Glass	Glass crusher	1.14 ton per month	Crushed glass stockpiled in the IWRMC compartment prior to sale. Unmanaged waste transferred to central waste management facility
	Compacted Metal	Metal baler	0.57 ton per month	Compacted metal stockpiled in the IWRMC compartment prior to sale. Unmanaged waste transferred to central waste management facility
	Shredded plastic	Plastic shredder	2.9 ton per month	Shredded plastic stockpiled in the IWRMC compartment prior to sale. Unmanaged waste transferred to central waste management facility
	GHG	Electricity usage		N/A

c. project input table need to be updated to include machineries needed for new composting technology.

Operation	**Equipment and Materials**	**IWRMC tools**	**1**	**Imported / purchased where available locally**
		Weighing Bench Scale	1	
		Glass to Sand Crusher	1	
		Plastic Shredder	1	
		Metal Can Baler	1	
		Vegetation Shredder	1	
		OWC Machine	1	
	Waste	Waste generated within the island	Approximately 1.9 ton of waste per day	Waste collected by vehicle from the waste bins within the island
	Fuel	Diesel	5000-15000 L/month	Local suppliers
	Water	Freshwater	200-1000l/day	Groundwater

3. **Waste per capita is derived from 2018 ESMP report. Please provide an updated waste per capita figure. Given that local tourism is expanding in the island, waste per capita is expected to be higher at the present.**

The updated waste per capita figure reflecting the local tourism situation as per the feasibility study for the Maldives Clean Environment Project Zone 4 & 5 is 1.26 kg per person per day.

4. **Page 81: impacts on vegetation sub heading states that no large trees will be removed as part of this project. But the report states 65 coconut trees and 5 other trees will be removed.**

The total number of coconut trees which require uprooting 65 coconut trees and 5 other trees.

5. **Provide details on how many people are being compensated by vegetation clearance/ cost for compensation and if it is borne by the proponent and who will be bearing responsibility for planting 2 trees for each of the felled trees.**

The responsibility for compensation and planting 2 trees for each felled tree is on the M. Mulah Island council. The following are the details of the compensation fees which will be paid prior to construction activities;

Quantity	Type of Tree	Size	Rate (MVR)	Total (MVR)
5	Other Trees		2205.00	2205.00
25	Juvenile Coconut palm	Small	30.00	750.00
8	Juvenile Coconut palm	Large	75.00	600.00
12	Mature Coconut palm	Inferior	150.00	1800.00
5	Mature Coconut palm	Ordinary	250.00	1250.00
7	Mature Coconut palm	Good	500.00	3500.00
8	Mature Coconut palm	Superior	700.00	5600.00
Total				15,705.00

6. **Report says a proper vegetation survey would be conducted therefore please request to share this survey with EPA prior to construction**

The proponent will provide the vegetation survey report conducted by the contractor prior to construction to EPA. This commitment is assured by the letter of commitment provided in the Annex 3 of the ESMP.

DECISION STATEMENT
ތިމާވެށީގެ މެނޭޖްމަންޓް ޕްލޭން ގަބޫލުކުރުން
APPROVAL OF THE ENVIRONMENTAL MANAGEMENT PLAN

Number: 203-ECA/438/2021/50 :ނަންބަރު

ތިމާވެށީގެ ގޮތުން ނިންމި ގޮތުގެ މިލިޔުން ދޫކުރި މ.މުލަކުގައި އައިޑަބްލިޔު ވޭސްޓް އެންޑް ރިސޯސް މެނޭޖްމަންޓް ސެންޓަރެއް ގާއިމްކުރުމުގެ މަޝްރޫއުގެ މަސައްކަތްކުރުމާއި ގުޅޭ ގޮތުން މިނިސްޓްރީ އޮފް އެންވަޔަރަންމަންޓް ގެ ފަރާތުން 19 ޖެނުއަރީ 2021 ގައި މުރާޖަޢާކުރުމަށް ހުށަހެޅުއްވާ އަދި 21 ފެބްރުއަރީ 2021 ގައި އިތުރު މަޢުލޫމާތު ހުށަހަޅުއްވައިފައިވާ ތިމާވެށި އަދި ސޯޝަލް މެނޭޖްމަންޓް ޕްލޭން ބެލި ގޮތުން ނިންމިގޮތް އެންގުމަށްޓަކައެވެ. މި މަޝްރޫޢުގެ ތިމާވެށީގެ ކޮންސަލްޓަންޓަކީ އަލްފާޟިލް ހަމްދޫން މުޙައްމަދު (EIA P03/2017)އެވެ.

This Environmental Decision Statement is issued for the purpose of communicating the decision regarding the ***Environmental and Social Management Plan for the Proposed Establishment of an IWRMC at Mulah, Meemu Atoll,*** *which was submitted for evaluation on* ***09th January 2021*** *and submitted additional information on* ***21st February 2021*** *by* ***Ministry of Environment.*** *The environmental consultant of this project is* ***Mr. Hamdhoon Mohamed (EIA P03/2017).***

1. This Environmental Decision Statement has been issued on behalf of the Environmental Protection Agency (hereinafter referred to as the Ministry) pursuant to the Environmental Impact Assessment Regulations 2012 (2012/R-27) to advise that the Ministry has decided that the proposed project can proceed according to the Environmental Management Plan.

1. ތިމާވެށްޓަށް އަސަރު ފޯރާނެ މިންވަރު ބަލާނެ ރިޕޯޓް ހެދުމާބެހޭ ގަވާއިދު 2012 ގެ ދަށުން (މި ލިޔުމުގައި މިގެ ފަހުން މިނިސްޓްރީ ކަމަށް ބަޔާން ކޮށްފައިވާ) މިގަވާއިދުގެ ތަންފީޒީ އިދާރާ، އެންވަޔަރަންމަންޓަލް ޕްރޮޓެކްޝަން އެޖެންސީގެ ފަރާތުން މި ތިމާވެށީގެގޮތުން ނިންމިގޮތުގެ ލިޔުން ދޫކުރެވުނީ މަތީގައި ބަޔާންކޮށްފައިވާ މަޝްރޫޢު ތިމާވެށީގެ މެނޭޖްމަންޓް ޕްލޭނުގައި ބަޔާންކޮށްފައިވާ ގޮތަށް ކުރިއަށް ގެންދިއުމުގެ ހުއްދަ ދީފައެވެ.

2. The decision has been made by the Ministry on the following conditions:

   i. In the event the project activity has not commenced **within one (1) year** from the date of issue, or if the duration of this Environmental Decision Statement has not been extended, this Environmental Decision Statement shall be considered null and void.

   ii. In the event the project activities have been delayed for more than one (1) year due to unforeseen circumstances, the Ministry shall have the discretion to extend the duration of the Environmental Decision Statement, or to terminate it. In such circumstances the proponent shall write to the Minister for an extension clearly stating out the reasons for the delay.

iii. The Minister, or his designate, may issue a cessation order requiring persons working on a Development Proposal to cease working until the order is withdrawn, if:

a) This Environmental Decision Statement has been withdrawn or;

b) There has been a breach of the conditions of this Environmental Decision Statement.

iii. ތިޔަގެ ލިޔުންތެރި ކަނޑައެޅި ބާރުދޭ ފަރާތް، ލިބިފައިވާ ތަރައްޤީ ގަޑިއަށް ކުރިއަށް ގެންދާ ކަންކަމުގައި ބައިވެރިވާ ފަރާތްތަކަށް، ނިންމުން ވަކިކުރެވޭ ހާލަތެއްގައި ނިންމުން ވަކިކުރެވޭ ދުވަހާ ހަމައަށް ވެސް ކަންކަން ކުރުމުގެ ހުއްދަ ހުއްޓާލާ ނުވަތަ ކަންކަން ކުރުމުގެ ހުއްދަ ދޫކުރުމުގެ ކަންތައްތަކަށް ބާރުދިނުމުގެ ބާރު ލިބިގެންވާ ފަރާތް ކަމަށް ވާނަމެ ވެ.

ހ) ލިބިފައިވާ ތަރައްޤީ ގަޑިއަށް ކުރިއަށް ގެންދާ ކަންކަމުގައި ބައިވެރިވާ ފަރާތްތަކަށް ދީފައިވާ ބާރު ހުއްޓާލާ ނުވަތަ ކަންކަން ކުރުމުގެ ހުއްދަ ދޫކުރުމުގެ ކަންތައްތަކަށް ބާރުދިނުމުގެ ބާރު ލިބިގެންވާ ފަރާތް ކަމަށް ވާ ނަމަ ވެ.

ށ) ލިބިފައިވާ ތަރައްޤީ ގަޑިއަށް ކުރިއަށް ގެންދާ ކަންކަމުގައި ބައިވެރިވާ ފަރާތްތަކަށް ދީފައިވާ ބާރު ހުއްޓާލާ ނުވަތަ ކަންކަން ކުރުމުގެ ހުއްދަ ދޫކުރުމުގެ ކަންތައްތަކަށް ބާރުދިނުމުގެ ބާރު ލިބިގެންވާ ފަރާތް ކަމަށް ވާ ނަމަ ވެ.

iv. It is the Developer's responsibility to undertake all project activities in accordance with the relevant laws and regulations of the Maldives.

iv. ދަށުވާ ހުރިހާ ގަޑިއަށް، ތަރައްޤީ ކުރުމުގެ ކަންތައްތަކުގައި ބައިވެރިވާ ފަރާތްތަކުގެ ވާޖިބުކަމަށް ވާ ނަމަ ވެ.

v. The Developer is aware that under the National Environment Protection Act (Law no. 4/93) and the Environmental Impact Assessment Regulations the Ministry reserves the right to terminate any activity without compensation if found that such an activity has caused significant, irreversible impacts on the environment.

v. ލިބިގެންވާ ތަރައްޤީ ގަޑިއަށް ކުރިއަށް ގެންދާ ކަންކަމުގައި ބައިވެރިވާ ފަރާތްތަކަށް ފެނުނު ގޮތުގައި ބަލާ ބަލާ ދިނުމަށް ވާ ނަމަ ވެ.

vi. All mitigation measures proposed in the EMP report for all the phases of the project shall be fully implemented.

vi. ތިމާގައިގެ ގޮތުގެ ތަންތާ ތަކުގައި ކުރިއަށް ގެންދާ ހުރިހާ ރިސްކް ދުރުކުރުމުގެ ޕްރޮގްރާމްތަކެއް ފުރިހަމަ ގޮތުގައި ތަންފީޒުކުރަންވާނެ ކަމަށް ބަޔާންކުރަމެވެ.

vii. The date of expiry stated in this Environmental Decision Statement is the duration given to commence the project activities approved under this Environmental Decision Statement.

vii. ތިމާގައިގެ ގޮތުގެ ތަންތާ ތަކުގައި ދެމުންދާ ވަގުތު ކަމަށް ބަޔާންކުރާ ތާރީޚުގެ ތެރޭ ތިމާގައި ގެންދާ ކަންތައްތަކުގެ ފަށާ ދުވަސް ކަމަށް ބަޔާންކުރަމެވެ.

viii. Once the project activities have started, the Proponent must inform the Environmental Protection Agency, the date of commencement of project activities.

viii. ކަންތައްތަކުގެ ފަށާ ދުވަސް، ތިމާގައި ގެންދާ ފަރާތުން ފެށުމުގެ ކުރިން ފެށޭ ދުވަސް ފާހަގަ ކުރަންވާނެ ކަމަށް ބަޔާންކުރަމެވެ.

Date of initial Issue: 24th February 2021

Date of expiry: 24th February 2022

Name: Mr. Ibrahim Naeem

Designation: Director General

Signature:

ތާރީޚް: 24 ފެބްރުވަރީ 2021

ވަގުތު ހުރުން: 24 ފެބްރުވަރީ 2022

ނަން: ބްރ. ހ. ނަޢީމް

ވަޒީފާ: ޖެނެރަލް ޑިރެކްޓަރ

ސޮއި: