FIRST ADDENDUM TO THE ENVIRONMENT IMPACT ASSESSMENT

PREPARED FOR THE PROPOSED

HULHULE'-MALE' BRIDGE PROJECT

January 2016

Prepared for

Ministry of Housing and Infrastructure

Consultant

CDE Consulting, Maldives

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ޖެނުއަރީ 2016

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List of Abbreviations

COADS	Comprehensive Ocean-Atmosphere Data Set
DO	Dissolved Oxygen
EIA	Envrionmental Impact Assessment
GPS	Global Positioning System
IPCC	Intergovernmental Panel on Climate Change
IPPC	International Plant Protection Convention
IUCN	International Union for Conservation of Nature
KWp	Kilowatt peak
MEE	Ministry of Environment and Energy
MHI	Ministry of Housing and Infrastructure
MoTAC	Ministry of Tourism, Arts and Culture
MoTCA	Ministry of Tourism and Civil Aviation
MSL	Mean Sea Level
MWSC	Maldives Water and Sewerage Company
NAPA	National Adaptation Programme of Action
NE	North East
NEAP II	National Environmental Action Plan II
NW	North West
PV	PhotoVoltaic
SAP	Strategic Action Plan
SE	South East
SW	South West
TDS	Total Suspended Solids
ToR	Term of Reference
UNFCCC	United Nations Framework Convention on Climate Change and the Kyoto Protocol

Acknowledgements

The lead author of this report is Dr. Simad Saeed

Additional assessments were undertaken by the following team members.

Dr. Ahmed Shaig (EIA Expert)

Ms. Shahdha (Pollution Specialist)

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Mr. Mohamed Ali (Field Sampling)

The curriculum vitae's of the EIA consultants are attached in Appendix E of this report.

Lead Consultant's Declaration

I certify that statements made in this Environment Impact Assessment are true, complete and correct to the best of my knowledge and available information.

Dr Simad Saeed

Proponent's Declaration

As the proponent of the proposed project, I guarantee that I have read the report thoroughly and that to the best of my knowledge all information provided here is accurate and complete.

(See Appendix G)

Executive Summary

The purpose of this document is to assess the potential environmental impacts and mitigation measures for the proposed changes to the Hulhulé-Malé Bridge project. This document is an addendum to the original Environmental Impact Assessment (EIA) prepared for the Bridge project in November 2015. The proponent of this project is Ministry of Housing and Infrastructure.

The main changes to the project includes expansion of the work site in Malé, and the addition two concrete batching to the project work site in Malé. The main rationale for these changes is to speed up the project, and to reduce the project costs.

The study area for the purpose of the addendum is the project work site in Male' and Hulhumale'. The baseline conditions of the site are largely based on the original EIA documents. Additional information on major changes to the environment is provided where appropriate.

The proposed developments are generally in conformance to the laws and regulations of the Maldives.

The key impacts from the proposed changes are due to site clearance of Male' worksite and operation of batching plants at Male' worksite. The clearance of the proposed expanded work site requires removal of hundreds of trees. Trees will be relocated where possible. Impacts from the operation of the batching plants include high noise levels, loss of visual amenity and specific impacts related to the wastewater disposal.

Significant impacts on the natural environment include impacts on terrestrial ecology from the site clearance of the expanded worksite. Hundreds of trees may potentially need to be removed or relocated. Further impacts on natural environment include impacts on marine ecology due to disposal of wastewater from the batching plants. Social impacts from the additional components include high noise levels from the operation of batching plants and loss of visual amenity.

A number of mitigation measures are proposed for the most significant impacts from the project. These include testing and monitoring of wastewater quality before disposal, limiting hours of batching plants operation to daytime and use of fences or walls to prevent transmission of dusts.

Alternatives have been proposed for wastewater disposal methods, waste water dispose location, location of the batching plants and alternative location for Male' worksite. Options for wastewater disposal methods include direct disposal of wastewater via the existing sewerage network, direct disposal into sea, and reuse of wastewater after passing through a settling tank

and after treatment. The last option is identified as the most ecologically preferred option, however, the option may not be feasible due to significantly high cost.

This report is prepared in accordance to the technical guidelines and EIA regulations, prepared by the Environmental Protection Agency (EPA), and the terms of reference issued by the EPA for this EIA addendum.

ސާރާ ހުލާސާ

މި ދިރާސާ ރިޕޯޓަކީ ހުޅުލެ-މާލެ ބްރިޖް މަޝްރޫއަށް ހުށަހަޅާފައިވާ ބަދަލުތަކުގެ ސަބަބުން ތިމާވެށްޓަށް ކޮށްފާނެ އަސަރު ދެނެގަތުމުގެ ގޮތުން ތައްޔާރުކޮށްފައިވާ ދިރާސާ ރިޕޯޓެކެވެ. މިރިޕޯޓަކީ މި މަޝްރޫއަށް ޖުލައި 2015 ގައި ތައްޔާރުކޮށްފައިވާ އީއައިއޭ ރިޕޯޓުގެ ފުރަތަމަ އެޑެންޑަމްއެވެ. މި މަޝްރޫއުގެ އެދިޕާރޓީ މިނިސްޓްރީ އޮފް ހައުސިންގ އެންޑް އިންފްރާސްޓްރަކްޗަރ އެވެ.

މިމަޝްރޫއަށް ގެނައުމަށް ހުށަހަޅާފައިވާ މައިގަނޑު ބަދަލުތަކުގެ ތެރޭގައި މާލޭގެ މަސައްކަތް ކުރާ ސަރަހައްދު ބޮޑުކުރުމާއި މިކަމާއިގުޅިގެން ނަގަންޖެހޭ ގަސްތަކާއި [illegible] ހިމެނެއެވެ. މީގެ އިތުރުން މާލޭގެ މަސައްކަތް ކުރާ ސަރަހައްދުގައި [illegible] ކޮންކްރީޓް ބެޗިން ޕްލާންޓް [illegible] ހިމެނެއެވެ. އަދި ހުޅުމާލޭގެ މަސައްކަތް ކުރާ ސަރަހައްދުގައި މަޝްރޫއުގެ ފުރަތަމަ އީއައިއޭ ރިޕޯޓުގައި ހުށަހަޅާފައިވާ ފަދައިން [illegible] މި ބަދަލުތަކުގެ މައިގަނޑު [illegible] ވަގުތީ މަސައްކަތްތަކުގެ ދުވަސް އަވަސްކުރުމާއި ޕްރޮޖެކްޓުގެ [illegible] ހިނގާ ހަރަދު ކުޑަކުރުމެވެ.

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ހުށަހަޅާފައިވާ ބަދަލުތަކުގެ ތެރެއިން އެންމެ ބޮޑު އަސަރުކުރާނެކަމަށް ލަފާކުރެވޭ [illegible] ކަނޑުމާއި ކޮންކްރީޓް ބެޗިން ޕްލާންޓް ހިންގުމުގެ ސަބަބުންނެވެ. [illegible] ގަސް ކަނޑާލަން ނުވަތަ އެހެން ސަރަހައްދަކަށް ބަދަލުކުރަން ޖެހޭނެއެވެ. ބެޗިން ޕްލާންޓް ހިންގުމުން ކުރާ އަސަރުތަކުގެ ތެރޭގައި ކައިރި ސަރަހައްދުތަކަށް މީހުންނަށް އަޑުގަދަވުމުގެ ސަބަބުން އުނދަގޫވުމާއި މަސައްކަތުގެ ސަބަބުން ސަރަހައްދުގެ ރީތިކަން ގެއްލުމާއި، ބެޗިން ޕްލާންޓުން ބާލާ ފެން [illegible] އަސަރުތަކުގެ [illegible] ހިމެނެއެވެ.

ޕްރޮޖެކްޓަށް އިތުރުކޮށްފައިވާ ކަންކަމުގެ ތެރެއިން ތިމާވެށްޓަށް ކޮށްފާނެ މައިގަނޑު އަސަރުތަކަށް ކަމުގައި މިދިރާސާއިން ފާހަގަކޮށްފައިވާ ކަންކަމުގެ ތެރޭގައި މާލޭ [illegible] އަސަރުކުރާނެއެވެ. މީގެ އިތުރުން ބެޗިން ޕްލާންޓް ބަހައްޓާނެ [illegible]

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މި އީއައިއޭގައި ފާހަގަކޮށްފައިވާ އަސަރުތަކަށް ކުޑަކުރުމުގެ ގޮތުން އެކިއެކި ފިޔަވަޅުތަކެއް މިރިޕޯޓުގައި އަލިއަޅުވާލާފައިވާނެއެވެ. އެގޮތުން ބޭނުންކުރާ ޕާރުންގެ ދުވާލު ފެރީގެ ޓްރިޕް ބަސްޓޮޕްތަކުގެ ކައިރިއެއް ހަމަޖެހުމާއި، ބޭނުންކުރާ ބޯޓްތަކާއި މަސައްކަތްތައް ދުވާލުގެ ވަގުތުތަކުގައި ކުރުމާއި، މަސައްކަތް ކުރާ ސަރަހައްދުގެ ވަށައިގެން ފެންސްއެއް ނުވަތަ ފާރެއް ބައްދުން ހިމެނެއެވެ.

ގެންދިޔުން ބަދަލުތަކުގެ ތެރޭގައި ބޭރުން ޕްލާންޓްތަކުގެ ބާރުވުން ނަރުގޭހުދިޔާ ބައެއް ގޮތްތަކާއި، ބާރުވުން ބޭރުކުރުވިޔަން އެއީ ސަރަހައްދަކާއި، މާދޭ ވިލްސަރިޖް ސަރަހައްދަށް ގެންދިޔަން ބައެއް ބަދަލުތަކުގެ އިތުރުން ބޭރުން ޕްލާންޓް ބަހައްޓަން ރަށުގެ އިތުރު ސަރަހައްދެއް ފާހަގަކޮށްފައިވާނެއެވެ.

މިރިޕޯޓް ތަޢާރުފުކުރުވިފައިވާ އިޖާބަ ގަވާއިދުތަކާއި ގުޅިގެންދިޔަ ފަރުދީމާޙައުލު އާއި މި މަޝްރޫޢުގެ ފުރަތަމަ އިޖާޒަތު ގުޅުންހުރި ގޮތުން އިޖާބަ ތަޢާރުފުކޮށްފައިވާ ޖަރިމަޝް އާޚް ރިފޯރޓްސްޝަން ބިނާކޮށްފައިވެ.

މިމަޝްރޫއަށް ގެންދިޔުމަށް ބަދަލުތަކަކީ ޖިއޮލޮޖިކަލް ރިޕޯޓުގެ ފާހަގަކޮށްގެ ބިލްޑިންގ ވެސް ގެއްލުނު ގަވާއިދުތަކާ އިޖާޒަތު ފާރާއި ހުށަހެޅިފައިވާ ބަދަލުތަކެވެ.

1 INTRODUCTION

1.1 Purpose of the EIA Addendum

This Environment Impact Assessment (EIA) addendum report is an evaluation of the potential environmental, socio-economic and natural impacts of the proposed alterations to the Hulhulé-Malé Bridge Project, Kaafu Atoll.

This document is submitted by the proponent to EPA to fulfil the requirements for an EIA under Article 5 of the Environment Protection and Preservation Act (4/93). The EIA Regulations 2012 has been used as the basis for preparing this document.

This report provides the background to the proposed changes to the project as well as an assessment of their likely environmental and social impacts, both beneficial and adverse. The proposed enhancement and mitigation measures are outlined where necessary together with an environment management plan and a monitoring programme.

1.2 Project Proponent

The proponent of this project, as proposed in the original project, is Ministry of Housing and Infrastructure of the Maldives.

1.3 Project background and rationale

Hulhule-Male' Bridge is a project developed to increase the social development and economic opportunities in the Male' urban area. One of the biggest constraints to the full utilization of Male'-Hulhule-Hulhumale as contiguous unit is the absence of land links.

The proposed changes to the project include expansion of the work site in Malé. In addition, two concrete batching plants will be added to the project work site in Malé and the use of septic tanks is proposed for sewage management at Hulhumale' worksite. The main rationale for these changes is to speed up the project, and to enhance project feasibility.

1.4 Project Scope Summary

As noted above the proposed changes to the project include:

i. Expansion of the work site in Malé to cover most of the "Adu Park", Usfagandu and surrounding roads.

ii. Site clearance on the expanded work area, including vegetation removal.

iii. Construction of two concrete batching plants

iv. Installation of septic tanks to manage sewage at the worker accommodation site.

More details are provided in the Project Description chapter.

1.5 Consultants, Contractors and Government Institutions

All the EIA related work is undertaken by consultants from CDE Consulting. The contractor for this project is CCCC Second Harbour Engineering Company Limited.

The project is executed by the Ministry of Housing and Infrastructure.

1.6 EIA Scope and Terms of Reference

The scope of this EIA addendum is broadly based on the EIA Regulations 2012. The assessment more specifically adheres to the Terms of Reference (ToR) issued by the Environmental Protection Agency on 10th January 2016. The ToR is based on scoping meetings held between the stakeholders on 10th January 2016. A copy of the ToR is attached in Appendix A.

The EIA report contains the following main aspects:

- A description of the project including the need for the project, how the project will be undertaken, full description of the relevant parts of the project, methodology used in the assessment, implementation schedules, site plans and summary of project inputs and outputs *(Chapter 1 and 2).*
- A description of the pertinent national and international legislation, World Bank safeguard policies, regulations and policies that are relevant and applicable to the project and a demonstration of how the project conforms to these aspects *(Chapter 3).*
- Information about the exiting baseline environmental conditions of the site. These include coastal and marine environment of the site and natural hazard vulnerability of the site *(Chapter 4).*
- An assessment of the potential impacts during both construction and operational stages of the project as well as identification and cost of the potential mitigation measures to prevent or reduce significant negative impacts during both construction and operation stages of the project *(Chapter 5 & 6).*
- Assessment of alternatives for the proposed project *(Chapter 7)*
- Environment Management Plan (Chapter 8)
- Details of the environmental monitoring plan *(Chapter 9).*

- Potential gaps in information *(Chapter 10)*
- Main conclusions (Chapter 11)

1.7 Assessment Methodology

1.7.1 General Approach

This EIA is broadly guided by the EIA Regulations 2012.

This report has been prepared to ensure that the significant environmental and social impacts of the proposed changes project have been considered and assessed at the project planning phase.

The process followed in the preparation of this EIA report consists of six parts. These are: scoping consultations; literature review; field surveys; stakeholder consultations; analysis of results; and compilation of the assessment in the form of a report.

In order to conduct a broad based and inclusive study, the proponent and the consultant have from the onset ensured the exercise is participatory. As such, discussions have been held with community members in the projects area and relevant stakeholders with the assistance and coordination of the proponent.

1.7.2 The Study Area

The area impacted by projects like these can be quite wide particularly when the socio-economic impacts are considered. The study area of this project considers the project work site in Male' and surrounding areas that are likely to be affected by the proposed changes.

Study area boundary as originally proposed is presented in Figure 1.1 and survey locations map for the project is attached in Appendix C.

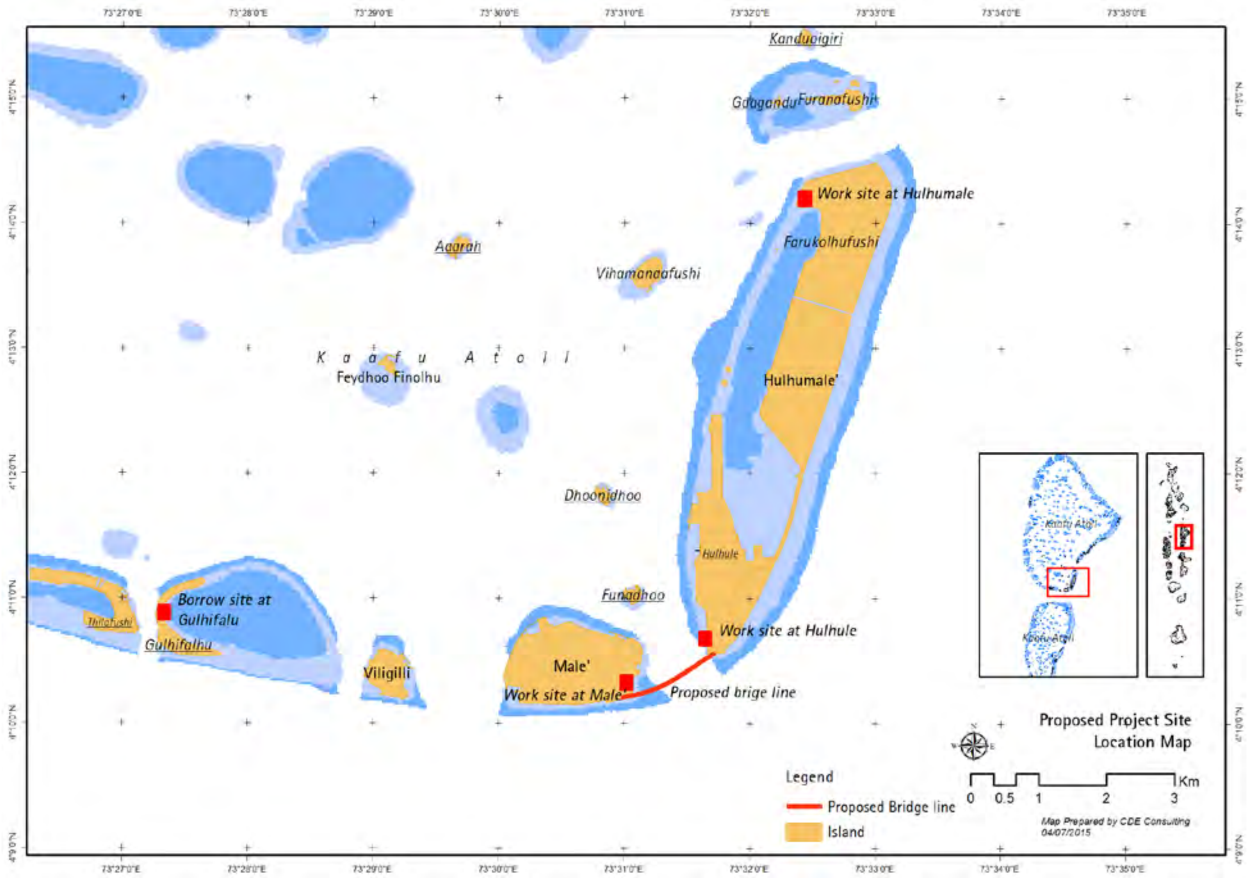


Figure 1.1: Study Area boundary

1.7.3 Field Observations

Field assessments were undertaken in Malé on 11th January 2016. Field visits mainly covered vegetation, water quality, of the proposed project sites. In addition stakeholder consultations were carried out with Malé Water and Sewerage Company, specifically for this assessment.

Terrestrial Flora and Fauna

Terrestrial fauna was not surveyed in detail as the occurrence of fauna was found to be minimal during the brief survey period.

The main methodology used for vegetation assessment was vegetation transect method. The vegetation transect method involves recording the species and their abundance along specific lines across the island. There were a number of footpaths across the island, which made the assessment relatively easy. Transects are used mainly to record species abundance and occurrence.

Water Quality

Water quality was assessed from MWSC laboratory. Water quality samples were taken at different locations selected based on proposed developments. Parameters measured include salinity, pH, temperature, turbidity and Total Suspended Solids (TSS).

1.7.4 Desk Study Review

A literature review was conducted to acquire background information on the site and its environment as well as to identify possible environmental impacts of similar developments in island settings. In this context, the EIA Regulations 2012, best practices from similar development activities, scientific studies undertaken in similar settings around Maldives and previous documents/historical publications was considered.

The literature review comprised of, but is not limited to, the following:

- The original EIA prepared for the Hulhule'-Male; Bridge project.
- Environmental Guidelines for Concrete Batch Plants
- Relevant regulations, including the Regulation on cutting down and uprooting trees.

1.7.5 Key Stakeholder Consultation

Stakeholder consultations were undertaken with the following stakeholders:

- MWSC
- The proponent

1.7.6 Data Analysis

The EIA experts used their experience and knowledge in their respective fields to analyse the data from the previous studies and field visits in order to determine the potential impacts of the proposed projects, the severity of effects arising from these impacts and how any adverse impacts can be best mitigated and positive impacts enhanced. This analysis provides the framework for the recommendations on corrective actions and remedial measures and provides the basis for the formulation of the environmental management plan which forms part of this report EIA

1.7.7 Report Format

The report format and structure presented here follows the report formatting guidelines issued by EPA.

1.8 Study Team Members

The team members of this EIA are:
Dr. Simad Saeed (EIA and coastal environment Specialist)
Mr. Ali Nishaman Nizar (Terrestrial Environment Specialist)
Mr. Mohamed Faizan (Marine Specialist)
Ms. Hana Saeed (Water and Sanitation Specialist)
Ms. Shahdha (Pollution specialist)
Mr. Mohamed Ali (Field Surveys)
The curriculum vitae's of the EIA consultants are attached in Appendix E of this report.

2 PROJECT DESCRIPTION

2.1 Project Location

The proposed changes to the project are in project work site in Malé and Hulhumale', Kaafu Atoll. The work site on Male' is located at the "Adi Park". Site in Hulhumale' is located on newly reclaimed barren land.

2.2 Project Outline and Project Site Plan

The proposed changes to the project covers three main components:

1. Expansion of the project work site in Malé.
2. Addition of concrete batching plant to the project work site in Malé.
3. Use of septic tanks for sewage treatment and disposal from temporary worksite in Hulhumale

Details of the proposed project components are outlined in the next section. The overall project location is provided in Figure 2.1; changes to the Male' worksite is presented in Figure 2.2 and Male' worksite site plan is provided in Figure 2.3.

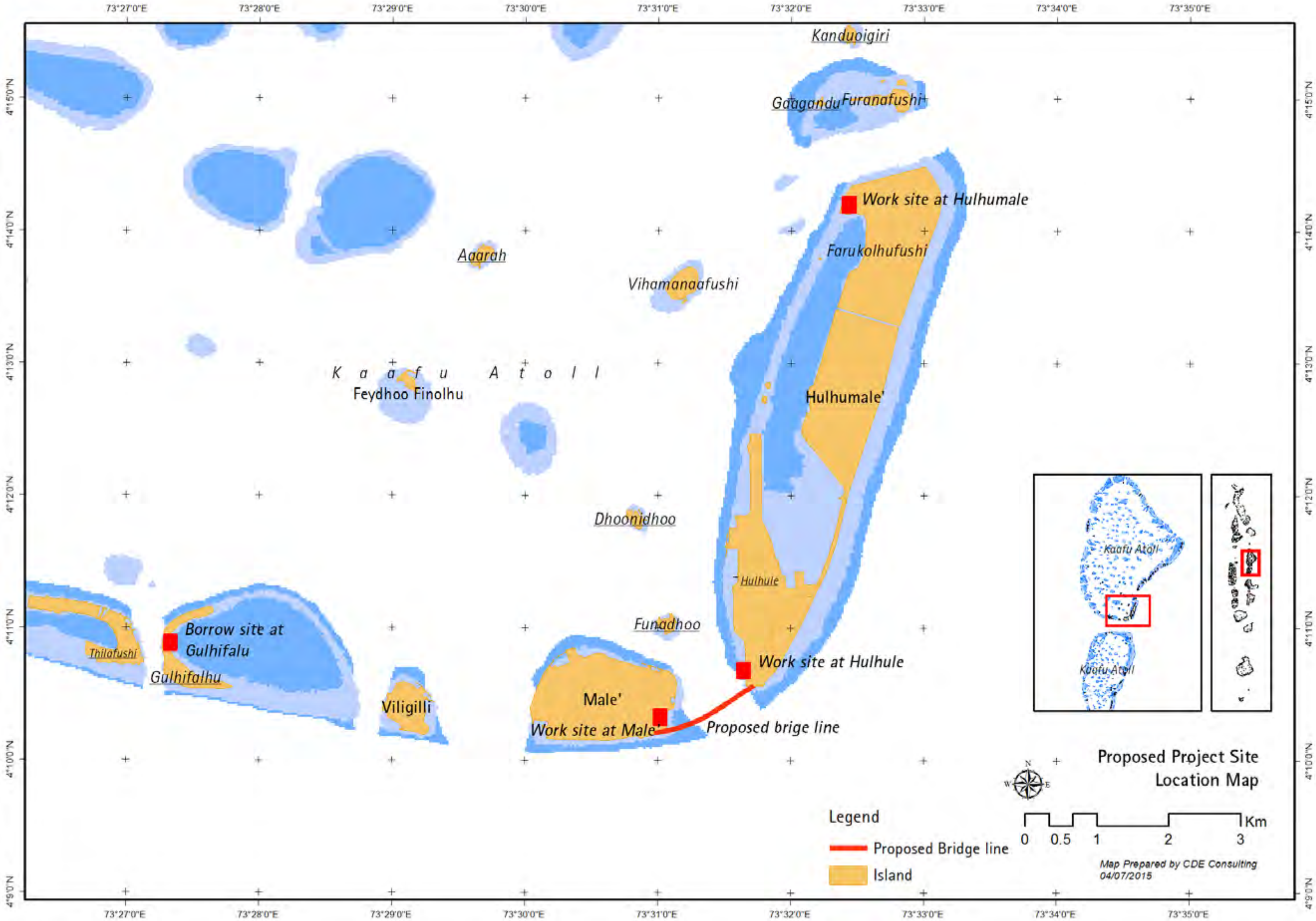


Figure 2.1: Location of proposed project site

Figure 2.2: Revised worksite for Male'

Figure 2.3: Site Plan Summary

2.3 Detailed Project Outline

2.3.1 Expansion of Project Work Site in Malé

One of the additional components of this addendum is to expand the existing work site in Male', which includes the area behind "Dharubaaruge", better known as "Usfasgandu Sarahadhdhu" and most of "Henveyru Adi Park".

The expanded area is similar in terms of the environment, to the proposed work site area in the original EIA. Much of the vegetation in the worksite may have to be removed. Any additional vegetation that will be affected from the expanded work site has been included in this addendum.

2.3.2 Concrete Batching Plants at project work site in Malé

The proposed changes to the project include addition of two concrete batching plants to the worksite in Male'. Each batching plant has a capacity of 20 cbm per hour. The total capacity of the batching plants at Male' worksite is 40 cbm per hour. Installation and operation of the batching plants will be carried out in accordance with EPA's Environmental Guidelines for Concrete Batch Plants.

2.3.2.1 *Water Intake*

Desalinated water will be used for concrete mixing in the batching plants. Water for the operation of the batching plants will be sourced from MWSC. Approximately 30 tons of desalinated water will be required per day for the operation of each of the batching plant at the Male' work site. Hence a total of 60 tons of water are required per day. MWSC has been consulted regarding the water intake. According to MWSC, providing the required amounts of water would not be a problem (refer to section 10).

2.3.2.2 *Waste water*

The cleaning and washing of the batching plants will produce wastewater with high levels of sediments in it. The wastewater generated from the batching plants will be collected and temporarily stored in a settling tank to undergo sedimentation. Once all the sediments have settled at the bottom of the tank, the clear water at the top will be discharged in to the sea (see Figure 2.3 for waste water discharge location). All relevant regulations and guidelines will be followed in handling and disposing the wastewater.

Figure 2.3. Wastewater outfall location

2.3.3 Use of septic tanks for sewage treatment at project work site in Hulhumale'

In the initial EIA of the project, septic tanks were proposed for sewage treatment at Hulhumale' worksite since the worksite is located in the newly reclaimed area of Hulhumale' where there is no existing sewerage network. However, EPA requested for an alternative for septic tanks, hence use of portable Sewage Treatment Plant was recommended (STP). Considering the high cost of purchasing a portable STP, the proponent has proposed to revert back to the use of septic tanks as proposed in the initial EIA. The use of septic tanks in Hulhumale' worksite area has been agreed by EPA during the scoping meeting of the First Addendum of the Hulhule'-Male' Bridge project. EPA further stated that no EIA is required for the installation and use of septic tanks in the Hulhumale' worksite since there is no existing sewerage network in that area. As the use of septic tanks has already been covered in the original EIA, no further assessments of this component has been covered in this addendum.

2.4 Project Schedule and Life Span

Mobilisation for the project will begin after the EIA is approved. Maldives Government has placed urgent demands on this project. The construction period is suggested to be 27 months. The construction preparation period is three months. During this period, the design work of construction drawing may be conducted. After commencement, the formal construction period is 24 months. The proposed activities of this addendum will have no effect on the existing work plan for the project.

2.5 Summary of Project Inputs and Outputs

Summaries of the types of materials that will go into the project and from where and how this will be obtained are given in the original EIA. A summary of the specific inputs for the operation of the batching plant is given in Table 2.1. The inputs for the clearance of the worksite are similar to the inputs provided in the initial EIA. Table 2.2 summarizes the outputs of the batching plants and the expansion of the work site in Male'.

Table 2.1: Major Inputs for the Batching plant

Input resource(s)	Source/Type	How to obtain resources
Material for concrete production	Cement, sand, aggregate etc	Import and purchase where locally available at competitive prices – Main Contractor's responsibility.
Water supply	Desalinated water	20 tons/day from MWSC
Electricity/Energy (during construction)	Diesel/ Electricity	STELCO and portable power plant

Table 2.2: Major Outputs from the Batching Plants and worksite clearance

Output Source/Type	Quantity	How it will be dealt with
Green waste from site clearance	Moderate quantity	Disposed at Thilafushi; transplanted where possible
Waste water	Approximately 250 tons/month	Discharged into sea after sedimentation
Dust	Moderate quantity	No special measures will be taken
Noise	70- 80 dBA	No special measures will be taken

3 POLICY AND LEGAL FRAMEWORK

These legal and policy provisions have to be fully respected in carrying out the proposed project. All contractors and sub-contractors will be informed of these requirements. This project conforms to all relevant laws and regulations of the Maldives. Refer to the initial EIA of Hulhule'-Male' Bridge Project for a complete list of applicable laws, regulations and guidelines relevant to the project. Provided below are guidelines specific to the proposed additional components.

3.1.1 National Waste Water Quality Guideline

The guideline suggests specific values of the maximum concentration that can be tolerated for each parameter potentially present in the wastewater. The values must not be exceeded when treated wastewater is released into surface water, ground water or into deep sea. According to this guideline, these values should be used in line with Environmental Impact Assessments and Clean Production Protocols to finalize the license for the discharge of specific wastewater.

The guideline covers combined domestic and industrial water requirements for deep sea discharge. According to this, no trade effluents will be accepted for discharge into deep sea outfall unless:

- The industry has proven to government that it is following best international Clean Production practice
- An Environmental Impact Assessment has been submitted, and
- The trade effluent complies with the following conditions:
  - The effluents should have a pH in the range 5 – 9.5;
  - Temperature no more than 44 Degree Celsius;
  - Total Suspended Solids up to 150mg/l.

Frequent monitoring of the receiving body is required on a regular basis to ensure the parameters above mentioned are within acceptable levels.

The project developer and contractor shall follow this guideline in the handling and disposal of effluents from the operation of batching plants and other sources of wastewater from construction and operation of the project.

3.1.2 Environmental Guidelines for Concrete Batch Plants

The draft guideline prepared by Environmental Protection Agency of the Maldives is intended to help mitigate the adverse environmental impacts that may arise during the operation of concrete batch plants. Due to the highly alkaline wastewater, dust emissions, and noise from a concrete batch plant, certain environmental considerations are essential whilst operating the plant and they include the following;

- Location of the concrete batch plant: The plant should be located in an area that will not pose a hazard to the environment and the amenity of the local community. To protect amenity, a minimum buffer distance of 100 meters between batch plant and sensitive land uses should be maintained. Sensitive land uses include residential areas, hospital and school zones.
- Wastewater Management: All sources of wastewater should be paved. Wastewater should be pumped from the collection pit to a recycling tank and wastewater must be treated at a waste treatment facility licensed by EPA for this type of waste when the water level exceeds this tank. In addition, during both wet and dry weather, wastewater discharge should be monitored for pH, total suspended solids and turbidity and the records should be maintained.
- Air Quality: Natural or artificial wind barriers such as trees, fences and high raised walls could be used to control the emission of dust from the plant. Appropriate measures should also be taken during the delivery of sand and aggregates.
- Noise Emission: Adequate buffers should be used and operating times should be limited to between 0700hrs and 1800hrs.
- Solid Waste: Where possible concrete waste should be reused and preference should be given to waste avoidance or reduction. Waste generated by the batch plant can be kept outside for no more than 24hrs.

The project developer and contractor shall make sure that that Concrete Batch Plants guideline is followed in the installation and operation of the batching plants. At present the proposed location for the batching plant does not comply with the regulation in terms of distance to sensitive land. Alternative options are proposed for the location of batching plant.

4 EXISTING ENVIRONMENT

The baseline data for the Hulhule'-Male' Bridge has been provided in the initial EIA report. As this addendum involves a relatively minor additional component, description of the existing environment is limited to the Terms of Reference provided by the EPA for this addendum. Hence, only vegetation and water quality of wastewater receiving body was assessed. For details of the baseline conditions refer to the initial EIA report.

4.1.1 Marine water quality assessment

The primary objective of the lagoon water quality sampling was to determine the baseline conditions of the marine water at discharge point of wastewater. Water samples were collected from one location. Water quality testing was done at the MWSC laboratory.

The following table shows (see Table 4.5) the test results of the marine water sample collected on 11 January 2016. Laboratory results are attached in Appendix D.

Table 4.1 Marine water quality assessment results from MWSC laboratory

Parameter	**Optimal Range (EPA)**	
		SW1
pH	8.0 – 8.3	8.43
Temperature (^{o}C)	18 - 32	22.8
Salinity ($^{o}/_{oo}$)		33.34
Total Suspended Solids (mg/l)	-	<5 (LoQ 5mg/L)
Turbidity		0.393

Most of the parameters (See Table 4.5 above) tested appear to be within acceptable ranges. The water was found to be slightly above the optimum pH range of 8.0 – 8.3. Rest of the parameters temperature, salinity, total suspended solids and turbidity are within the accepted levels provided in the EPA guidelines. This indicates that the marine water quality of this area is fairly good.

4.2 Natural and Biological Environment

4.2.1 Terrestrial ecology

4.2.1.1 *Flora*

General Characteristics

The proposed work site in Male' is a relatively large area located on the SE corner of the island. Due to its urban location, there are no naturally occurring vegetation groups in the vicinity of this location. All trees in the area have been planted as part of landscaping.

The proposed expansion does not add anything significant to the existing terrestrial environment in terms flora or fauna. The only notable observations were the additional trees that fall with in the footprint of the expanded work site area.

The expanded work site at "Usfasgandu Sarahadhdhu" includes mostly Casuarina (*Casuarina litoralis*), Hibiscus (*Hibiscus tiliaceus*), and Sea Lettuce (*Scaevola taccada*).

The expanded work site at "Henveyru Park" includes mostly Hibiscus (*Hibiscus tiliaceus*) and Coconut palms (*Cocos nucifera*).

A revised list including all the floral species observed in the work site area in Male' is provided in Flora Inventory Table 4.2.

Unique Vegetation

No unique trees or species of importance were observed in the expanded work area in Male'.

Vegetation Types

Since the area of assessment is relatively small and as it is located in an urban area, there are no specific vegetation groups that can be classified at this location.

The general classification that could be used for the entire areas would be an "urban landscaped area" with multiple ornamental and tree species used to further enhance the aesthetic value of the location.

No specific species can be identified as being the dominant species at this location.

Pest & Diseases

No additional pests or diseases were identified in the expanded work area in Male'.

Table 4.2 Revised Flora inventory at proposed bridge work area in Male'

#	Categories	Name				Ethnobotanical Aspects			Distribution (ACFOR)	Population (approx.)	IUCN Red List (Category)	Remarks
		Family	Scientific	English	Dhivehi	General Uses	Medicinal Uses	Potential Uses				
1	Tree	Arecaceae	*Cocos nucifera*	Coconut palm	Dhivehi ruh	Multiple Uses, timber, fruit, toddy, thatch making…etc	-	Virgin Coconut Oil Production	C	43	Unlisted (proposed LC)	-
2		Fabaceae	*Pterocarpus indicus*	Burmese rosewood	Ofi eley	Salt-tolerant species, fast growing, shade, wind barrier	-	-	R	2	Unlisted (proposed LC)	-
3		Clusiaceae	*Calophyllum inophyllum*	Alexander Laurel wood	Funa	Timber, Seed Oil, Local Medicine, Shade	-	Large Shady tree for picnic areas	R	2	LC	-
4		Combretaceae	*Terminalia catappa*	Country almond	Midhili	Timber, Nuts (expensive)	-	Procesed nut fetches high prices	O	6	Unlisted (proposed LC)	-
5		Malvaceae	*Hibiscus tilaceus*	Sea hibiscus	Dhiggaa	Timber, firewood, rope making, erosion control	-	-	A	99	Unlisted (proposed LC)	-
6		Moraceae	*Ficus benghalensis*	Banyan tree	Nika	Timber, Shade	-	-	R	5	LC	-
7			*Artocarpeae sp.*	Breafruit	Bambukeyo	Timber, Shade, Edible fruit when cooked	treat sore eyes and sciatica	-	R	1	LC	-
8		Mimosaceae	*Leucaena leucocephala*	Leucaena	Ipil-ipil	Legume, great for its nitrogen fixing properties of soil	-	-	R	2	Unlisted (proposed LC)	-
9		Caesalpiniaceae	*Tamarindus indica*	Tamarind	Helen'beli	Edible fruit, wind barrier	-	-	R	2	Unlisted (proposed LC)	-
10		Casuarinaceae	*Casuarina litoralis*	Casuarina	Fithuroanu	firewood, windbreak, control soil erosion	-	-	F	25	LC	-
11		Tiliaceae	*Muntingia calabura*	Strawberry tree	Jeymu	Edible fruit, Timber, Shade	Antiseptic, antipruritic, treat abdominal cramps	Production of jam	R	1	Unlisted (proposed LC)	-
12		Apocynaceae	*Ochrosia oppositifolia*	Cork wood tree	Dhunburi	lighter construction, carpentry, suuport for	-	-	F	16	LC	-

#	Categories	Name				Ethnobotanical Aspects			Distribution (ACFOR)	Population (approx.)	IUCN Red List (Category)	Remarks
		Family	Scientific	English	Dhivehi	General Uses	Medicinal Uses	Potential Uses				
						betel plants						
13			*Plumeria krugii*	Frangipanni	Gulchampha	Ornamental, highly fragrant	-	-	R	1	LC	-
14	Shrub	Goodeniaceae	*Scaevola taccada*	Sea Lettuce	Magoo	roofing, consumption during food shortage	swellings, eye reddening,	-	C	45	Unlisted (proposed LC)	-
15		Rubiaceae	*Morinda citrifolia*	Noni	Ahi	Edible fruit	diabetes, blood pressure, arthritis, muscle aches, mestrual issues	-	F	10	LC	-
16	Others (ground cover / vines / ornamentals)	Verbenaceae	*Clerodendrum inerme*	Garden quinine	Dhungethi	Fragrance, hedge plant	-	-	O	5+ patches	Unlisted (proposed LC)	-

5 IMPACT IDENTIFICATION

5.1 Introduction

Potential adverse and beneficial impacts of the proposed changes to the project are identified and evaluated in this section. Refer to the original EIA for a complete impact identification evaluation of the Hulhule'-Male' Bridge project.

Significant impacts are identified and evaluated in two stages. The first stage identifies the environmental and socio-economic components that may be impacted from alterations. The second stage determines the significance of impacts of each component. The following sections provide details of the evaluation of impacts.

Nature of potential impacts is defined here as No Impact, Adverse Impact or Beneficial Impact. Table 5.1 below provides the nature of potential impacts from the proposed project on environmental and socio-economic aspects by the project components. Where impacts are not applicable to different components, this is indicated as 'X'. Some aspects may be affected both adversely (indicated as [-]) and beneficially (indicated as [+]) from the project.

5.2 Impact Identification and Evaluation

Environmental and socio-economic aspects that may be impacted by the additional components of this addendum is identified in Table 5.1 are further evaluated to identify significant impacts. Assessments of the impacts are conducted using the four criteria of Magnitude, Reversibility, Duration and Distribution as described below. Evaluation of key impacts is provided in Table 5.2.

1. **Magnitude**: Refers to the quantum of change that will be experienced as a consequence of the impact.
2. **Reversibility:** Refers to the degree of reversibility of an impact (i.e. ease of reversing the conditions).
3. **Duration:** Refers to the temporal scale (i.e. duration, frequency) of the impact. It does not take into account the duration of the impact's effects.
4. **Distribution:** Refers to the spatial scale of the area impacted (e.g. a small portion of a reef or an entire lagoon)

Estimates for negative impacts represent a 'worst case scenario' based on the assumption that the project will undergo full-scale development with no consideration for its environmental and social consequences, i.e. significance is assessed prior to implementation of mitigation measures.

Values are attributed by the EIA team on the basis of direct observation of surveyed sites, professional judgment and pre-existing experience in development projects of similar nature.

5.3 Evaluation of Cumulative Impacts

While direct primary impacts are relatively easy to identify and evaluate, special consideration needs to be afforded to evaluating cumulative impacts. While it is relatively simple to identify and evaluate direct primary impacts, the complex nature of natural systems makes it difficult to accurately predict synergistic and interactive impacts of a particular development project. On the other hand, it is relatively simple to identify potential additive impacts.

The following sources of cumulative impacts were considered in evaluating the potential impacts of the resort development project.

- Time crowding: overall impacts of many similar concurrent developments. E.g. While many marine species and birds are relatively versatile and can relocate to other similar habitats following disturbances, concurrent developments in nearby habitats will reduce their chances of relocation and survival.
- Space crowding: high density of impacts on a single environmental medium. E.g. release of effluent from different sources into the same area.
- Indirect impacts: secondary and tertiary impacts resulting from an activity. E.g. groundwater contamination can affect the growth of terrestrial plants, which result in loss of habitat for terrestrial fauna.
- Triggers and thresholds: ecological systems can undergo fundamental changes beyond certain thresholds. Standards and guidelines have been developed based on anticipated threshold levels, for instance, in determining water quality. Such standards have been considered, where available.

Table 5.1: Impact Identification Matrix

Project Activity	**Ambient noise level**	**Ambient air quality**	**GHG emissions**	**Groundwater**	**Coastal Processes**	**Marine water**	**Terrestrial Flora and Fauna**	**Soil Condition**	**Marine Flora and Fauna**	**Landscape Integrity/ Scenery**	**Natural Hazard Risk**	**Health and Safety**	**Demand for Resources and Services**	**Local Economy**	**Social Cohesion**
Mobilization	-	X	-	X	-	-	-	-	-	-	X	X	X	+	+
Site clearance	-	-	-	-	X	X	-	-	X	-	-	X	X	X	X
Batch Plant Installation	-	X	X	X	X	X	X	X	X	-	X	-	X	X	X
Batch Plant Operation	-	-	-	-	X	-	-	-	-	-	X	-	-	+	-
Demobilization	-	-	-	-	-	-	-	-	-	-	X	X	-	+	+

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

Table 5.2: Evaluation of key impacts on the natural and socio-economic environment

Impact area	Potential impacts	Nature/ Distribution/ Duration/ Magnitude	Reversibility	Significance
	Preliminary works			
Ground water quality	**Water pollution;** During setup and preparation on site, some chemicals and oils spillages may occur, and have adverse effects on the ground water;	Direct/negative; Project site; Short term; Moderate negative change	Reversible	Insignificant
Impacts on soil	**Impacts on soil and land capability** Will predominantly be felt during the site clearance activities for the temporary construction areas; operation of batching plant may affect exposed soil.	Direct/negative; Project site; Short term; Minor negative change	Reversible	Insignificant
Marine water quality	**Water pollution;** During setup and preparation of the temporary construction areas, some chemicals and oils spillages may occur, and have adverse effects on the marine water;	Direct/negative; Project site; Short term; Moderate negative change	Reversible	Insignificant
Terrestrial flora & fauna	**Near construction areas;** Temporary construction areas will require the removal/ transplanting of some plants	Direct/negative; Construction areas; Short term; Minor negative change	Reversible	Moderately Significant – large number of trees need to be removed or relocated
Visual amenity	**Loss of visual amenity;** Vegetation clearance of the expanded worksite area and the installation of batching plants may adversely impact the visual amenity of the project site	Direct/negative; Construction areas; Short term; Minor negative change	Reversible	Moderately Significant – Short term
	Implementation stage			
Marine water quality	**Water pollution;** Wastewater from the batch plant will be discharged in to the sea. discharge of wastewater from the batching plant may effect marine water quality and marine life if laden with sediments and with higher than normal pH.	Direct/negative; Project site; Short term; Moderate negative change	Reversible	Moderately Significant – Short term
Marine life	**Temporary loss of corals and sessile organisms;** Depending on the batching plant discharge water quality, fishes and other marine life in discharge area may be adversely impacted	Direct/negative; Project site; Short term; Moderate negative change	Reversible	Moderately Significant –Short term
Terrestrial flora &	**Near construction areas;**	Direct/negative;	Reversible	Moderately Significant – large

Impact area	Potential impacts	Nature/ Distribution/ Duration/ Magnitude	Reversibility	Significance
fauna	Male' work site area will require the removal/ relocation of some plants	Work site areas; Short term; Moderate negative change		number of trees need to be removed or relocated
Ground water quality	**Water pollution;** Some chemicals and oils spillages may occur, and have adverse effects on the ground water. Concrete and cement residues from the batch plant may mix with rainwater and adversely impact ground water quality. Similarly, spillage of wastewater from the batching plant may occur and have adverse impacts on the ground water; moderate levels of contamination from the use of septic tanks in Hulhumale'	Direct/negative; Project site; Short term; Moderate negative change	Reversible	Moderately significant
Impacts on soil	**Impacts on soil and land capability** Will predominantly be felt during construction activities land connection construction areas. Operation stage of the batching plants may have adverse impacts on soil quality through spillage of wastewater or mixing of concrete and cement residues with rain or construction water.	Direct/negative; Project site; Short term; Minor negative change	Reversible	Insignificant- Spillages are very unlikely and residues from the batching plant are expected to be of very small quantities
Noise	**Noise pollution;** Operation of batching plants will emit high levels of noise, which may adversely impact the neighbouring premises and residents particularly noise sensitive areas such as hospitals.	Direct/negative; Project site and neighbourhood; Short term; Minor negative change	Reversible	Moderately significant- short term
Ambient air quality	**Dust emission;** Cement, sand and aggregates used in the batching plant may emit dust particles, which may have adverse impacts on the ambient air quality; of particular concern is the proximity of the batching plant to residential areas and hospital.	Direct/negative; Project site; Short term; Minor negative change	Reversible	Significant
Visual amenity	**Loss of visual amenity;** The existence and operation of batching plants may adversely impact the visual amenity of the project site. Additionally, dust particles from cement, sand and aggregates used for concrete production may settle on neighbouring premises and parked vehicles and have adverse impacts on the visual amenity of these buildings and vehicles.	Direct/negative; Project site; Short term; Minor negative change	Reversible	Moderately significant- short term

6 SIGNIFICANT IMPACTS AND MITIGATION MEASURES

6.1 Impacts on Natural Environment during Construction

6.1.1 Terrestrial Ecology

Main fauna observed in the periphery of project (including the expanded work site area) includes common birds as crow, piegons, reptiles such lizard and mammals cats, rats and bats. No endangered or rare animals are observed at this site. Therefore, the impact on terrestrial ecology by this project mainly will be adverse impact on vegetation due to land clearance.

The temporary work site area in Male' will occupy the urban greening land between Ameenee Magu and Boduthakurufaanu Magu. It is estimated that the impacted area after the expansion of the work site area is about 3.7 ha and the quantity of impacted trees is about 200. Transplanting trees is required to be conducted according to relevant laws and regulations of the Maldives. During the construction phase, avoidance should be considered as much as possible, if the avoidance can't be realized, then transplanting should be considered.

No species of significant importance were identified in the expanded work site area.

6.1.2 Marine Ecology

If the waste water from Batching Plant is directly discharged into the sea without passing through a settling tank, a moderately significant amount of siltation and sedimentation of the lagoon waters is anticipated. Similarly, increased turbidity of the lagoon water is expected. These factors will cause adverse impacts such as smothering of corals and reduced light penetration to the coral and benthic communities. Under normal circumstances, corals have a self-cleansing mechanism and can withstand a certain rate of sedimentation. Hence, detrimental impacts such as reduced coral growth and recruitment rate and decreased visibility can be short term effects. However, if the sedimentation exceeds the rate at which corals can self-clean then it may lead to serious detrimental impacts such as coral mortality and alteration of habitat and species composition within the lagoon.

In addition, sedimentation is likely to cause shifts in invertebrate populations as sediment is deposited at the crevices/crannies blocking their habitat. This favours domination of invertebrate populations that are more tolerant of the condition. The overall population diversity, size and quality of reef ecosystem are likely to decline due to increased and prolonged sedimentation arising from the proposed activities.

6.2 Impacts on the Socio-economic Environment

6.2.1 Noise and Air Emission

Operation of batching plants is expected to generate high noise levels and dust. The project site is located in an area with sensitive land uses in close proximity including residential buildings, a court house and a hospital. The nearest residential building located about 20 m away from the project site. Hence high noise levels may become a significant public nuisance. It may potentially become a cause of conflict between the contractor and the public.

The potential emission of dust is a major concern during the NE monsoon as wind will blow directly from the site to the residential areas and hospital.

6.2.2 Visual amenity

The existence and operation of batching plants may adversely impact the visual amenity of the project site. Additionally, dust particles from cement, sand and aggregates used for concrete production may enter and settle on neighbouring premises and parked vehicles and have adverse impacts on the visual amenity of these buildings and vehicles.

6.2.3 Recreation

As noted in the original EIA, the project site in Male' is adjacent to Lonuziyaraiy kolhu and Usfasgandu parks. These two parks are very popular recreational open spaces in Male'. It is estimated that about 600 footballers, 120 surfers, and over a thousand people use the area for recreational purposes. Several children access the children's park, and there are many who hang out with friends, and visit the area for rest and relaxation. The bridge construction activities will reduce access to the open spaces and park area. This will have a negative impact on recreation and fitness activities. It will be important to provide alternative routes and space for walking, jogging, football, cricket and children's activities.

The proposed changes to use the entire area as a worksite will significantly affect recreational activities of residents. Based on public consultations, it was reported in the original report to, where possible, leave aside at least two football pitches in the area. However, only one pitch is now available for local use used the proposed changes.

6.3 Mitigation Measures for Significant Adverse Impacts

6.3.1 Air and Noise Pollution

The activities of the proposed additional components that can lead to air and noise pollution are operation of the vehicles for site clearance and the operation of the batching plants.

Mitigation Measures

- Relocate the batching plant away from the settlement as much as possible (See Chapter 7 for options). A 100 m buffer between the batching plants and sensitive land uses is ideal as specified in the draft guideline for batching plant construction (See Chapter 3). If 100 m is not possible, the furthest possible distance should be considered). Special permit will have to be obtained by the proponent from EPA if the batching plants have to be located outside the boundary limit provided in the guidelines.
- Properly tune and maintain all vehicles and machinery
- Keep ground/ soil damp to minimize dust/ topsoil erosion by wind
- Conduct construction activities during daytime to minimize nuisance to public
- Limit operation times to between 7.00am and 6.00pm. Maintain noise level at low levels between 35-40 dB (for an 8-hour period) within the buffer zone if work is extended beyond 6pm. Special permit will be obtained by the proponent from EPA if operation hours extend beyond the specified limit.

6.3.2 Contamination of Marine Water, Groundwater and Land

Contamination of marine water, groundwater and land can occur during construction. Construction activities have a particularly high potential for pollution. Contaminants can include wastewater from concrete batching plants, cement, fuel, chemicals used for different purposes and general construction waste. Exposure of groundwater to these contaminants increases the risk of groundwater contamination.

Mitigation Measures

- Oil, solid waste & hazardous waste handled carefully & transported in sealed containers.
- All paints, lubricants, and other chemicals used on site stored in a secure and bunded location
- All raw materials stored away from the vicinity of the coastal areas
- General refuse stockpiled in one central area
- Keep spill cleanup materials readily available
- Properly tune and maintain all machinery
- Carry out construction activities user the supervision of a suitably experienced person

Costs are to be included in the contract value and are mainly the responsibility of the contractor.

6.3.2.1 *Wastewater*

Potential pollutants in wastewater from the batching plants include cement, sand, aggregates and small amounts of petroleum products. These pollutants may adversely affect the marine and ground water quality if discharged into sea without sedimentation or treatment or if any spillages occur on the ground.

Mitigation Measures

- Pass the waste water from batching plants to a settling tank
- Monitor pH, and Total Suspend Solids and clarity before discharge of effluent from settling tank
- pH value should not exceed the defined EPA standards.
- Train workers in testing and monitoring of waste water quality, spill prevention and cleanup, and designate responsible individuals
- Provide water quality test kits on site

Costs are to be included in the contract value and are mainly the responsibility of the contractor.

6.3.2.2 *Solid Waste*

With the introduction of the batching plants at Male' work site, more construction wastes are expected to be produced. The main source of solid waste from the batching plants is waste concrete. In addition, clearance of the expanded worksite area will produce additional amounts of green waste. Impacts of solid waste is provided in detail in the initial EIA. The mitigation measures provided in this section are specific to the construction waste from batching plants.

Mitigation Measures

- Prevent access manufacture of concrete by taking precise orders for concrete batch productions
- Reuse waste concrete for construction where possible. If waste concrete cannot be used, dry the waste concrete in a pit before disposing at the designated waste site.

6.3.3 Loss of Terrestrial Vegetation and Fauna

Activities that can lead to loss of terrestrial vegetation and fauna are:

- Vegetation removal for construction
- Inadvertent and deliberate damage by construction workers

Mitigation Measures

- For trees impacted by the temporary work site facilities that will come in place at the Male' work site area, transplanting is required according to the relevant laws and regulations of the Maldives. Avoidance should be considered as much as possible, if the avoidance cannot be realized, transplanting should be considered. However, no trees of significant importance occurs in this area and most are quite old. Hence transplantation may not be a viable option.

- The scope of permanent construction land occupation and temporary land occupation should be controlled strictly. All the construction activities must be confined to the proposed site. It is strictly prohibited to cut down or remove any vegetation outside the construction site boundary.

- The contractor must clear the temporary work sites immediately after the construction is completed and return the land to land owner for use.

6.3.4 Loss of Visual amenity

The potential causes for the loss of visual amenity of the project site and surrounding areas due to the proposed changes to the project are;

- The installation and operation of batching plants
- Entering and settling of fine dust particles emitted from the operation of batching plants in neighbouring buildings and parked vehicles

Mitigation Measures

- Use fences or other visual barriers around the project site
- Site the batching plants out of the prevailing wind direction to minimize dust emission
- Use natural or artificial wind barriers such as trees, fences or walls around the batch plant to control the emission of dusts from the plant

6.3.5 Loss of recreational facilities

The loss of recreational facilities is critical and partially unavoidable. The new artificial beach under construction on the western side of Male' will partially relieve the issues related children's play area and general open areas. However, the issue of recreational games such as football pitches still remain.

Alternative locations for football and fitness should be provided as a mitigation measure.

7 ALTERNATIVES

7.1 Disposal of wastewater from batching plants

A number of alternatives were considered during the planning of the additional components of this EIA regarding the disposal of wastewater from batching plants. The following table summarizes the different alternatives considered.

Table 7.1 Summary of reducing impacts of erosion

Option/aspect	Advantages	Disadvantages
Dispose via existing sewerage network of MWSC	1. Low cost option. No additional cost of a settling tank. 2. Cost of water quality testing and treatment will be avoided.	1. High loads of sediment discharged into the network. Existing sewer pipes may get blocked or damaged. 2. Additional burden on MWSC sewerage network
Direct disposal of wastewater into the sea	1. Cost of settling tank can be avoided. 2. No additional cost of water testing or treatment	1. Significant adverse impacts on marine water quality and biodiversity. 2. Against environmental guidelines on wastewater management and concrete batch plant operation
Sedimentation via a settling tank (Proposed option)	1. Minimize the amount of sediments discharged with the wastewater 2. Less impact on marine water quality and biodiversity compared to direct disposal or disposal via the existing network	1. Moderately high cost option 2. Wastewater may have contaminants other than sediments that may potentially have adverse impacts on marine life and water quality 3. Needs regular supervision and maintenance 4. Loss of a valuable resource since wastewater is not reused

Option/aspect	**Advantages**	**Disadvantages**
		5. Extra cost on buying more water from MWSC 6. Additional pressure on water production at MWSC
Sedimentation and treatment via a settling tank. Reuse of treated water (Preferred option)	1. Option with the lowest potential impacts on marine life and marine water quality 2. Reuse of wastewater for purposes like cleaning and washing can reduce the overall cost of purchasing water 3. Less pressure on water production at MWSC	1. Highest cost option- may not be feasible 2. Water quality testing is expensive and may incur significant additional costs to the project 3. Staff training and allocation required for water testing 4. Needs regular supervision and maintenance

7.2 Alternative location for wastewater disposal

The proposed location for disposal of wastewater is presented in Figure 2.4. This location is close to the "*Raalhugandu*" surf point. The alternative location for wastewater disposal is the lagoon offshore of where the Tsunami monument stood before (see Figure 2.4) for alternative disposal location). Depending on the final location of batch plants, this may become a low cost option and create fewer public nuisances. However, if the water is disposed properly as specified by the regulations and the mitigation measures proposed in this report, no major impact is expected regardless of the locations proposed.

7.3 Alternative location for Batching Plant

The proposed location for concrete batching plant will be an issue in terms of noise and dust pollution as they are too close to residential areas and hospital. It is recommended to move the batching plant up to 100 m away from the residential areas to comply with the draft guidelines on batching plant construction. If this distance is not possible, the proponent will obtain a special permit from EPA.

Suggestions for alternative zones to locate the batching plant are presented in Figure 7.1. The final location can be determined in consultations with the contractor.

7.4 Alternative Worksite

As noted in the original EIA, the loss of recreational land is major impact and should be mitigated wherever possible. The currently proposed worksite removes one of the main football pitches in the area, which is heavily used. It is recommended to consider retaining the existing pitch. The alternative site plan suggested to compensate for these potential changes are presented in Figure 7.2.

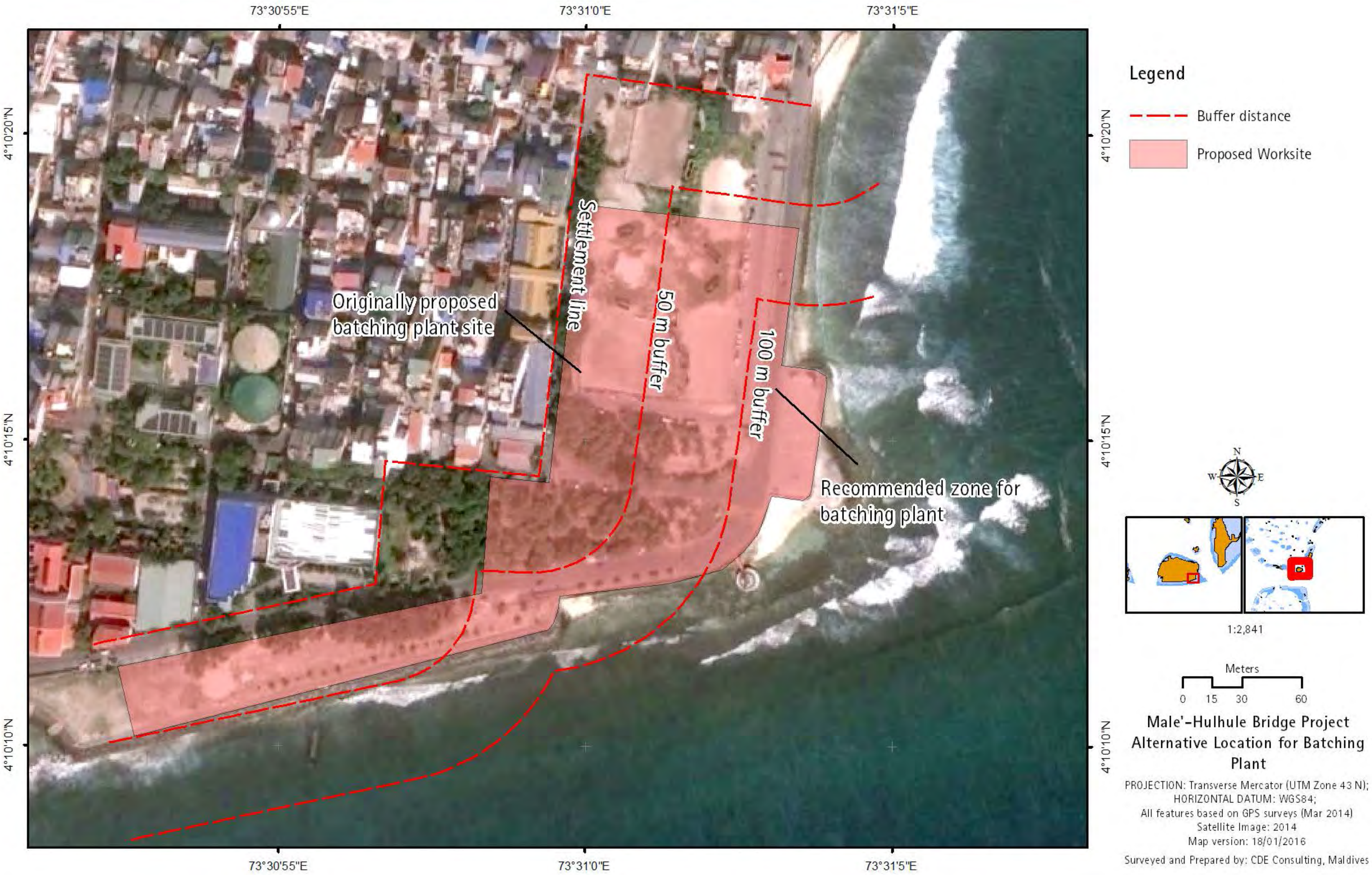


Figure 7.1: Alternative concrete batching plant sites

Figure 7.2: Alternative concrete batching plant sites

8 ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) is an important component of the EIA process, needed to determine the accuracy of impact prediction, the adequacy of mitigation measures, and level of compliance with commitments regarding implementation of mitigation measures and monitoring of relevant environmental aspects.

The main objectives of the environmental management plan are to:

- Produce a framework for managing anticipated impacts, including practicable and achievable performance requirements and systems for monitoring, reporting and implementing corrective actions.
- Provide evidence of compliance to legislation, policies, guidelines and requirements of relevant authorities.

8.1 Environmental management system

The environmental management framework for the proposed project is based on the standards and policies set out by the Environmental Protection Agency of the Maldives.

- **Environmental Management Planning and establishment of key performance indicators:** The EMP specifies environmental management measures and required performance standards
- **Monitoring and corrective action**: The implementation of EMP measures will be monitored. Any inconsistencies between the EMP and its on-site implementation will be identified and addressed through corrective actions
- **Auditing, reviews and improvement**: The EMP will be reviewed. Improvements to the EMP will be made as necessary to achieve desired environmental outcomes.

The environmental management strategy is demonstrated in the following figure.

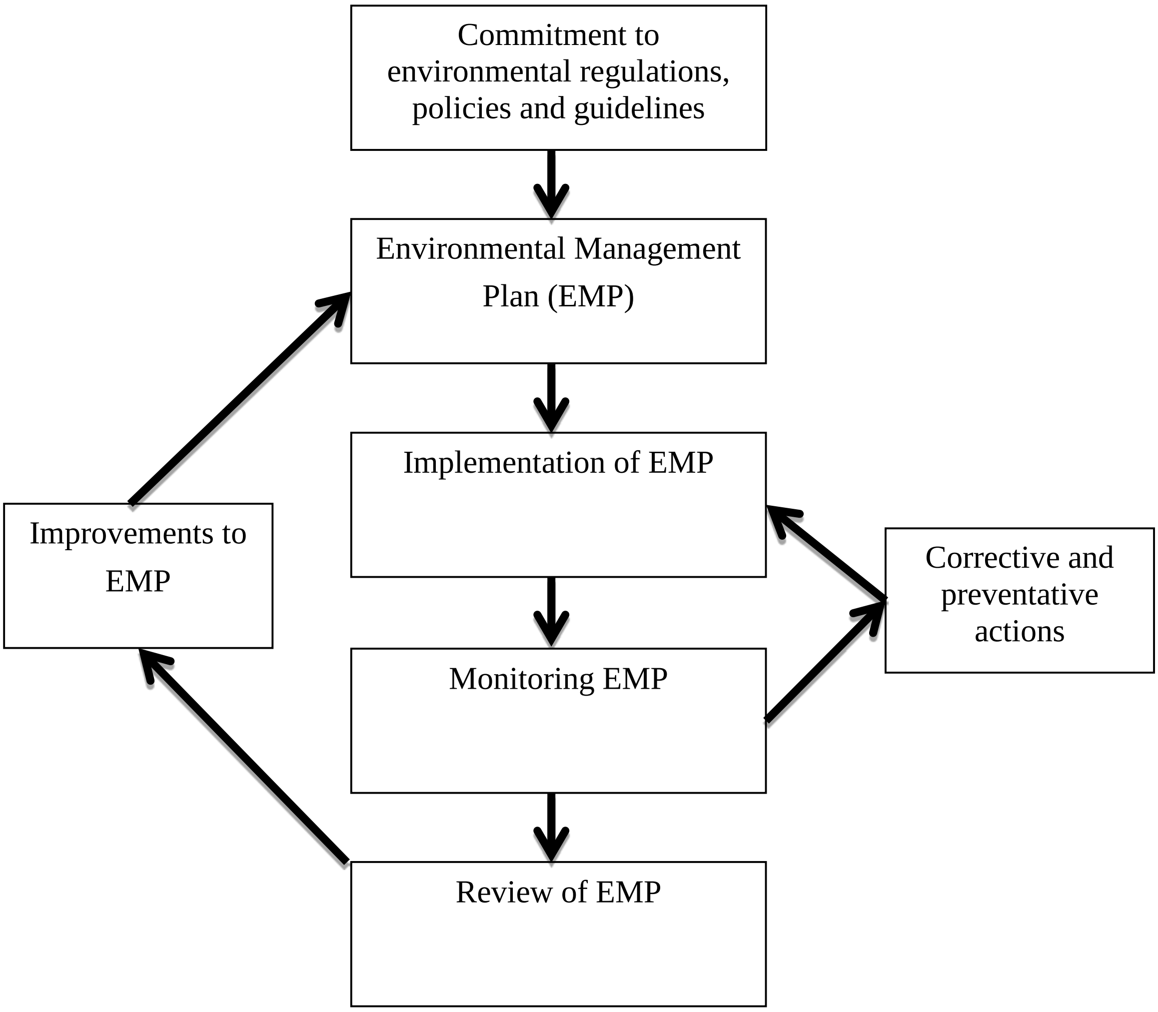


Figure 8.1 : Environmental Management Strategy flow diagram

8.1.1 Management structure and responsibilities

The following parties are involved in the EMP of this project:

- Project proponent: Ministry of Housing and Infrastructure
- Consultants: Environmental consultants and engineers
- Environmental Regulatory Authority: Environmental Protection Agency (EPA)
- Government Authority: Ministry of Housing and Infrastructure
- Contractor: CCCC Second Harbour Engineering Company Limited
- Local Authority: Male' City Council

The roles and responsibilities of the parties involved are as follows.

8.1.2 Project proponent

- Execution of all project activities
- Preparation of EMP
- Monitoring of the project activities
- Submission of annual environmental monitoring reports as required by the EPA

8.1.3 Consultants

- Environmental Consultants
    - Preparation of EMP in consultation with the proponent
    - Monitoring of performance of project activities according to the EMP, as instructed by the proponent
    - Auditing the EMP to ensure desired outcomes are achieved
    - Making amendments to the EMP according to the results of the audits
    - Preparation of environmental monitoring report as required by the EPA (detailed in Chapter 9 of this report)
- Project engineer
    - Monitoring contractor compliance to design specifications
    - Reporting contractor compliance for payment purposes
    - Approving structures
    - Guiding contractor on unforeseen issues related to implementing design specifications

8.1.4 Environmental Protection Agency

- Review environmental monitoring report
- Intervention in the event of a breach in environmental permit conditions
- Site visit and inspection

8.1.5 Contractor

- Undertaking construction work as defined by the proponent and project engineer
- Ensure compliance with the EMP during construction stage, including purchase of construction equipment, implementing mitigation measures and monitoring construction site
- Ensure all construction workers are aware of EMP and comply with its requirements

8.1.6 Local Authority

- Identify and assist in relocating large trees where possible
- Providing local approvals for various activities related to the project such as road closures

8.2 Management Programme

The proposed management programme is outlined in Table 8.1 below

Table 8.1: Environmental Management Plan for construction and operation phase

Activity	**Management measures**	**Responsible party**	**Timing**
Training of staff and contractors	All construction workers and project management staff will be provided information on general environmental issues, compliance with environmental permits and EMP. All staff involved with environmental monitoring will be provided training in environmental monitoring procedures. Health checks conducted prior to the commencement of project. Inform the general public on the project activities.	Project proponent & Environmental Consultant	Before commencement of construction activities
Documenting non-conformances and corrective actions	All non-conformances to the environmental permit conditions, observed during monitoring will be documented. Necessary corrective actions and preventative actions will be identified. Corrective actions will be implemented, with systematic follow ups to ensure effectiveness of these measures.	Project proponent & Environmental consultant	Continuous during construction phase
Supervision of project activities	Assign appropriately experienced and qualified personnel to supervise the entire project and ensure that all activities are carried out with minimal adverse impact on the environment.	Project proponent	Before commencement of the project
Traffic management	Inform local authorities to close the area during the implementation phase and implement a traffic diversion plan with assertive signboards to manage traffic.	Project proponent	Before commencement of the project

Waste management	All waste are to be segregated, stored temporarily and transferred to the existing waste management site.	Project proponent	Continuous, during construction phase
Control of groundwater contamination and soil quality	Oil, solid waste and hazardous waste handled carefully and transported in sealed containers. High quality fluids will be used during the drilling process to minimise any chance of pollution of ground water. Where possible, above ground sumps or mud handling systems will be used. Additives to drilling water may be used in small quantities. Contingency measures to be in place to prevent, contain, clean-up and dispose of any spillage.	Project proponent	Continuous during construction phase
Noise	A fixed and rigid stationary type of enclosure that is no less than 2 m high will be set up around the construction area. The equipment that produces loud noises shall be set in the east and in the south side of the construction site, far away from residential area. The office spaces and living area that produces much lower levels of noises shall be arranged in the west and north side, closer to the residential area. With the exception of activities related to continuous pouring of concrete and other necessary repair work, all other work should be avoided at night time during the construction phase, in order to reduce the effects of noise pollution in the area. If any construction activity is	Project proponent	Continuous, during construction phase

	required at night time, contractor should ask for the opinions of the local municipal administrative authority. Strengthen the maintenance of construction equipment. Mechanical equipment should be placed in a firm and stable ground. The driving routes and schedules for the construction vehicles moving in and out of the site shall be reasonably arranged and their management should be strengthened. Contractors shall try and reduce movement of heavy vehicles during night time (22:00 to 06:00 hrs) during the construction period as much as possible.		
Air quality	Hard enclosure walls not lower than 2 m high shall be set up around the construction area of the proposed project to prevent the impact of air-borne dust in the construction site on the outside. Optimize the layout plan of the construction site; i.e. the concrete mixing area where air-borne dust is easily produced, shall be located at the southeast side of the site, keeping it far away from residential area. During the construction phase, all earthwork activities such as the preparation of roadbeds, pipelines…etc. will be undertaken along with watering measures to prevent air-borne dust pollution. Vehicle washing facilities will be set up (including drainage facilities) along with mud sedimentation facilities at the construction site. All vehicles shall complete the wash, cover and clean process before leaving the construction site, to prevent excess materials, building rubble and mulch from scattering around in the vicinity. The access road used to transport materials and the access road to the	Project proponent	Continuous, during construction phase

	storage yard shall be watered regularly. The contractor shall provide watering carts for watering, twice a day and this frequency should be appropriately increased in the hot-dry season or strong-windy weather to ensure air-borne dust pollutants are kept to a minimum. For materials such as concretes, sand and lime, which can easily get scattered during handling and various stages of logistics, should be kept covered and wind-proofed to reduce air-borne pollutants. Open type processing operations such as mixing mortar and concrete shall not be carried out openly in the construction site as they can easily generate air-borne dusts. The demolition and dismantlement of construction structures shall be carried out in calm weather conditions with lower levels of wind speed in order to reduce the amount of air-borne pollutants. Any unfinished work of the day should be covered along with watering measures as well.		
Control of marine water quality and marine life	All wastewater shall be passed through a settling tank and treated where possible before discharging into sea. Ensure pH and TSS of the wastewater are within the standards specified in the wastewater guidelines. Disposal of any sewage, garbage and waste oil to the sea is strictly forbidden. Such waste should be gathered and disposed together with other pollutants on the bridge construction site. Prior to construction commencement, the detailed investigation shall be completed for the sea bed along the bridge pier construction area. Any live coral along the area and within 10m scope of its periphery should be	Project proponent	Continuous, during construction phase

	transplanted. All operations shall be handled by experienced personnel and supervised thoroughly.		
Terrestrial flora and fauna management	Any trees impacted by the temporary work site facilities, shall be transplanted as per relevant local laws and regulations. Removal of the trees should be avoided as much as possible, and unless absolutely necessary, measures shall be taken to consider transplanting options for those trees. The scope of activities that occupies land spaces for permanent and temporary construction features shall be controlled as strictly as possible. All the construction activities must be confined to the proposed site. The proponent should provide alternative locations for transplanting any required trees. Upon completion of the bridge project, the contractor shall clear the site, replant any necessary vegetation and/or return the land to its previous land owner.	Project proponent	Continuous, during construction phase
Health and safety of construction staff	Experienced personnel shall be appointed to instruct and supervise work. First aid kit and evacuation facilities shall be made readily available on site at all times. Site will be made accessible only to authorise personnel and the area will be fenced off temporarily to restrict access to the general public.	Project proponent	Continuous, during construction phase

	Work will be carried out during calm weather conditions for offshore boreholes. Chemicals and hazardous materials used on the vessel shall be safely stored and secured. As much as possible, work shall be carried out during the daytime. Safety precaution boards shall be erected on site.		

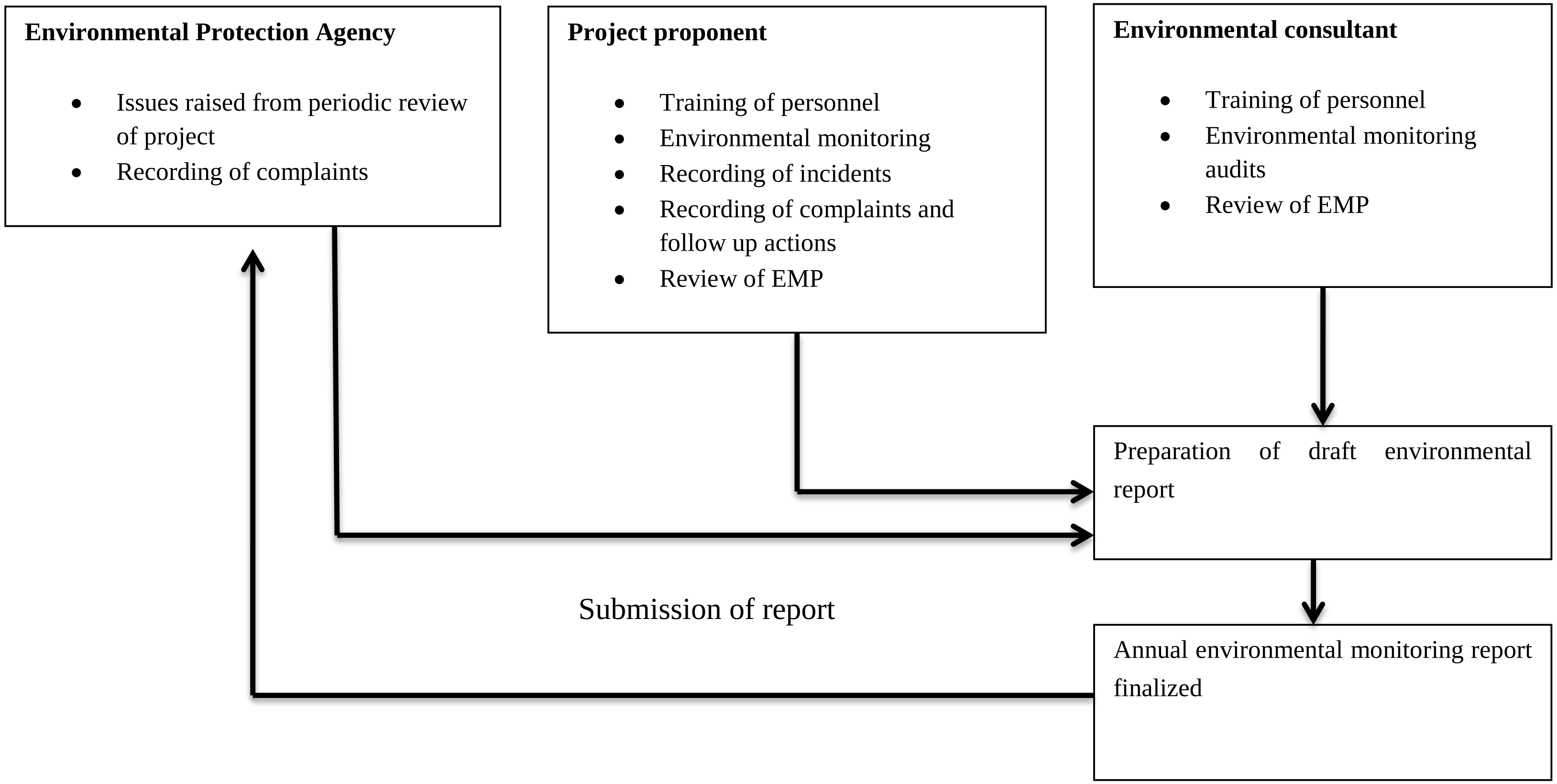
8.3 Communications

This EMP will be communicated to all actors with responsibilities for its implementation, including all parties involved in the construction and operation of the bridge.

Regulatory filings such as the EIA and annual monitoring reports submitted to the EPA are an important part of external communications related to the environmental and social performance of the project. Potential risks and procedures included in the EMP to reduce identified risks will also be communicated to relevant stakeholders, such as the surrounding communities.

Environmental and social reporting shall be undertaken to provide evidence of the ongoing implementation of the EMP and will cover training activities, site conditions and operations, monitoring data, details of non-conformances, incidents, complaints and follow up action, results of audits and reviews. Reporting shall be undertaken by the project proponent and the Environmental Consultant. The reporting shall constitute an annual report of the environmental performance of the facility and operations. The annual environmental reporting process is summarized in Figure 8.2.

Figure 8.2: Environmental Management Plan for construction and operation phase



8.4 Monitoring and Reporting Responsibilities

The Ministry of Housing and Infrastructure will be responsible for regular monitoring and reporting of progress and achievements of the bridge project. The EPA, from time to time, will conduct an oversight of the sub-project results submitted by contractors and evaluate how the process was implemented.

The EPA will be the lead agency for monitoring, reporting and evaluation on social impacts of the bridge. The Ministry of Housing and Infrastructure will establish a monitoring cell within the Ministry, particularly during the construction stage to gather information and consult on the bridge related issues. EPA will also carry out supervision to monitor progress of monitoring data collection. The main aim of supervision is to observe the challenges and to support the implementation teams. While most of the monitoring will be conducted by the MHI, if necessary, it may use the services of competent third party monitors to provide periodic and objective assessments of progress, shortfalls and challenges in the implementation of specific project components/sub-components. It may also seek assistance of the external consultants for advice and guidance on technical aspects such as changes in wave conditions.

The monitoring and reporting of the bridge project at the different stages *will include:*

A: <u>Pre-construction</u> to ensure that: (i) proposed construction activities, as applicable at each site(s), are subjected to environmental screening; plan and design for construction activities *confirms to the Environmental Guidelines of the Government of the Maldives for Planning and Design;* and (ii) site specific Environmental Assessment (EMP or EIA) for any changes to the approved EIA is prepared in time and incorporated into bidding documents for submission to the EPA for review and approval;

B. <u>During construction</u>: The MHI and EPA, on an ongoing basis, will conduct compliance monitoring, using the specific environmental measures relevant to, and prescribed for the activities as well as to assess general environmental and social management/performance. Supervision, as well as progress report(s), should contain information with regard to social and environmental compliance as well as any difficulty or outstanding works need to be prepared. The findings should be discussed with the key stakeholders. The MHI and EPA will establish monitoring mechanism for operational stage monitoring. In addition, the Government of Maldives may consider an annual independent monitoring on social and environmental management and performance. The EPA will record these findings.

C. <u>Mid-Term and End-term Reviews:</u> The EPA and MHI may conduct this, roughly during the middle of the project period, and an end-term review close to the time when the project ends. Important elements of these reviews will assess the project's progress.

D: During post-construction: The EPA and the MHI will agree to jointly prepare a post-construction, post bridge completion report for their records. In addition, joint reviews by the Government and the contractor each year when the project is under implementation may also be conducted. The objective is to ensure the collection of reasonably complete and credible data from all participating project institutions on the key performance indicators and others.

8.5 Evaluation

The objective of evaluation is to judge the impact of implementation effectiveness. It will be done through independent consultants having experience in similar tasks. This will be undertaken during midterm and end of the project. The evaluation will assess the effectiveness of addressing environmental and social impacts of the project. The midterm evaluation will give feedback for the implementation of the bridge environmental impact management framework.

8.6 Capacity Building

Past experiences of similar projects suggest that the capacity of the government to deal with social and environmental issues is generally weak at all levels. The MEE and MHI therefore, will strengthen environmental training during the bridge construction phase through the following suggested measures:

- Providing bridge and offshore infrastructure related training and awareness sessions to environmental policy makers
- Providing Environmental Assessment and Monitoring training specific to bridge and offshore construction projects to EPA staff
- Preparing manuals and guidelines on how to assess the environmental impacts of bridge and offshore construction projects.
- Recruit or identify a Social, Environment and Safety Officer, who will be responsible for the following:
    - Liaison point for contractor to assist in following the procedures set out in this EIA, particularly the screening and approval processes.
    - Monitor the compliance of social and environment aspects related to bridge project.
    - First point of contact for Grievance Redress Mechanism
- Social, Environment and Safety Officer must have a background in social and environmental management and be provided training specific to bridge and offshore construction projects

8.7 Bridge EIA Implementation Budget

The EIA related monitoring will be implemented and funded for most part by the MHI. The submissions, preparation of EAs and funding the mitigation measures will be responsibility of MHI and will be included as part of the overall project cost.

The MHI will be responsible for financing the Social, Environment and Safety Officer post and monitoring activities. These are expected to be financed as part of the project administrative costs.

8.8 Stakeholder Engagement

Local regulatory requirements for stakeholder engagements are spelled out primarily in the EIA Regulations 2012, where pubic consultations are required with all relevant stakeholders during the preparation of the EIA.

This project has gone through a stakeholder consultation process covering Government Agencies, civil society, business entities and the general public, among others. Consultations have also been undertaken during the EIA preparation process. More details of planning stage stakeholder engagement are presented in Chapter 10 of the initial EIA.

Further engagements of stakeholders are expected throughout the construction stage.

The public and persons affected by the project will engage the project through a Grievance Mechanism to be established by MHI.

This report will be disclosed publicly on EPA website during evaluation stage for public review and comments.

8.9 Health and Safety Management

The purpose of this section is to define requirements and designate procedures to be followed during the construction activities for the project. All provisions of this section are mandatory to all contractors and subcontractors that may be engaged in all phases of the project. The provisions presented here conforms to the Employment Act of Maldives (Law number: 2/2008), specifically Chapter 8 of this Act: Work Place Safety and Employee Health.

Project health and safety organization

The project supervisor onsite has the overall authority and responsibility for all site related activities, including health and safety of the workers and public during construction stage.

All employees will have the right to refuse to work and/or stop work authority when the employee feels that the work is unsafe (including subcontractors) or where specified safety precautions are not adequate or fully understood. All employees have the right to refuse to work on any site or operation where the safety procedure specified in this document or other safety policies are not being followed.

All authorized visitors to the project sites shall be briefed by the Supervisor on the health and safety risks at the site and will be required to comply with the health and safety policies specified here. Unauthorized visitors will not be permitted to the project site.

Health and Safety Risks

The main health and safety risks envisaged form this project are:

a) Accidents and Fatigue

There is a general risk of accidents leading to injury to workers, due to inadequate operational control procedures. This may occur during construction. Such risks will be minimized through close supervision of construction activities. Access to site will be regulated and restricted, to minimize the risk of accidents. Since traffic accidents during the transportation process can also endanger communities, special attention will be given to driver awareness. Another significant source of occupational health and safety risk is fatigue, which can result in injury and prolonged illness. Hence, the working hours of the personnel will be scheduled with such considerations.

b) Noise

Noise can pose a significant health risk, especially for those in close proximity to equipment that emit loud sounds. However, loud noise is unlikely to prolong beyond 3-4 hours a day at a stretch.

Safety Program

a) Personal protective equipment

Personal Protective Equipment shall be provided to protect workers from physical hazard that may be encountered. All employees are required to be trained in the use, limitations, care and maintenance of the protective equipment that they will have to use during the project.

All project personnel will be required to wear:

- Boots (Leather boots with safety toe)
- Hard hat (Resist penetration by objects, absorb shock/blow, water resistant and slow burning,

- Safety glasses
- Masks
- Gloves

The following safety equipment must be used as required:

- Ear mufflers (if working an high noise area)
- Protective chemical gloves (when handling any waste oil or chemicals)
- Safety harnesses

All protective equipment's must be inspected regularly for any malfunction/damages.

b) Site Control

- All authorized visitors to the project sites shall be informed to the Supervisor. Unauthorized visitors will not be permitted to the project site.
- The working area of the site will be barricaded to prevent any trespassing into the area where the machineries are in constant work.
- No open electrical connection will be kept at the site, all the switch boards, panels etc. will be covered and protected

c) Safety Briefing

All personnel will be made aware of task-specific health and safety risks that they may encounter during work.

All personnel will be informed of fire prevention measures, fire extinguishing methods, and emergency response plan and evacuation procedures.

Emergency Response

The major categories of emergencies that could occur are:

a) Illnesses and physical injuries

b) Natural disasters (e.g., flooding)

c) Fires and explosions

All accidents should be immediately reported to the site supervisor. In case of fire, the supervisor or the most senior person on site must initiate a full evacuation from the site.

First Aid box with the necessary medicine will be kept at the site office to take care of the small injuries etc.

In Male' City, the emergency contacts are as follows:

- Fire and Rescue: Maldives National Defence Force, Fire Department
- Accidents and Ambulance: ADK hospital or IGM Hospital
- Police: Central Police station

Records of the any accident or fault will be maintained so that the precaution will be taken for future

9 ENVIRONMENTAL MONITORING PLAN

9.1 Introduction

This chapter will outline the monitoring plan for the proposed additional components of the project. Environmental monitoring is essential because, although with proper mitigation measures, the overall environmental damage can be significantly minimized, an unforeseen impact may still occur. Furthermore, some of the impacts predicted may turn out to be far greater than predicted, making mitigation measures ineffective. Therefore, in order to avoid or reduce the chances of such events, regular and frequent environmental monitoring is vital.

9.2 Objectives of the Monitoring Plan

The main objectives of the monitoring plan are:

1. To identify whether the predicted impacts are accurate and mitigation measures taken are effective
2. To identify any unforeseen impacts so that appropriate mitigation measures can be taken at the earliest
3. To identify and resolve any issues of social unrest at the earliest
4. To eliminate or reduce environmental costs

9.3 Before Construction

The monitoring assessments prescribed in Table 9.1of the initial EIA are required before construction, if the construction activities begin 12 months after this EIA.

9.4 Monitoring during Construction Phase

Table 9.2 of the initial EIA shows the details of the different monitoring attributes and parameters must be monitored during the construction stage.

Additionally, the following aspects will be monitored during the implementation of the additional components to ensure that environmental impacts are minimized.

1) Daily monitoring to ensure that the cleared areas and other construction processes are not creating any significant dust and noise nuisance for the local environment.

2) Daily monitoring of vehicle refuelling and repair should be undertaken to ensure that these exercises are carried out on hardstands and to ensure that they are done properly. This is to reduce the potential of soil contamination from spills. Spot checks will be conducted by the site supervisor.

3) Daily inspection of site clearance activities to ensure that the proposed building plans are followed.

4) Monitor and ensure that approved suppliers and sources of local materials are used.

5) Regular monitoring of the wastewater to ensure that the wastewater discharge is within the standards specified in the wastewater guidelines and batching plant guideline.

Table 9.1: Monitoring Schedule for Pre-construction Stage (if required)

Monitoring Attribute	**Indicator**	**Methodology**	**Locations & samples**	**Frequency**	**Applicable standard**	**Est. Total Costs USD**[1]
Marine Water Quality (Marine)	The following parameters will be tested: Temperature, Salinity, pH, Total Suspended Solids, Turbidity, Temperature	Laboratory analysis	One Location (sites W1) One sample from the site	Once prior to commencement of construction activities	WHO marine water quality standards	32

Table 9.2: Monitoring Schedule for Construction Stage

Monitoring Attribute	**Indicator**	**Methodology**	**Locations & samples**	**Frequency**	**Applicable standard**	**Est. Total Costs USD**[2]
Marine Water Quality (Marine)	The following parameters will be tested: Temperature, Salinity, pH,, Total Suspended Solids, Turbidity,	Laboratory analysis	One Location (sites W1) One sample for the site	On every four months during construction and once annually during operational phase for 5 years	WHO marine water quality standards	65
Wastewater from batching plants	The following parameters will be tested; pH, TSS, and turbidity,	On-site analysis	Settling tank	Daily for the duration of batching plant operation	National Wastewater guidelines Environmental Guidelines for concrete Batch Plant	11, 600

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[1] *Covering pre-construction, construction and operations stage*

[2] *Covering pre-construction, construction and operations stage*

9.5 Monitoring report

A detailed environmental monitoring report is required to be compiled and submitted to the EPA annually based on the data collected for monitoring the parameters included in the monitoring plan given in the EIA. This report may be submitted to the relevant Government agencies in order to demonstrate compliance. If required, however, a monitoring report for the proposed work phase may be prepared and submitted to the Ministry of Environment. The report will include details of the site, strategy of data collection and analysis, quality control measures, sampling frequency and monitoring analysis and details of methodologies and protocols followed. In addition to this more frequent reporting of environmental monitoring will be communicated among the environmental consultant, project proponent, the contractors and supervisors to ensure possible negative impacts are mitigated appropriately during and after the project.

9.6 Cost of monitoring

The cost of monitoring is estimated to be US$ 15,000 annually. Professional consultants will be hired to undertake the monitoring and the necessary equipment for monitoring will be procured.

For pre-construction and construction stage monitoring, individual parameter costs are provided in the relevant tables above.

9.7 Commitment to monitoring

The proponent is fully committed to undertake the monitoring programme given in this chapter (see Appendix G).

10 STAKEHOLDER CONSULTATIONS

Stakeholder consultation regarding the proposed changes to the EIA of the Hulhule'-Male' Bridge project was held with Male' Water and Sewerage Company (MWSC) on 14 January 2016 via a phone interview. The main focus of the consultation was to understand MWSC's capacity and willingness to provide water for the batch processing. Summary of discussion points of the interview are provided below.

The proponent conducted a separate consultation session with MWSC on 4 January 2016. Minutes of the consultation meeting with Ministry of Housing and Infrastructure and MWSC are provided in Annex F.

10.1 Male' Water and Sewerage Company (MWSC)

Date: 14 January 2016
Time: 2:00 PM

Method: Phone interview

Participant;

Engineering Manager

Mohamed Imran Adnan

Phone: 3323209

Email: Imran@mwsc.com.mv

Summary of discussion points;

- Representative from MWSC informed that the proponent had consulted MWSC regarding water intake for batch processing.
- MWSC had been informed that 60 tons of water would be required per day for the operation of the batching plants.
- MWSC stated that they have the capacity and are willing to provide the required amount of water throughout the construction stage.

11 POTENTIAL DATA GAPS AND ASSESSMENT LIMITATIONS

11.1 Gaps in Information

The environment of Maldives is generally poorly understood. This may be due to the lack of detailed studies in the Maldives. Much of the literatures on coral islands are derived from studies done in the Pacific which unfortunately has very different climatic and geologic settings.

Diminutive knowledge is known about the hydro-geology of the parts of most aquifers that contain saline water compared to the parts that contain freshwater. Utmost ground-water source evaluations have been dedicated to instituting the extent and properties of freshwater aquifers, whereas evaluations of saline water-bearing units have been commonly devoted to determining the effects on freshwater movement.

Detailed environmental analysis for an EIA is often required to be undertaken in a relatively short period of time. Give the seasonal climatic variations in Maldives and the differences in local geomorphologic and climate settings in individual islands such a short time frame is often too little to assess selected aspects of the environment. This problem is compounded by the absence of long-term studies in other parts of Maldives. Hence, most EIA's end up being based on an environmental snapshot of specific point in time. However, experienced EIA specialists can deliver a close match to reality based on a number of similar assessments. In this regard, the following gaps could be identified in information.

- Absence of long-term site specific or even regional data (at least 2 years). Most critical data include current, wave and terrestrial modification history.
- Absence of historical and long-term records on reef and lagoon environment.
- Lack of detailed data on geology and soil due to time limitation in EIA submission.
- Lack of current and wave data as the wave and current gauges for the project are currently deployed in the lagoon and will require some time to extract.

These gaps are seriously considered in the assessment and care has been taken to address the issue in designing mitigation measures and the monitoring programme.

11.2 Uncertainties in Impact Prediction

Environmental impact prediction involves a certain degree of uncertainty as the natural and anthropogenic impacts can vary from place to place due to even slight differences in ecological, geomorphological or social conditions in a particular place.

As note earlier, there is also no long term data and information regarding the particular site under consideration, which makes it difficult to predict impacts. It is important to consider that there will be uncertainties and voluntary monitoring of natural processes as described in the monitoring programme is absolutely essential.

Similar projects, at this scale, have not been undertaken in the Maldives and similar scale project in coral reef and atoll environment setting is rare. This poses a challenge in accurately predicting the impacts from the project

Table 11.1: EIA study aspects and their limitations

Issue/Item	**Required Information**	**Current Status / action**
Detailed Master Plan of the Male' Urban region	A broader Master Plan for the region	There is no detailed master plan.
Engineering designs	Detailed engineering designs such as M&E and structural designs	Details can only be worked out after the EIA approval.
Details of the utility machinery and equipment	Exact model of equipment	Use typical equipment details
Demand and road usage	Detailed demand analysis and traffic forecast for 10 years	Not available as this is the first of its kind; use ferry traffic as proxy
Environmental baseline data	Detailed data on geology, hydrogeology and soil. Air quality measurements Up-to-date Socio-economic data of Male'	Baseline snapshots of the site taken to design mitigation measures Estimated based on other similar studies in Maldives Primary date collection will be time consuming; Secondary sources will be used
Environmental Standards	Environmental Standards for Air and Noise Quality	USEPA standards followed

12 CONCLUSIONS

The key conclusions of this addendum are summarized below.

- This Environment Impact Assessment (EIA) addendum report is an evaluation of the potential environmental, socio-economic and natural impacts of the proposed alterations to the Hulhulé-Malé Bridge Project, Kaafu Atoll.
- The proposed changes to the project covers three main components:
    a. Expansion of the project work site in Malé
    b. Addition of concrete batching plant to the project work site in Malé
    c. Use of septic tanks for sewage treatment and disposal from temporary worksite in Hulhumale
- The study areas of this addendum are Male' worksite and Hulhumale' worksite areas.
- The proposed developments are generally in conformance to the laws and regulations of the Maldives.
- The key impacts from the proposed changes are due to site clearance of Male' worksite and operation of batching plants at Male' worksite. The clearance of the proposed expanded work site requires removal of hundreds of trees. Trees will be relocated where possible. Impacts from the operation of the batching plants include high noise levels, loss of visual amenity and specific impacts related to the wastewater disposal.
- Significant impacts on the natural environment include impacts on terrestrial ecology from the site clearance of the expanded worksite. Hundreds of trees may potentially need to be removed or relocated. Further impacts on natural environment include impacts on marine ecology due to disposal of wastewater from the batching plants. Social impacts from the additional components include high noise levels from the operation of batching plants and loss of visual amenity.
- A number of mitigation measures are proposed for the most significant impacts from the project. These include testing and monitoring of wastewater quality before disposal, limiting hours of batching plants operation to daytime and use of fences or walls to prevent transmission of dusts.

- Alternatives for the disposal of wastewater from the batching plants have been proposed in the report. These include direct disposal of wastewater via the existing sewerage network, direct disposal into sea, and reuse of wastewater after passing through a settling tank and after treatment. The last option is identified as the most ecologically preferred option, however, the option may not be feasible due to significantly high cost.
- The monitoring plan has been designed with a focus to analyse the significant impacts over time. Cost of monitoring is estimated at US$15,000 per year.
- A management framework has been proposed and it is essential that this framework be used in the construction and operation stage of the project.

13 REFERENCES

CHINA SHIPPING ENVIRONMENT TECHNOLOGY AND CDE CONSULTING (2015), *EIA for the proposed Hulhule'-Male' Bridge Project, Kaafu Atoll,* Maldives.

CHINA SHIPPING ENVIRONMENT TECHNOLOGY AND CDE CONSULTING (2015), *Additional Information for the EIA of the proposed Hulhule'-Male' Bridge Project, Kaafu Atoll,* Maldives.

APPENDIX A – Terms of Reference

بسم الله الرحمن الرحيم

[illegible]
"Dhivehin" – Always Maldivian, Forever Independent

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Environmental Protection Agency EPA

203-EIARES/138/2016/10

Terms of Reference for the Addendum 1 to the Environmental Impact Assessment of the Male'-Hulhule' Bridge Project

This is the draft TOR for the Addendum 1 to the EIA report on the ongoing Male'-Hulhule' Bridge Project. This TOR addresses the proposed additional component to the ongoing project. While every attempt has been made to ensure that this TOR addresses all of the major issues associated with development proposal, they are not necessarily exhaustive. They should not be interpreted as excluding from consideration matters deemed to be significant but not incorporated in them, or matters currently unforeseen, that emerge as important or significant from environmental studies, or otherwise, during the course of preparation of the EIA report.

1. **Introduction and rationale** –Describe the purpose of the project and, if applicable, the background information of the project/activity and the tasks already completed..Objectives of the development activities should be specific and if possible quantified. Define the arrangements required for the environmental assessment including how work carried out under this contract is linked to other activities that are carried out or that is being carried out within the project boundary. Identify the donors and the institutional arrangements relevant to this project.

2. **Study area** – Submit a minimumA3 size scaled plan with indications of all the proposed infrastructures. Specify the agreed boundaries of the study area for the environmental impact assessment highlighting the proposed development location and size. The study area should include adjacent or remote areas, such as relevant developments and nearby environmentally sensitive sites (e.g. coral reef, sea grass, mangroves, marine protected areas, special birds site, sensitive species nursery and feeding grounds). Relevant developments in the areas must also be addressed including residential areas, all economic ventures and cultural sites

3. **Scope of work**– Identify and number tasks of the project including preparation, construction and decommissioning phases.

Task 1. Description of the Proposed Additional Components to the project –The description of the proposed additional components to the project shall consider the following.

a) Details of the proposed components, justification for the proposed components, a full description of how the additional project activities will be undertaken including work methods and the project schedule.
b) Clearly labeled site plan of the project boundary, with regard to the proposed component.
c) Project inputs and outputs of the proposed components.

Task 2. Description of the Environment– Baseline environment in the Environment Impact Assessment for the Male'-Hulhule' shall be referred to.

- Details of the vegetation that is required to be cleared.
- Marine water quality of discharge location for parameters: pH, temperature, salinity, turbidity, TSS.

Where baseline data is to be collected, careful consideration shall be given to the methodologies of sampling and surveying. Data collection shall focus on key issues needing to be examined for the EIA. Consideration of likely monitoring requirements shall be borne in mind during survey planning, so that the data collected can be used as a baseline to monitoring impacts.

All survey locations shall be referenced with Geographic Positioning System (GPS). The report should outline the detailed methodology of data collection utilized to describe the existing environment.

Task 3. Legislative and regulatory considerations – Identify the pertinent legislation, regulations and standards, and environmental policies that are relevant and applicable to the proposed changes, and identify the appropriate authority jurisdictions that will specifically apply to the project. The EIA addendum report should clearly identify the different applicable clauses and articles of the legislative and regulatory requirements.

- Environmental guidelines for concrete batch plants and how the project conforms to these guidelines.
- Waste water guidelines.

Task 4. Determine the Potential Impacts of the Proposed Additional Components to the Project – Identify the impacts of the proposed additional components to the project. Distinguish between significant impacts that are positive and negative, direct, indirect or cumulative, reversible and irreversible, short and long term. Identify any information gaps and evaluate their importance for decision-making.

Task 5.Analysis of Alternatives to the Proposed Additional Components to the Project – Describe the alternatives examined for the proposed project that would achieve the same objective.

Task 6.Stakeholder consultation – Identify appropriate mechanisms for providing information on the development proposal and its progress to all stakeholders.In this respect consultation shall be undertaken with the following stakeholders and any other relevant stakeholders identified during the preparation of the EIA report:

- MWSC regarding water for washing purposes during batch plant operation.

Details of the consultative meetings including summary outcomes, participants, date, time and location should be described. The EIA report should include a list of people/groups consulted, their contact details and summary of the major outcomes.

Task 7. Mitigation and management of negative impacts – Identify possible measures to prevent or reduce significant negative impacts to acceptable levels.

Task 8. Monitoring Plan – Identify the critical issues requiring monitoring, in addition to the issues addressed in the existing monitoring plan, to ensure compliance to mitigation measures. Details of additions to the existing monitoring programme including the additional physical and biological parameters to be monitored, frequency, duration and cost commitment from responsible person, detailed reporting timetable and ways and means of undertaking the monitoring programme must be provided.

Presentation - The addendum to the environmental impact assessment report will be presented in print and digital format and will be concise, focusing on significant environmental issues. It will contain the findings, conclusions and recommended actions supported by summaries of the data collected and citations for any references used in interpreting those data. The addendum to the environmental impact assessment report shall be organized according to, but not necessarily limited by, the outline given in the Environmental Impact Assessment Regulations 2012 and the relevant amendments.

Timeframe for Submitting the Addendum – The developer must submit the completed Addendum to the Environmental Impact Assessment within 3 months.

10th January 2016

ECA001

APPENDIX B –Concept Plan

The coordinates of temporary facilities land

No.	X	Y
A	61061.10	5126.92
B	61088.46	5305.63
C	61152.80	5312.93
D	61149.93	5344.23
E	61289.30	5361.78
F	61275.76	5465.54
G	61207.59	5458.84
H	61204.65	5478.09
I	61145.07	5471.21
J	61148.89	5452.41
K	61126.57	5445.39
L	61112.12	5430.43
M	61105.84	5411.35
N	61094.67	5344.65
O	61082.35	5343.66
P	61028.29	5132.15

Note: ▨ The scope of temporary facilities land

APPENDIX C – Survey Locations


Survey Locations Map
Legend
SW 1
Vegetation Survey Area
Seawater Sample 1
N
100 m
Google earth
Image © 2016 DigitalGlobe

APPENDIX D – Water Test Reports

Male' Water & Sewerage Company Pvt Ltd
Water Quality Assurance Laboratory
FEN Building 5th Floor, Machangoalhi, Ameeneemagu, Male', Maldives
Tel: +9603323209, Fax: +9603324306, Email: wqa@mwsc.com.mv

بسم الله الرحمن الرحيم

WATER QUALITY TEST REPORT

Test Report No: 300678/2016/01

Customer Informations : ***CDE Consulting Pvt Ltd***
H.Orchidmaage 4th Floor
Ameeru Ahmed Magu
Male'
Rep.of Maldives

Date: 13/01/2016

Sample Description / Location~	**Male'-Hulhule Bridge Area** **SW1**	**TEST METHOD**	**UNIT**
Sample Type~	Sea water		
Sampled Date~	11/1/2016		
Sample Received Date	11/1/2016		
Test Requisition Form No.	900162760		
Sample No.	821269		
Date of Analysis	11/1/2016 - 13/1/2016		
PARAMETER	**ANALYSIS RESULT**		
Physical Appearance	Clear	Visual	-
pH	8.43	Method 4500-H+ B. (adapted from Standard methods for the examintation of water and waste water, 21st edition)	-
Salinity	33.34	Method 2520 B. (adapted from Standard methods for the examintation of water and waste water, 21st edition)	‰
Temperature	22.8	Electrometry	°C
Total Suspended Solids	<5 (LoQ 5mg/L)	Method 8006 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)	mg/L
Turbidity	0.393	HACH Nephelometric Method (adapted from HACH 2100N Turbidimeter User Manual)	NTU

Keys:

mg/L: Milligram Per Liter, **‰:** Parts Per Thousand, **°C:** Degree Celcius, **NTU:** Nephelometric Turbidity Unit

LoQ: Limit of Quantification

Checked by:	**Approved by:**
Afnan Farooq Laboratory Executive	Mohamed Eyman Senior Technical Officer

Notes:

Sampling Authority: Sampling was not done by MWSC Laboratory

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~ Information Supplied by the customer

********************END OF THE REPORT********************

APPENDIX E – CV's of Consultants

Ahmed Shaig

Phone: (+960) 77 88 758 shaig@cde.com.mv

Personal Details

Date of Birth: 19/02/1976 **Nationality:** Maldivian **Gender:** Male **Marital Status:** Married

Permanent Address: Maldives **Present Address:** M. Muleege, Orchid Magu, Male', Maldives.

Education

PhD, Environmental Science, 2009
James Cook University, Townsville, Australia

Research degree on 'Settlement Planning for Natural Hazard Resilience in Small Island States: The Population and Development Consolidation Approach'

BSc Land and Spatial Information Studies/Information Science. (double major), 1999-2001
University of Otago, Dunedin, New Zealand

Diploma in project planning, implementation, monitoring and evaluation, 1995
ILO training Centre, Turin, Italy

Employment History

Director, Environmental Services	2008 to present
CDE Consulting	Supervisor: Dr. Simad Saeed
Republic of Maldives	Phone: +(960) 7777445
Head of environmental wing	

Assistant Under-secretary, Spatial Planning	2002-2004
Ministry of Planning and National Development	Supervisor: Hon. Hamdun Hameed
Republic of Maldives	Phone: +(960) 332-3919

Head of Spatial Planning Unit. Relevant Tasks include:

- Oversee environment related projects and application of environmental guidelines for planned projects.
- Plan, implement and oversee the development of a National GIS;
- Aid/facilitate/oversee urban planning, housing, land use planning, natural resource planning and environment related projects; Provide assistance in project planning (includes urban and regional planning, natural resources planning)

Project Manager, National Digital Mapping Project	2005 (8 months)
Ministry of Planning and National Development	Supervisor: Hon. Hamdun Hameed
Republic of Maldives	Phone: +(960) 332-3919

- Project involved aerial photography and satellite imagery of entire Maldives, ground surveying of key settlements, digital conversion of data and setting up a Mapping Unit.

Assistant Planning Officer/Planning Officer	1994-1999
Ministry of Planning and National Development	Supervisor: Mr. Mohamed Hunaif
Republic of Maldives	Phone +(960) 331-3040

Relevant tasks involved:

- Assisting in the National GIS Development Programme (Junior GIS developer)
- Facilitate urban planning, housing, land use planning, natural resource planning and environment related projects.

Experience in Consultancy

- *September 2002:* Member of the team appointed for environmental surveying and carrying capacity assessment of islands for tourism development in the southern atolls of Maldives for Ministry of Tourism Maldives.
- *October 2002:* Developed the Census GIS for United National Population Fund
- *December 2002:* Developed the Maldives Protected Areas Systems GIS for Maldives Home Affairs Housing and Environment.
- *February 2003*: Participated in the preparation of Royal Island and Spa Resort Annual Environmental Monitoring Report for Royal Island and Spa.
- *April 2003:* Member of the team selected for developing town plans for urban centres in Northern and Southern Regional Development Zones, looking specifically into environmental control measures, for Ministry of Planning and National Development.
- *April 2003:* Participated in the preparation of Environmental Impact Statement for Coastal Modifications on Rihiveli, South Malé Atoll, Maldives.
- *April 2003:* Participated in the surveying and preparation of Environmental Impact Statement for the proposed coastal improvements to address coastal erosion concerns on Royal Island Spa Resort, Baa Atoll, Maldives.
- *May 2003:* Participated in the bathymetry survey and preparation of Initial Environmental Examination for Deepening of Existing Entrance Channel to Service Jetty, Soneva Gili Resort and Spa, North Malé Atoll, Maldives
- *May 2003:* Participated in the preparation of Initial Environmental Examination for development of an access channel into the natural inner lagoon (*Vilu*) of Mayafushi resort, North Ari Atoll.
- *May 2003:* Participated in the preparation of Environmental Impact Assessment for Landaa Giraavaru Pvt. Ltd. for the development of a Four Season's Tourist Resort on the island of Landaa Giraavaru in Baa Atoll, Maldives.
- *June 2003:* Participated in survey and preparation of Initial Environmental Examination for the Development of a Mooring Area and Associated Beach Replenishment in, Boduhithi Club, North Malé Atoll, Maldives.
- *July 2003:* Participated in the surveying and preparation of Initial Environmental Examination for Short-term and Long-term Shore Protection Measures at Alimatha Tourist Resort, Vaavu Atoll, Maldives.
- *July 2003:* Conducted shoreline and vegetation line of Alimatha Tourist Resort, Vaavu Atoll, Maldives.
- *July 2003:* Participated in the surveying for Initial Environmental Examination for Short-term and Long-term Shore Protection Measures at Dhiggiri Tourist Resort, Vaavu Atoll, Maldives.
- *July 2003:* Participated in conducting and preparation of Fun Island Resort Annual Environmental Monitoring Report.
- *July 2003:* Participated in conducting and preparation of Sun Island Resort Annual Environmental Monitoring Report.
- *July 2003:* Participated in conducting and preparation of Holiday Island Resort Annual Environmental Monitoring Report.
- *August 2003:* Developed the Initial Environmental Examination for the construction of Sun Decks along the southern beach of Kudarah Island Resort.
- *September 2003:* Participated in surveying and preparation of Fonaddoo Environmental Impact Assessment Report for the development of fisheries complex, Fonaddoo, Maldives.
- *October 2003*: Participated in surveying and preparation of Kuda Rah Erosion Study and recommendations for shore protection and erosion prevention
- *November 2003:* Conducted vegetation and shoreline survey of Dhonveli Beach and Spa and Four Seasons Report for the Boundary Delineation between the two islands.
- *December 2003:* Contributed to the Landuse Planning Guidelines of Maldives (environmental aspects) for Ministry of Housing and Urban Development.
- *December 2003*: Contributed to the Development of a Building Code of Maldives for Ministry of Housing and Urban Development.
- *January 2004:* Co-author to the Environmental Guidelines for the Development of Resort Islands in Maldives, Ministry of Tourism.
- *February 2004:* Developed the Baa Atoll Spatial Development Plan for Ministry of Planning and National Development.

- *April-July 2004:* Participated in the preparation of the Environmental aspects of the 8 bid proposals for resort Development for various proponents.
- *November 2005:* Participated in the preparation of EIA for L.Gan Resettlement Project for Ministry of Housing.
- *December 2005:* Participated in the surveying and preparation of EIA for Gn Fuvahmulaku Tourist Hotel Development
- *November 2005:* Developed a GIS for strategic planning to select islands for tourism development for Ministry of Tourism.
- *January 2006:* Local consultant for the Strategic Environmental Assessment (SEA) of Maldives Regional Development Plan, for AGRIFOR Consult Consortium, Belgium.
- *June 2006:* Developed the Baa Atoll Resource Management GIS for Ministry of Environment and Energy.
- *August 2006:* Consultant to the Integrated Climate Change System (ICCS) project – Assessment of vulnerability of Maldives Islands and Beaches to climate change
- *September 2006:* Consultant to the ICCS project – Assessment of vulnerability of Maldives Infrastructure to climate change
- *November 2006:* Consultant to the preparation of National Adaptation Programme of Action in Maldives for Ministry of Environment.
- *December 2006*: Environmental Consultant to the United Nations Development Programme (UNDP) Project: Disaster Risk Assessment of Selected nine Safe Islands in Maldives.
- *April 2007:* Prepared the Coastal Erosion Assessment and Management Report for Ga.Meradhoo Island.
- *May 2007:* Participated in the preparation of EIA for N. Randheli Resort Development Project, I&T Management group.
- *June 2007:* Participated in the preparation of Millennium Development Goals, Maldives Country Report.
- *October 2007*: Natural Hazard Assessment consultant to the UNDP Project: Disaster Risk Assessment of Selected Safe Islands in Maldives.
- *November 2007*: Prepared the EIA for proposed coastal protection, beach replenishment and access improvement of Elaa, Thaa Atoll, for Mr Abbas Mohamed, H. Merry Rose.
- *May 2009*: Participated in the preparation of EIA for sand sourcing and beach replenishment project of Viligilli Island, Addu Atoll, for Shangri-La at Viligilli..
- *April 2009:* Participated in the preparation of EIA for N. Maafaru Airport Development Project for Noonu Hotels Pvt Ltd.
- *May 2009:* Participated in the preparation of EIA for resort development in Huvandhumaavattaru, Noonu Atoll
- *June 2009:* Prepared a status of the environment report Randheli Island, Noonu Atoll.
- *July 2009:* Prepared the Environmental EIA for harbour development in Fiyoari, Gaafu Dhaalu Atoll.
- *July 2009:* Participated in the preparation of EIA for Jetty and arrival lounge development project in Gan, Addu Atoll, for Island Aviation Services Private Limited.
- *July 2009:* Team Leader for the socio-economic risk assessment of Selected Safe Islands in Maldives.
- *August 2009:* Coastal erosion data synthesis for selected islands of Maldives, for World Bank Maldives Environmental Management Project.
- *September 2009:* Prepared the beach management plan and development control measures for Reethibeach Island Resort, Baa Atoll.
- *September 2009:* Participated in the preparation of EIA for agricultural island development in Felivaru, Noonu Atoll, for Fantasy Private Limited.
- *September 2009:* Consultant to review the safer islands programme and cost benefit study of mitigation measures in three islands in the Maldives for UNDP.
- *October 2009:* Consultant to the Maldives Environmental Management Project for waste management technical assistance for World Bank.
- *December 2009:* Environmental consultant for advising on resort development and development control measures in Randheli Island, Noonu Atoll.
- *January 2010:* Prepared the beach management plan and development control measures for Shangri-La Island Resort, Addu Atoll.
- *January 2010:* Consultant to the Atoll Ecosystem Conservation project conservation component defining conservation areas and development controls.
- *February 2010:* Prepared the environmental audit of Thunbafushi Island, Kaafu Atoll, for Champa Brothers Private Limited.

- *March 2010:* Prepared the beach management plan and development control for Herathera Island Resort, Addu Atoll.
- *March 2010:* Lead author in the preparation of EIA for power plant upgrading project in Palm Beach Island in Lhaviyani Atoll.
- *April 2010:* Lead author in the preparation of EIA for Seagrass removal and beach replenishment project in Olhuveli Island Resort and Spa, Kaafu Atoll.
- *April 2010:* Prepared an EIA addendum for resort development in Gaakoshibee Island, Shaviyani Atoll.
- *May 2010:* Consultant to undertake island environmental scoping studies in 30 islands in North Maldives to determine islands with resort development potential for GMR Group of India.
- *May 2010:* Lead author in the preparation of EIA for harbour development project in Madidhoo Island, Shaviyani Atoll.
- *June 2010:* Lead author in the preparation of EIA for deep piling project in Olhuveli Island Resort and Spa, Kaafu Atoll.
- *July 2010:* Lead author in the preparation of EIA for the development of an aquaculture site in Kanduoigiri, Kaafu Atoll.
- *July 2010:* Environmental planning consultant for Shangri-La at Viligilli Maldives, Addu Atoll.
- *July 2010:* Environmental planning consultant to the Addu Land Use Planning project (including defining development controls) in Addu Atoll Maldives for South Province Office.
- *August 2010:* Environmental Consultant for the Atoll Ecosystem Conservation Project to declare Baa Atoll as a UNESCO Biosphere reserve.
- *September 2010:* Lead author in the EIA for Seagrass removal and beach replenishment project in Herathera Island, Addu Atoll.
- *September 2010:* Lead author in the EIA for resort redevelopment in Vilamendhoo Island Resort, Ari Atoll.
- *September 2010:* Lead author in the preparation of EIA for Gulhifalhu land reclamation project in Gulhifalhu, Male' Atoll, for Capital Investment and Finance Limited, UK.
- *September 2010:* Participated in the preparation of EIA for sewerage system development project in Miladhoo, Noonu Atoll.
- *October 2010:* Consultant to undertake the coastal adaptation survey of 40 islands in Maldives for Ministry of Housing and Environment.
- *November 2010:* Environmental consultant for advising on resort development and development control measures in Maamigili Island, Raa Atoll
- *January 2011:* Lead author in the preparation of EIA for sewerage and water system development project in Hithadhoo Island, Addu City for Bi-water International Private Limited.
- *February 2011:* Lead author in the preparation of EIA for sewerage and water system development project in Maradhoo Island, Addu City for Bi-water International Private Limited.
- *March 2011:* Lead author in the preparation of EIA for sewerage and water system development project in Feydhoo Island, Addu City for Bi-water International Private Limited.
- *April 2011:* Lead author in the preparation of EIA for sewerage and water system development project in Maradhoo-Feydhoo Island, Addu City for Bi-water International Private Limited.
- *May 2012:* Coastal erosion mitigation assessment and planning for Six Senses Laamu, Laamu Atoll
- *January 2012:* Lead author in the preparation of EIA for sewerage and water system development project in Fuvahmulah Island, Addu City for Bi-water International Private Limited.
- *February 2012:* Coastal erosion mitigation assessment and planning for Fushivelavaru Island
- *March 2012:* EIA for the proposed resort redevelopment project in Conrad Rangali Island for Champa and Crown Resorts
- *March 2012:* EIA for the proposed resort redevelopment project in Gasfinolhu Island Resort, Champa and Crown Resorts
- *May 2012:* Environmental consultant for advising on resort development and development control measures in Gasfinolhu Island, Male' Atoll
- *June 2012:* Environmental consultant for advising on resort development and development control measures in Nakachchaa Huraa Island, Male' Atoll
- *April 2012:* Member of the consultant team that prepared the Tourism Opinion and Profile Survey 2011, Ministry of Tourism.
- *October 2012:* Environmental consultant to the preparation of 4th Tourism Master plan for Ministry of Tourism, Maldives.
- *November 2013:* Environmental consultant for advising on land reclamation, resort development and development control measures in Dhiffushi Island Reef, Male' Atoll.

- *January 2013:* Environmental consultant for advising on resort development and development control measures in Hankede Island, Addu Atoll

- *January 2013:* Environmental consultant for advising on resort development and development control measures in Hankede Island, Addu Atoll

June 2013: Local Environment consultant to the WCCM project, HIDRIA and Aquatica, Spain.

Membership of Professional Bodies

- Member of Building Code Committee, Maldives
- Member of Commission on Sustainable development
- Member of the Technical Committee for Developing Spatial Plans for conducting tourism related activities in Ari Atoll.
- Member of Climate Advisory Council to the President of Maldives 2009- to present.
- Registered EIA Consultant in Maldives Environment Protection Agency roster.

Major Publications

SHAIG, A. (2001) "An Overview of Web Based Geographic Information Systems". In Proceedings: Thirteenth Annual Colloquium of the Spatial Information Research Centre. P.A. Whigham (ed). 2 - 5 Dec, Dunedin, New Zealand. University of Otago, pp.255-264.

SHAIG, A. (2006). Climate Change Vulnerability and Adaptation Assessment of the Coastal Infrastructure of Maldives. Technical Paper submitted to Maldives National Adaptation Plan of Action for Climate Change. Ministry of Environment, Energy and Water, Male', Maldives.

SHAIG, A. (2006). Climate Change Vulnerability and Adaptation Assessment of the Land and Beaches of Maldives. Technical Paper submitted to Maldives National Adaptation Plan of Action for Climate Change. Ministry of Environment, Energy and Water, Male', Maldives.

SHAIG, A. (2007) Land Study of Maldives, 2006. Ministry of Planning and National Development, Male' Maldives.

SHAIG, A. and Aslam, M (2007) Detailed Island Risk Assessment Maldives Volume I to Volume IV – Natural Hazard Assessment (Final Draft). UNDP, Male' Maldives

SHAIG, A. (2007) Detailed Island Risk Assessment Maldives Volume I to Volume IV – Environmental Vulnerability Assessment (Final Draft). UNDP, Male' Maldives.

Academic Achievements

2001 Critchlow Associates Prize in Surveying, New Zealand.
Prize awarded annually by University council for the highest standard of Achievement in Spatial Information Studies in University of Otago.
1994 Certificate for best results in General Certificate of Examinations, Advanced Level.
Science Education Centre, Male', Maldives

References

Hamdun Hameed
Member of Parliament
Male', Maldives
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minister@planning.gov.mv

Simad Saeed, Dr
Managing Director,
CDE Consulting
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David King, Dr.
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Clarification

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications and my experience. I understand that any willful misstatement described herein may lead to my disqualification or dismissal, if engaged.

Signature Date: 15 July 2013

PERSONAL DETAILS

Name in Full : Ali Moosa Didi
Date of Birth : 18.06.1985
Gender : Male
Nationality : Maldivian Address:
Permanent : Saraasaruge Aage, S.Hithadhoo
Neelonfaru Magu

Present : Ma. Rose Villa SE, 4th Floor Dhevina Magu
Male'

Telephone : +960 9912001

EDUCATIONAL QUALIFICATIONS

Madharasthul Islamiya School

Certification, University of Cambridge General Certification of Education O/L

Subject English Mathematics
Business Account Commerce
Economics

Secondary School Certificate Islamic Studies
Dhivehi Language

WORK PLACE DETAILS

Commerce Development and Environment Pvt.
H. Orchidmaage, 4th Floor
Ameeru Ahmed Magu,
Male', Republic of Maldives
Telephone: + 960 3312514
Fax: + 960 3315926
E-mail: ali@cde.com.mv

EMPLOYMENT RECORD

January 2004 – December 2008 Commerce Development & Environment Pvt

Assistant Surveyor January 2009 – December 2009 Ryco Investment Pvt
HR. Officer

January 2010 – To Current Date Commerce Development & Environment Pvt Surveyor

WORK EXPERIENCE

Assistant Surveying Officer (Sep 2008 – To Current Date)

-Survey proposed areas for the new projects under the instruction of survey officer.

-Determine precise location and measurements of points, elevations, lines, areas, contours for the construction studying the morphology of the seabed mapmaking and for construction staking, defining and managing parcels data, as-built and profiling.

-Utilize recourses to the optimum level.

-Use company civil/ survey software for contouring, setting alignments, setting points construction, land division.

-Edits and troubleshoot incoming data collector files in accordance with company procedures.

Processing Survey Data's Using Topcon Tools, Surfer, Sonar XP, etc

-Reviews and utilize survey crew field notes. -Imports verified data into the appropriate CAD drawing file, using company standards point layer management and description keys.

-Prepares survey drawings and documents using company standards, prototypes, templates and blocks.

-Operate digital cameras and download photo files into database and/ or CAD drawings.

-Utilize company scanners to transfer reference maps into CAD files to facilitate utility mapping and property line.

-To perform bathymetric and topographical survey before start of the Projects

-Plotting survey data using AutoCAD 2006-2009

-Processing Survey Data’s Using Topcon Tools, Surfer, Sonar XP, etc.

-Modeling accurate contours

-Advanced at ESRI ArcGIS (ArcMap, Arc Catalogue)

-GPS, wetland vegetation species identification, extensive geological identification skills

-Preparation of survey maps

-Make sure all the survey instruments are working in good condition.

Ali Nishaman Nizar

G. Dhoores Villa, 20132
06th March 1988
(00) 960 778 5767
ali.nishaman@gmail.com

EDUCATION

Cyprus Forestry College (2006 - 2008)

- Adv. Diploma in Forestry

Center for Higher Secondary Education (2004 - 2006)

- Edexcel - G.C.E. A'levels (Statistics, Business, Accounts)
- Cambridge - Certificate in Advanced English

Majeedhiyya School (2001 - 2003)

- Cambridge - O'levels (Mathematics, Economics, Commerce, English, Accounts)

EXPERIENCE

Terrestrial Environment Consultant – CDE Consulting, (July 13 – Present)

- Provides technical assistance to various national and international projects, specifically providing input in areas such as; wetlands, agriculture, forestry, vegetation mapping, mangroves, waste management, composting…etc.
- Working on and contributing to several Environmental Impact Assessment studies.

Local Consultant – Vegetation Expert – Hidria, Spain, (May 13 – Aug 13)

- Worked as a local consultant for Hidria, on developing the Wetland Management Plan for Addu Hithadhoo Eidhigali Kilhli and Gn.Fuvahmulah Bandaara & Dhandimagu Kilhi.

Agriculture Implementation Officer (AIO) – Project Implementation Unit, MOFA (Oct 10 – Jun 13)

- Worked on the "Post-Tsunami Agriculture and Fisheries Rehabilitation Programme" & the "Fisheries and Agriculture Diversification Programme"
- Focal point for forming and mobilizing agriculture cooperatives in island based communities.

Head of Agriculture Research & Extension – Ministry of Fisheries and Agriculture (Jan 10 – Sept 10)

- Lead a team of 5 staff at the Agriculture Research and Extension Section in the Capital city and an additional 15 staff at our regional research centers in the North and South
- Devised agricultural research programs that develop and improve agriculture in a sustainable manner in the country.

Agriculture Officer – Ministry of Fisheries and Agriculture (Aug 08 – Dec 09)

- Handled the "Training & Extension Unit" (Agriculture Division).
- Planned and coordinated all agriculture related training programs in the Maldives on a daily basis according to the staff availability.

National Project Assistant – F.A.O, United Nations (Aug 06 – Oct 06)

- Worked on a Post-Tsunami forest rehabilitation project.
- Worked with international consultants on several aspects of Maldivian forestry, agriculture and especially focusing upon Maldivian Mangrove ecosystems.

WORKSHOPS / SHORT-TERM TRAININGS ATTENDED

- 2009,
    - Workshop on Strengthening Plant Quarantine and Inspection, Male', Maldives, 15-16 July 2009
    - "Awareness of Food Security" Workshop, Male', Maldives, 22nd October 2009
    - Workshop on Updating and Finalization of the Agriculture Development Master Plan (ADMP), Male, Maldives, 21st December 2009

- 2010,
    - Fisheries & Agriculture Diversification Programme, Financial, Procurement & M&E Training, Male', Maldives, 26-28 January 2010
    - Team Leaders Meeting, 8th Virtual University for Small States of the Commonwealth's (VUSSC) International Training and Materials Development Workshop, Singapore, 14-20 April 2010
    - Prevention, Control and Management of Forest Invasive Species in South Asia, (by APFSIN), Male', Maldives, 29th April 2010
    - 8th Virtual University for Small States of the Commonwealth's (VUSSC) International Training and Materials Development Workshop, Male', Maldives, 15-31 March 2011
    - Loan Administration Training, Hdh.Kulhudhuhfushi, Maldives, 3-8 July 2010
    - Workshop to Finalize the Draft Pesticides and Plant Protection Bill, Male', Maldives, 12-13 July 2010
    - International Workshop on Climate Change Extreme Events Adaptation Practices and Technological Solutions, New Delhi, 16-18 August 2010

- 2011,
    - FADIP "Rolling Baseline Survey" Workshop, Male, Maldives, 2-3 March 2011
    - Knowledge Sharing in Asia Workshop #3: Participatory Techniques in the Field, Godavri, Nepal, 30th March 2011 – 2nd April 2011
    - Knowledge Sharing in Asia Workshop #2: Writing to Share Knowledge Effectively, Godavri, Nepal, 3-6 April 2011
    - Consultation Workshop for Facilitators on Cooperatives and Business Development, UNDP Building, Male, Maldives, 21st April 2011
    - AFE's Workshop on "Value Chain Program Design", Chiang Mai, Thailand, 12-16 September 2011
    - Training of Trainers Workshop on Systematization, Nepal, 8-10 December 2011

- 2012,
    - Workshop on Knowledge Management, tools and techniques (as a trainer for the programme), Maldives, 29th November 2012 – 02nd December 2012
    - Partnering 4 Development Forum, UNDP, Paradise Island Resort, 2nd December 2012

- 2013,
    - Consultative Workshop on ICRAF's Capacity Development Strategy & ICRAF's South Asian Partner's Capacity Needs Assessment, BRAC (Bangladesh Rural Advancement Committee) Centre, 30-31 January 2013
    - Certificate in Co-operative Poverty Reduction, Co-operative College of Malaysia, Malaysia, 3-21 March 2013

SKILLS

- ICT Competent (MS Applications, Corel Suite…etc)
- Flexible to travel at any time
- Able to Multi-task and work in stressful conditions
- Able to co-ordinate and work with CBPO's / Co-operatives / NGO's
- Decision Making Skills
- Logistical Planning Skills
- Good Interpersonal Skills
- Training Skills in "Agri-Business", "General Agriculture", "Hydroponics", "Agro-Forestry", "Home-gardening", "Baseline Surveys" and "Co-operatives".

MEMBERSHIPS IN PROFESSIONAL ASSOCIATIONS

- Bluepeace - an Environmental NGO
  - Advisor on environmental and agricultural issues since the year 2009.
  - Participated in several beach and reef cleanup programs.
  - A member since the year 2008.
- United Artists of Maldives - an association focusing on Maldivian Art and Artisans
  - Sits in the Steering committee of UAM as the Media Coordinator, since January 2013
  - Participated in the International Hay Festival Activities held in the Maldives in 2010.
  - A member since the year 2008.
- UN Global Compact Maldives Network - a network of local private sector parties
  - Representative for Addu Meedhoo Cooperative Society
  - Representative for CDE Consulting

REFEREES

- Dr. Ahmed Shaig,
  Director of Environment, CDE Consulting,
  shaig@cde.com.mv
  +9607788758

- Dr. Aminath Shafia,
  Former State Minister, Ministry of Fisheries and Agriculture,
  shafia@fishagri.gov.mv
  +9607792458

LANGUAGE PROFICIENCY

- Fluent in both writing and reading of Dhivehi (mother tongue)
- Fluent in both writing and reading of English

AHMED HAIMAN RASHEED

PERSONAL DETAILS

Full Name:	**Haiman Rasheed, Ahmed**	NIRC:	**A297924**
Gender:	**Male**	Date of birth:	**September 24, 1993**
Place of birth:	**S.Feydhoo, Republic of Maldives**	Nationality:	**Maldivian**

Permanent Address:

Goal Corner
S.Feydhoo 19040
Republic of Maldives

Contact Details**:** **(Mobile): +960 7684393**

Email for correspondence: **haiman@cde.com.mv**

EDUCATION

Year	Name of Education Institute	Title of Qualification	Status
2007 – 2009	**DHARUMAVANTHA SCHOOL**	**GCE / IGCSE O' Level under the curriculum of University of Cambridge**	**Graduated**

EMPLOYMENT HISTORY

Time Period	**Position Held, Employee**	**Task assigned**
February 2014 – present	Associate Consultant, CDE Consulting	- Marine surveying (Conducting inspections, surveys & examinations of reefs) - Beach surveying - Compiling Marine reports (Prepare reports on types of surveys conducted
August 2013 – February 2014	Assistant technician, Ministry of Fisheries and Agriculture	- Designing the structure of FAD (Fish Aggregating Device) - Research on the status and pelagic fishes found near FADs
January 2011 – January 2012	Research officer, CDE Consulting	- Marine surveying (Conducting inspections, surveys & examinations of reefs) - Beach surveying - Compiling Marine reports (Prepare reports on types of surveys conducted
December 2009 – June 2010	Research officer, CDE Consulting	- Marine surveying (Conducting inspections, surveys & examinations of reefs) - Beach surveying - Compiling Marine reports (Prepare reports on types of surveys conducted)

REFERENCES

Name	Address, Telephone & Fax	Email, Occupation & Business Title
Ahmed Shaig, PhD	**CDE Pvt Ltd** **4th Floor, Orchidmaage** **Ameer Ahmed Magu, Henveiru** **Male', Maldives** **(Telephone): +960 3312514** **(Fax): +960 3315926**	**Director** **CDE Pvt Ltd** **info@cde.com.mv**
Ahmed Yameen	**Ministry of fisheries and agriculture** **7th Floor, velaanaage** **Ameer Ahmed Magu, Henveiru** **Male', Maldives** **(Telephone): +960 3322625** **(Fax): +960 3326558**	**Assistant director**

Mohamed Faizan

Contact Details

Address: H. Pent Land,
Lansimoo Goalhi,
20041 Male',
Maldives

Tel: +960-7501205

E-mail: Faizan@cde.com.mv

Education

August 2012 – October 2014 University of Malaya, (Malaysia)
- Master of Technology (Environmental management)
- Dissertation title "Study on the impact of anthropogenic pressure on coral reefs around Cape Rachado, Malacca and recommendations to improve its management"

July 2006- June 2010 International Islamic University Malaysia, (Malaysia)
- Bachelor of Biotechnology (Honours).
- Final year thesis title "Spatio-temporal study on coastline changes along Tanjung Lumpur – Cherok Paloh Coast".

June 2002 – June 2004 Centre for Higher Secondary School, (Maldives)
- GCE Advanced level.

January 1997 – February 2002 Majeediyaa School, (Maldives)
- GCE Ordinary level.

Employment History

July 2014 – Present CDE Consulting
- **Environmental Consultant** at CDE Consulting. Roles and responsibilities include preparation of Environmental Impact Assessment reports, undertaking environmental baseline surveys, and conduct environmental monitoring.

June 2010 – July 2012 CDE Consulting
- **Environmental Consultant** at CDE Consulting. Responsibilities included undertaking environmental baseline studies for Environmental Impact Assessments, and environmental monitoring. In addition, co-ordination of field surveys.

February 2005 – April 2006 Integrated Climate Change Strategy
- **Project Assistant** for the Integrated Climate Change Strategy implemented by Ministry of Environment, Energy and Water (Maldives).
- Responsibilities included assisting the project manager, in preparation of financial reports, organizing workshops.
- Helped launch monthly newsletter on climate change "Nakaiy".

EIA experience

Environmental Impact Assessment (EIA)	Proponent	Date
EIA for the proposed Malé-Hulhulé bridge - Undertook the marine baseline assessment surveys, and prepared marine assessment report	Ministry of Housing and Infrastructure	July 2015
EIA for the proposed redevelopment of of Nasandhuraa Palace Hotel - Undertook the marine baseline assessment surveys	Nasandhura Palace Hotel Investments Private Limited	June 2015
EIA for the proposed resort development in Madivaru,Kaafu Atoll - Undertook the marine baseline assessment surveys	Shuaz Investment Private Limited	May 2015
EIA for the proposed Coral Reef rejuvenation project at Velaa Private Island - Undertook the baseline assessment surveys, including stakeholder consultations. Complied the EIA report.	Velaa Private Island	March 2015
EIA for the proposed Coral Gardening at Shangri-La's Villingili Resort & Spa - Undertook the baseline assessment surveys, including stakeholder consultations. Complied the EIA report.	Shangri-La's Villingili Resort & Spa	February 2015
EIA for the proposed sewerage system project at Kanditheem, Shaviyani - Marine environment assessment and report for the EIA	Male' Water and Sewerage Company Pvt Ltd	April 2014
EIA for the proposed beach replenishment project in Holiday Inn Resort Kandooma, Maldives, South Male' Atoll - Marine environment assessment and report for the EIA	Holiday Inn Resort Kandooma Maldives	April 2014
EIA report for the proposed sewerage system at Maduvvari, Raa Atoll - Undertook the baseline assessment surveys, including stakeholder consultations. Complied the EIA report.	Mr. Ibrahim Shazyl, Venture Maldives Pvt Ltd	February 2012
EIA report for the proposed installation and operation of desalination plant at Hithaadhoo, Baa Atoll - EIA report compilation.	Mr. Ismail Shafeeu, Static Company Pvt Ltd	January 2012

EIA report for the proposed Solid Waste Management facility at Thilafushi - Baseline marine assessments and EIA report compilation.	Tatva Global Renewable Energy (Maldives) Private Limited	December 2011
EIA for the development of a domestic airport on Koodoo, GA. Atoll - Undertook baseline assessments for the EIA, and prepared the existing environment chapter for the EIA.	Bonavvista (Maldives) Private Limited Singapore	October 2011
EIA prepared for the proposed harbor entrance channel dredging project in Bodufolhudhoo Island, North Ari Atoll - Undertook the baseline assessments for the EIA, and prepared the existing environment chapter of the EIA and compiled the overall EIA report.	Ministry of Housing and Environment	August 2011
EIA prepared for the proposed re-development – phase I of Gasfinolhu Island Resort, Kaafu Atoll, Maldives - Baseline marine assessments and report preparation for the EIA.	Mr. Hussain Afeef	July 2011
EIA prepared for the proposed re-construction of Shaviyani Foakaidhoo Harbour - Undertook the marine baseline assessments and, prepared the marine assessment report for the EIA.	Ministry of Housing and Environment	March 2011
EIA for the sewerage system development in N. Miladhoo - Marine environment assessments	Works Corporation Limited	September 2010

Mohamed Ali

ID #: A 094918
Nationality: Maldivian
Languages: English, Sinhalese, Dhivehi
Date of Birth: 13/09/1983
Telephone: 960-790-6007
Email: mohamed.ali@cde.com.mv

Experience

Marine Environmental Specialist June 2011- Present
CDE Consulting

Marine Environment Officer July 2008 – May 2011
Banyan Tree Vabbinfaru

Freelance Lobster Hunter, Shark Fisherman Jan 2007 - July 2008
Laamu Atoll

Dock Assistant Sep 2006 - Jan 2007
Tourist Submarine Maldives

Education and Certifications

PADI Rescue Diver June 2011
PADI Enriched Air Diver June 2011
Emergency First Responder May 2011

Basic Computer Science 2001 - 2006
Singapore Informatics, Colombo Sri Lanka

Profile

I am very passionate about protecting the marine environment. After having worked as both a fisherman and a marine environment officer I am aware of the impact that human activity has on our fragile marine environment. My favorite activities are reef monitoring and planting coral gardens. With my undying passion for the underwater world and also with my vast experience diving all over the Maldives, educating people on the marine environment is my greatest mission, to ensure the preservation and protection of our most valuable treasure. Furthermore, I have got the opportunity to work besides the greatest marine experts in the world namely Prof. J.E.N. Veron,Dr. Norman Queen and Dr. Daphne G. Fautin.

References

N.D. Abdul Azeez Abdul Hakeem
Former Director of Conservation
Mobile: + 960 7784263
Banyan Tree Maldives

Dr. Steve Newman
Former Marine Lab Manager at Banyan Tree
steve.newman@ncl.ac.uk

Robert James
Former Marine Lab Manager at Banyan Tree

Shahdha

Sustainable Development Consultant
CDE Consulting Pvt Ltd
Phone: +960 9700169 E-Mail: shahdha@cde.com.mv

Professional Experience

Sustainable Development Consultant

CDE Consulting Private Limited, Male', Republic of Maldives. **1 March 2015- Present**

- Experience

Environmental Impact Assessments

- EIA for the proposed test drilling For Hulhule'-Male' Bridge construction project
- EIA for the proposed redevelopment of Nasandhura Palace Hotel, Male'
- EIA for the proposed Hulhule'-Male' Bridge Project
- EIA for the proposed construction of a 9-storey building at the compound of ADK Hospital, Sosun Magu, Male', Maldives
- EIA for the proposed tourist development project at Madivaru Island, Kaafu Atoll
- EIA for the proposed land reclamation and resort development project in Ithaafushi Reef, South Male' Atoll
- EIA for the proposed resort development in Bodukaashihuraa, Alifu Dhaalu Atoll, Maldives

Surveys

- Maldives Visitor Survey 2015 for the Ministry of Tourism
- Maldives Democracy Survey 2015 for International Foundation for Electoral Systems (IFES)

Environmental Monitoring Projects

- Environmental and Social Performance Annual Monitoring 2014 for Shangri-La's Vilingili Resort & Spa, Addu Atoll, Maldives

- Key Skills and Competencies

- Ability to interpret environmental laws and regulations and act accordingly
- Sound knowledge of environmental management procedures and assessment of risk
- Solid understanding of waste management, climate change, disaster prevention and mitigation, and coastal environment and processes
- Profound knowledge of sustainable development issues
- Ability to assess and analyze complex social problems
- Competent in identifying and communicating with stakeholders
- Skilled in data collection, analysis and report writing

Clinical Assistant

Indhira Gandhi Memorial Hospital, Male, Republic of Maldives **February 2010- December 2011**

Relief Teacher

HDh. Atoll School, HDh. Vaikaradhoo, Republic of Maldives **July 2009- November 2009**

Academic Qualifications

Bachelor of Environments 2012-2014

Major: Environmental Geographies, Politics and Cultures,

The University of Melbourne, Melbourne, Victoria, Australia.

Advanced Level Edexcel Examination

Higher Secondary Certificate (HSC) Examinations 2007-2009

Center for Higher Secondary Education, Male', Republic of Maldives

Cambridge GCE O-level

IGCSE Examinations

Secondary School Certificate (SSC) Examination 2004-2006

Cener for Higher Secondary Education, Male', Republic of Maldives

Achievements

- Dean's Honours Award for outstanding academic achievement in 2014 (University of Melbourne) 2014
- Australian Development Scholarship 2011
- Fourth place among the National Top 10 Achievers in the Higher Secondary School Completion Examinations 2009 2009
- Second place among the National Top 10 Achievers in the Secondary School Completion Examinations 2006
- Best All Round Student of H Dh. Atoll School 2006
- Haveeru Atolls Scholarship Award 2007-2009
- School Captain at H Dh. Atoll School.
- Student Association's Vice President in 2006 at H Dh. Atoll School 2006
- Deputy and Acting School Captain in 2005 at H Dh. Atoll School
- Student Association's President in 2005 at H Dh. Atoll School 2005

Professional Development and Memberships

- Member of the University of Melbourne Australian Awards Club 2013- 2014
- Participated in the Women's Mentoring Network at the University of Melbourne 2013
- Completed a 21 hours course on Standard First Aid at the Faculty of Health Sciences, Maldives College of Higher Education 2010
- Member of the Science Club at the Center for Higher Secondary Education 2007-2009
- School Prefect Board member at the H Dh. Atoll School 2004-2006

Computer Skills

- Experienced in using Microsoft office Word, Excel, Powerpoint and Project.

Language Skills

	Understanding	Speaking	Writing
▪ **English**	Excellent	Excellent	Excellent
▪ **Dhivehi**	Excellent	Excellent	Excellent

APPENDIX F –Stakeholder Consultation Notes

Minutes of Meeting

Date/ Time: - 04 Jan 2016 14:00 MWSC

Scope: CMFB Project – Water Supply Requirements

Attendees:

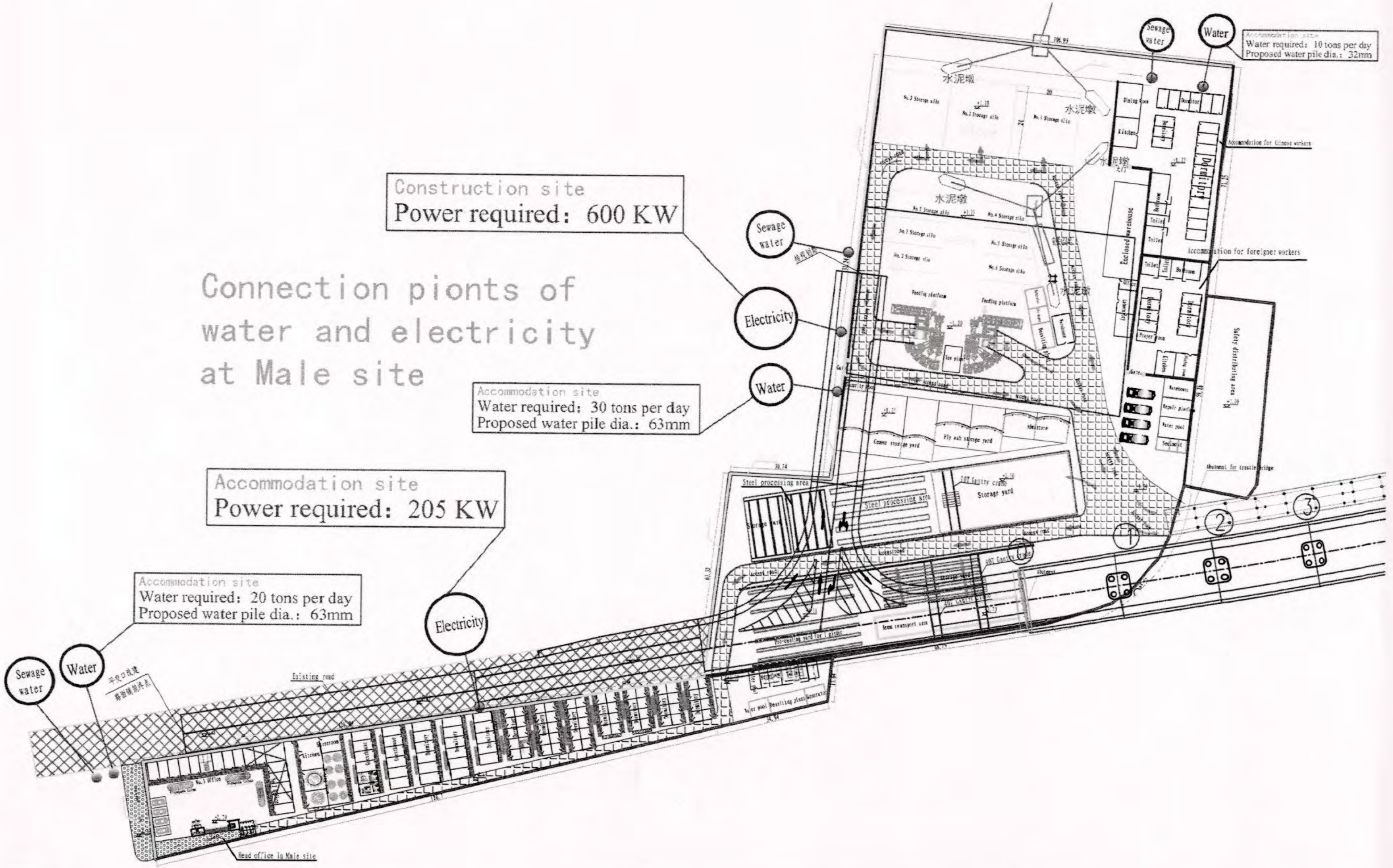
Mohamed Imran Adnan – Engineering Manager – MWSC
Ismail Ibrahim – CMFB Project Director – MHI

Points of Discussion:

- As the Contractor for CMFB has mobilized, to expedite project MHI wanted to clarify whether MWSC could provide the water required by the Contractor for work and campsite requirements at their Male' site noting the impracticality of establishing a plant on Male'.
- The indicative figures of water required by the Contractor for the Male' site was given as 60 tons per day.
- MSWC confirmed that meeting this requirement would not be an issue but that concessional rates sought by MHI and the Contractor will have to be decided through detailed discussions.

Ismail Ibrahim

Connection pionts of water and electricity at Male site



APPENDIX G – Letter of Commitment to Monitoring

بسم الله الرحمن الرحيم

Ministry of Housing and Infrastructure
Male', Republic of Maldives.

މިނިސްޓްރީ އޮފް ހައުސިންގ އެންޑް އިންފްރާސްޓްރަކްޗަރ
މާލެ، ދިވެހިރާއްޖެ.

Date: 17th January 2016

No: 138-PIS1/203/2016/16

Environmental Protection Agency
Ministry of Environment and Energy,
Ameenee Magu, Maafannu, Male', 20392,
Maldives.

Sub: Addendum 1 of Male'- Hulhule Bridge EIA:

As the proponent of the project, we guarantee our commitment to finance and implement all construction mitigation and the monitoring program as specified in the report.

Signature:

Name: Fathimath Shana Farooq

Designation: Director General