ENVIRONMENT IMPACT ASSESSMENT

FOR THE PROPOSED

LAND CLEARING AND TREE RELOCATION
PROJECT

IN FULHADHOO ISLAND, BAA ATOLL

February 2018

Prepared for
Fulhadhoo Island Council, Baa Atoll
Male’, Maldives

Consultant
CDE Consulting, Maldives
2018

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<tr>
<td>COADS</td>
<td>Comprehensive Ocean-Atmosphere Data Set</td>
</tr>
<tr>
<td>DO</td>
<td>Dissolved Oxygen</td>
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<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<tr>
<td>GPS</td>
<td>Global Positioning System</td>
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<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
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<td>IPPC</td>
<td>International Plant Protection Convention</td>
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<tr>
<td>IUCN</td>
<td>International Union for Conservation of Nature</td>
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<td>KWp</td>
<td>Kilowatt peak</td>
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<td>MCM</td>
<td>Millenium Capital Management Private Limited</td>
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<td>MEE</td>
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<td>Ministry of Tourism and Civil Aviation</td>
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<td>MSL</td>
<td>Mean Sea Level</td>
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<td>MWSC</td>
<td>Maldives Water and Sewerage Company</td>
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<td>National Adaptation Programme of Action</td>
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<td>United Nations Framework Convention on Climate Change and the Kyoto Protocol</td>
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Acknowledgement

The lead author of this report is Dr. Ahmed Shaig.

Additional assessments were undertaken by the following team members.

Mr. Mohamed Faizan (Marine assessment)

Ms. Shahdha (Socioeconomic assessment)

Mr. Ali Nishaman (Terrestrial surveying)

Ms. Aminath Inan Abdul-Muhsin (stakeholder consultation)

Mr. Ali Moosa Didi (Bathymetry surveys)

Ms. Fathimath Shuhaina (Marine Surveying)

Mr. Ahmed Mahid (Marine surveying)

The curriculum vitae’s of the EIA consultants are attached in Appendix I 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. Ahmed Shaig
Proponent’s Declaration

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(Please refer to Appendix J)
Executive Summary

The purpose of this document is to fulfill the requirements to get necessary environmental clearance from the Environmental Protection Agency (EPA) to carry out the proposed land clearing and tree relocation project at Fulhadhoo Island, Baa Atoll. The proponent of the project is B.Fulhadhoo Island Council.

This EIA also serves as a document to be submitted to Ministry of Tourism (MoT) to transport trees from Fulhadhoo to Bolidhuffaru Reef reclamation project. An EIA has already been approved for Bolidhuffaru Resort project. However, the report excludes landscaping components, as the vegetation source islands were not identified at the time. The original EIA recommended preparing EIA Addendums when the vegetation source islands were identified. MoT now accepts reports submitted to EPA (and Decision Notes) if the project boundaries span multiple agency jurisdictions. Hence this report and Decision Note will be submitted to MoT to seek construction approval for landscaping.

Fulhadhoo Island is in need for land clearing to create an access road to the western end of the island. The island council requires removing the vegetation within the road footprint but has been unable to do so due to the need for heavy equipment. The landscaping contractors for Bolidhuffaru Resort development project approached the Island Council with an offer to clear the required land in return for the opportunity to transport the trees to Bolidhuffaru for transplantation. The aim of the project from proponent’s perspective are to create the planned ring road around the island and assist in better access to the western sand spit for the booming guest houses on the island. From the contractor’s perspective the aim is to acquire a portion of the native landscaping plants required to landscape Bolidhuffaru Resort.

The project has three main components: (i) Vegetation removal; (ii) transplantation, and (iii) demobilization and clean-up. Vegetation removal involves mobilization and site setup, identifying and marking areas to be cleared, and vegetation uprooting and backfilling. Transplantation involves site preparation at receiving site, transporting trees, transplantation and maintenance. The final component is demobilizing equipment and cleaning up the sites.

The proposed site for land clearance is located on the undeveloped western part of Fulhadhoo island. The vegetation in this part of the island is modified with forestry areas. The proposed site (road) for vegetation removal contains both forestry areas and natural vegetation zones. The proposed dredging site has been dredged before and is currently used as a basin. The site is predominantly made up of coral sand and does not contain any live coral colonies.
All project designs are in conformance to most of the laws and regulations of the Maldives, and relevant international conventions that Maldives is party to. The key laws and regulations applicable to this project are: Environmental Protection and Preservation Act, Environmental Impact Assessment Regulation 2012, Tourism Related Environmental Impact Assessment Regulation 2015, Waste Management Regulation, Regulation on Cutting Down and Uprooting Trees, and Dredging and Reclamation Regulation. The project at present is non-compliant to some of the clauses in Dredging and Reclamation Regulation. Due to the geography of the island, the proposed borrow site falls within 500 m of the reef edge, same as most of the dredging works done on the island so far. A section of the site falls within 50 m of shoreline but it has to be noted that there is an existing basin within this distance. Project will require special consideration and approval from EPA on grounds of high socio-economic benefits. EPA has the authority to provide approval in exceptional circumstances. Additional approvals are required from EPA for land clearing and dredging and reclamation before commencement of project activities.

The most significant impact of this project is the impact on terrestrial biodiversity. It is anticipated that approximately 245-260 trees and plants, including 135-150 palms may need to be removed from Fulhadhoo during land clearing. All trees that are useable for replanting will be transferred to Bolidhuffaru resort and replanted. Impacts will also be felt on marine biodiversity due dredging and associated direct removal of marine flora and fauna, turbidity and sedimentation; contamination of marine and ground water and soil due to accidental spillage/leakage of fuel and waste; salinization of ground water due to use of dredged sand for backfilling and risks to the health of construction workers. There will also be positive impacts on the island community due to improved access to the western beach of the island and subsequent improvement in guesthouse businesses, and in the form of employment and business opportunities.

Mitigation measures have been proposed to minimise anticipated impacts. These include replanting two trees for every tree removed from the island at designated areas in Fulhadhoo Island, storing the vegetation removed in a nursery, making reusable green waste available for the community, and restricting excavator movement within predefined routes.

This report has evaluated alternative options for the most significant anticipated impacts. The options evaluated include the ‘No project’ option, alternative locations for borrow sites, alternative tree relocation sites, and alternative green waste disposal options. Since land clearing for road development is a necessity for the island and the disadvantages of not using the opportunity to transplant the trees are higher than the advantages it presents for the Island
Council, it is recommended to proceed with the project with the mitigation measures proposed in this report.

Consultations were carried out with members of Fulhadhoo Island Council. Island community of Fulhadhoo, Baa Atoll Council, Baa Atoll Biosphere Reserve Office, Ministry of Tourism, Ministry of Housing and Infrastructure, Ministry of Environment and Energy, project contractor, and Boldhuffaru Resort Developer. Fulhadhoo Island Council and Fulhadhoo public were very welcoming of the project as it is believed that the project will benefit the entire community.

The Environmental Management Plan (EMP) for this project is designed to produce a framework for anticipated impacts, including practicable and achievable performance requirements and systems for monitoring, reporting and implementing corrective actions. In addition, it will also provide evidence of compliance to legislation, policies, guidelines and requirements of relevant authorities.

Monitoring plan is designed to assess any changes to the physical environment as a result of the project activities. Environmental monitoring cost of pre-construction stage (if required) is approximately MVR 35,000. Monthly environmental monitoring cost during the construction phase is MVR 25,000.

The main conclusion of this report is to move forward with the proposed development on grounds of high socio-economic benefits.

Environmental and socio-economic risks associated with the project are expected to be significantly reduced if the mitigation measures and monitoring programme presented in the report are properly implemented within the framework of the environmental management plan.
EIA for the proposed Land Clearing and Tree Relocation Project in Fulhadhoo, Baa Atoll

Page|xvi

Prepared by: CDE Consulting
EIA for the proposed Land Clearing and Tree Relocation Project in Fulhadhoo, Baa Atoll

Prepared by: CDE Consulting
1 INTRODUCTION

1.1 Purpose of the EIA

This Environment Impact Assessment (EIA) report is an evaluation of the potential environmental, socio-economic and natural impacts of the proposed land clearing and tree relocation project at Fulhadhoo Island, Baa Atoll. The project is proposed by Fulhadhoo Island Council, Baa Atoll. Land clearing being undertaken on B. Fulhadhoo Island and some of the vegetation is being relocated to Boludhiffaru Reef reclamation project. The EIA consultant is CDE Consulting Private Limited.

This document has been developed based on the Terms of Reference (Appendix A) issued by the Environmental Protection Agency (EPA) on 18 December 2017 following scoping meeting held on the same day. This document is submitted to EPA by the proponent to fulfil the requirements of Environmental Protection and Preservation Act (EPPA) of the Maldives (4/93), more specifically the clause 5 of the Act, which states that a report should be submitted before implementation of any project that may have a potential impact on the environment.

This EIA also serves as a document to be submitted to Ministry of Tourism (MoT) to transport trees from Fulhadhoo to Bolidhuffaru Reef reclamation project. An EIA has already been approved for Bolidhuffaru Resort project. However, the report excludes landscaping components as the vegetation source islands were not identified at the time. The original EIA recommended preparing EIA Addendums when the vegetation source islands were identified. MoT now accepts reports submitted to EPA (and Decision Notes) if the project boundaries span multiple agency jurisdictions. Hence this report and Decision Note will be submitted to MoT to seek construction approval for landscaping.

1.2 Legal Status of Land

The proposed land has been earmarked for the road development and is owned by the state. All common property resources falling within the proposed clearing footprint is also owned by the state. The Council confirms that there is no private or common property resource that requires compensation within the proposed project footprint.

Ministry of Housing and Infrastructure (MHI) has provided approvals for the land clearance and allocation for housing (See Appendix C).

Approved land use plan of the island is presented in Annex I.
1.3 Project Proponent

The proponent of this project is by Fulhadhoo Island Council, Baa Atoll.

Contact details for the proponent are:

Fulhadhoo Island Council Idhaaraa
Fulhadhoo, Ball Atoll
Tel: +(960) 6600005

1.4 Background and Rationale of the Project

Fulhadhoo Island is in need for land clearing to create an access road to the western end of the island, as part of an overall ring road. At present, there is an existing narrow road that does not align with the island land use plan. Council requires removing the vegetation within the footprint of the planned ring road but has been unable to do so due to the need for heavy equipment.

The landscaping contractors for Bolidhuffaru Resort development project approached the Island Council with an offer to clear the required land in return for the opportunity to transport the trees to Bolidhuffaru for transplantation. Bolidhuffaru resort development project is being developed by reclaiming land from the lagoon and requires about 3000-5000 plants to landscape the island. Trees and plants are to be sourced from various islands across Maldives and from overseas. Goidhoo, Fulhadhoo and Fehendhoo have been identified as an area to transplant trees from.

The requirement for land clearing on Fulhadhoo and the need to reuse removed trees for landscaping on another island presents a mutually beneficial arrangement and environmentally friendly method to prevent permanent biodiversity loss.

1.5 Project Scope

The overall project involves the land clearing and transplanting trees from Fulhadhoo to Bolidhuffaru Resort.

The project components are as follows:

Component I – Vegetation Removal

1. Mobilization and site setup
2. Identifying and marking areas to be cleared
3. Vegetation uprooting and backfilling

Component II – Transplantation
1. Site preparation at receiving site
2. Transporting trees
3. Transplanting and maintenance

Component III – Demobilization and clean up

1.6 Aim and Objectives

The aim of this project is to clear land for a section of the planned ring road on Fulhadhoo Island.

The objectives of the project from the Proponents’ perspective are to:

- Creating the planned ring road around the island
- Assist in better access to the western sand spit for the booming guest houses on the island.

The objectives of the project from the Contractors’ perspective are to:

- Acquire a portion of the native landscaping plants required to landscape Bolidhuffaru Resort.

1.7 Project Location

Fulhadhoo Island is located on the northern rim of Goidhoo Atoll. Goidhoo Atoll is a separate natural atoll located with the administrative unit of Baa Atoll (see Figure 1.2). The total population of Fulhadhoo was 174 persons at the time of most recent census (Census 2014).

Table 1.1 provides a summary of the basic information about Fulhadhoo Island.

The proposed project site is located on the western half of Fulhadhoo Island. The locations for the proposed site are presented in Appendix B. Site location map and satellite image is presented in Figure 1.1 and Figure 1.3 respectively. Figure 1.2 shows the sensitive environments with in the vicinity.

The proposed relocation sites are located on Bolidhuffaru Reef. It is a newly reclaimed island to develop a tourist resort. At the moment the island is a barren land which is in its reclamation phase. Table 1.2 provides a summary of basic information about Bolidhuffaru Resort.
### Table 1.1: Summary of basic information about Fulhadhoo

<table>
<thead>
<tr>
<th>Island Name</th>
<th>Fulhadhoo Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>72°55'55.736&quot;E, 4°53'7.131&quot;N</td>
</tr>
<tr>
<td>Island Area</td>
<td></td>
</tr>
<tr>
<td>Within Vegetation Line</td>
<td>24.8 Ha (1.57 sq km)</td>
</tr>
<tr>
<td>Within Low Tide Line</td>
<td>27.44 Ha (1.63 sq km)</td>
</tr>
<tr>
<td>Built-up area</td>
<td>6.42 Ha</td>
</tr>
<tr>
<td>Length</td>
<td>About 1,766 m</td>
</tr>
<tr>
<td>Width at the widest point</td>
<td>About 246 m</td>
</tr>
<tr>
<td>Distance to Male’ City</td>
<td>About 97 km</td>
</tr>
<tr>
<td>Distance to Bolidhuffaru Reef</td>
<td>About 99 km</td>
</tr>
</tbody>
</table>

### Table 1.2: Summary of basic information about Bolidhuffaru Reef

<table>
<thead>
<tr>
<th>Reef Name</th>
<th>Bolidhuffaru Reef</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>73°23'21.9&quot;E, 4°5'4.9&quot;N</td>
</tr>
<tr>
<td>Reef Area</td>
<td></td>
</tr>
<tr>
<td>Overall area (within visible depth)</td>
<td>345 Ha</td>
</tr>
<tr>
<td>Within shallow reef</td>
<td>187 Ha (1.8 sq Km)</td>
</tr>
<tr>
<td>Final Reclaimed Land</td>
<td></td>
</tr>
<tr>
<td>Within mean tide line</td>
<td>About 35 Ha</td>
</tr>
<tr>
<td>Length</td>
<td>About 2400 m</td>
</tr>
<tr>
<td>Width at the widest point</td>
<td>About 1700 m</td>
</tr>
<tr>
<td>Distance to Hulhule Int. Airport</td>
<td>About 19 km</td>
</tr>
<tr>
<td>Distance to Male’ City</td>
<td>About 17 km</td>
</tr>
<tr>
<td>Distance to nearest resort</td>
<td>About 0.7 km to Jumeirah Vittaveli</td>
</tr>
<tr>
<td>Initial estimated number of Keys</td>
<td>288</td>
</tr>
</tbody>
</table>
Figure 1.1: Location map of Fulhadhoo Island
Figure 1.2: Locality map showing nearby islands and registered environmentally sensitive areas
Figure 1.3: Satellite Image of project site
Figure 1.4: Location Map fo Bolidhuffaru reef
1.8 Consultants, Contractors and Government Institutions

All the EIA related work is undertaken by consultants from CDE Consulting. Design criteria and technical specifications for landscaping at Bolidhuffaru Reef were prepared by Topo Design Studio. The contractor for the project is Salted Fibre Private Limited.

The Government agency relevant to this development is Ministry of Housing.

All coordination related to the project will be carried out by special project team established by the proponent.

1.9 Project Financing

It is estimated that the project will cost around Rf 550,000. No donor agencies are involved in this project. The project will be funded by Salted Fibre Pvt Ltd. The arrangement between Island Council and Salted Fibre is that the company will undertake land clearing, levelling and disposal of green waste at their own costs, in return for the opportunity to reuse the trees and transplant them to a site of their choice.

1.10 Scope and Terms of Reference of EIA

The scope of this EIA is broadly based on the Environmental Impact Assessment Regulations 2007. The assessment more specifically adheres to the Terms of Reference (ToR) issued by the Environmental Protection Agency on 18 December 2017. The ToR is based on scoping meetings held between the stakeholders on the same day. 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, implementation schedules, site plans and summary of project inputs and outputs (Chapter 1&2).

A description of the pertinent national and international legislation, 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).

Assessment of alternatives for the proposed project (Chapter 6)

Details of the environmental monitoring plan (Chapter 7).

Potential gaps in information (Chapter 8)

Main conclusions (Chapter 9)

1.11 Assessment Methodology

1.11.1 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 project at the preconstruction, construction, operation and demobilising stages 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.

Much of the baseline information for this study is based on the original EIA. The rest of this section summarises the methods used in the original EIA.

1.11.2 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 that the entire island the immediate lagoon may be affected by the development and that Fulhadhoo population will experience the bulk of the socio-economic change.
Based on the results of the initial scoping of potential environmental impacts and the identification of sensitive aspects of the environment we have identified the following geographical areas likely to be affected at the various stages of the Project:

- During mobilization, vegetation removal and transportation, a zone of about 10-15 m from the removal and transportation footprint may be affected.
- During operation of the island most impacts will be confined to the area that will be affected by construction impacts.
- There will also be induced development impacts due to the project, mainly in the form of positive socio-economic benefits to locals.

Study area boundary is presented in Figure 1.5 and survey locations map for the project is attached in Appendix E.

1.11.3 Field Observations

Field assessments were undertaken in Fulhadhoo between 25 and 29 December 2017. Field visits mainly covered water quality, flora, fauna, soil conditions, marine environment and lagoon condition of the proposed project sites. In addition, stakeholder consultations were carried out in
Fulhadhoo Island during the trip. Consultations were carried out with Atoll Council representative on 28 December 2017.

*Coastal Processes*

Beach profiles were taken from designated locations around the island using standard levelling techniques. These profile locations are marked in Appendix E. The measurement of beach profiles involves standard practice of surveying with a staff and a dumpy level. Measurements were taken along the beach profile line at different intervals, wherever there occurred a distinctive morphological feature, such as beach ridge, high water mark, an erosion scarp, dip, rise, or other significant break in the beach slope up to a minimum distance of 30 m from the Benchmark. Other beach attributes such as beach rock were marked using handheld GPS.

Lagoon currents were measures using drogue method. About 3 measurements were undertaken from every site and an average value is determined.

Tide data has been taken from Male’ International Airport Tide Gauge.

*Marine Assessments*

*Manta tow survey*

Manta tow survey was conducted to determine the general benthic cover and reef condition along the study area. A snorkeler (observer) was towed behind a slow moving boat, along the reef edge for a series of set periods of 2 minutes. At each stop the observed noted down the estimate percentage coverage of live corals, dead corals, dead corals, sand/silt and rubble along the tow area. The GPS coordinates were recorded at the start and end of each new tow.

*Photo Quadrat Survey*

The benthic composition of the substrate was assessed by taking ten high-resolution images every 5 m (pictures covering 0.5m2 of the seabed) along the same transect line used for the fish surveys. These were later analysed using CPce. CPce, or Coral Point Count with excel extension, developed by the National Coral Reef Institute, is software designed to determine coral community coverage and diversity using transect photographs. Underwater photographic frames are overlaid by a matrix of randomly generated points, and the fauna/flora of species or substrate type lying beneath each point is identified. 20 random points per picture were analysed to characterize the substrate composition (sample size: 200 points per transect).
Fish census

Fish census was carried at each line transect survey location. All fishes observed along 50 m belt transect at each site was recorded and their abundance recorded as follows: Single (1), Few (2-10), Many (11-100) and Abundant (>100).

Timed swim

Timed swim carried out at three locations, to qualitatively determine the benthic substrate composition at these locations. Swims were timed at 5 minutes, during which two observed swam across the site noting down the main benthic substrates, seagrass and coral species observed. Three replicate swims were made at each site.

Water Quality

Water quality parameters were assessed from MWSC laboratory and onsite using a multi-parameter probe. Water quality samples were taken at different locations selected based on proposed developments. Parameters measured include electrical conductivity, total dissolved solids (TDS), salinity, pH, temperature, and dissolved oxygen (DO). Nitrates, nitrites and phosphates were analysed at the Public Health Laboratory which uses methods prescribed in “Standard Methods for Examining Water and Wastewater”. pH, Salinity and TDS was tested onsite using a multi-parameter probe. Samples were collected in clean 1.5L PET bottles after washing them with the water to be sampled. Water samples were collected at mid depth. Biological samples were collected in sterilized 100 ml glass bottles provided by the Public Health Laboratory.

Terrestrial Flora and Fauna

Terrestrial fauna was limited to visual observations during the period of the survey.

The main methodology used for vegetation assessment was vegetation transect method and remote sensing. 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.

The second method used was remote sensing technology. A high resolution satellite image was used to classify the island vegetation. An extensive grid of ground truthing data were established and manual classification was carried out based variations in colour band combinations. The classification system used was devised for small coral islands by CDE Consulting and has been tested in other similar assessment.
The specified classes for this assessment (see the following sections) ensured that these errors were kept to a minimum by using identifiable classes. Error levels for coconut groves and coastal vegetation particularly strand vegetation are very low with a confidence level of over 90%. Error Levels for mixed vegetation are high with confidence level around 70%. The ground truthing grid data is used partly as manual training data. The team which undertook this assessment has experience in mapping other coral islands which also reduces the interpretation errors significantly. The goal for this assessment is not to give an exact classification but to provide a crude estimate of the entire vegetation system. This method is to some extent better than the limited transect data method currently used in the EIAs of Maldives. The error levels for this exercise are well within acceptable range for the objectives at hand.

1.11.4 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:

- Baa Atoll Biosphere Reserve related studies
- EIA for coconut palm relocation from Maalhos Island, Baa Atoll by CDE Consulting
- Terrestrial Ecosystem monitoring Study for North Province
- Island development plans of Fulhadhoo
- EIA for Goidhoo Harbour Rehabilitation
- Survey of climate change adaptation measures
- Relevant regulations, including dredging and reclamation regulation, Dewatering Regulation and Regulation on cutting down and uprooting trees.

1.11.5 Public and Key Stakeholder Consultation

Stakeholder consultations were undertaken with the following stakeholders:

- B. Fulhadhoo Island Council
- B.Fulhadhoo Island Public
- B. Atoll Council
- Ministry of Environment and Energy
1.11.6 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.

1.11.7 Report Format

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

1.12 Study Team Members

The team members of this EIA are:
Dr. Ahmed Shaig (EIA and coastal environment Specialist)
Mr. Ali Nishaman (Terrestrial Environment Expert)
Mr. Mohamed Faizan (Marine Environment Specialist)
Ms. Shahdha (Socioeconomic assessment)
Mr. Mohamed Ali (Marine Surveys)
Mr. Alim Mossa Didi (Bathymetry Surveys)
Ms. Fathimath Shuhaina (Marine surveys)
Ms. Aminath Inan Abdul-Muhsin (stakeholder consultation)

The curriculum vitae’s of the EIA consultants are attached in Appendix J of this report.

1.13 Limitations of the study

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 noted earlier, there is also no long term data and information regarding the particular site under consideration, which makes it
difficult to predict impacts. However, the level of uncertainty is partially minimised due to the experience of resort and operation in similar settings in the Maldives. Nevertheless, 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.

The table below summarizes the limitation of this study.

*Table 1.3: Limitation of the study*

<table>
<thead>
<tr>
<th>Issue/Item</th>
<th>Required Information</th>
<th>Current Status / action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exact Number of trees in the clearing site</td>
<td>Exact count of trees to be remove; It is impractical to count the total number of trees to be removed as some of these areas have dense vegetation. The only way to physically count them is to cut down undergrowth which is not recommended for environmental reasons.</td>
<td>Best-guess estimate has been used for undergrowth. Mature trees and palms are counted using drone photography.</td>
</tr>
<tr>
<td>Details of the utility machinery and equipment</td>
<td>Exact model sizes of equipment are not known, including the size of barge, excavator and trucks</td>
<td>Assume standard sizes</td>
</tr>
<tr>
<td>Natural Hazard Risks</td>
<td>Detailed modelling of flooding and storm damage risks</td>
<td>Data not available at local level; use broad level studies undertaken for Maldives</td>
</tr>
<tr>
<td>Environmental baseline data</td>
<td>Historical and long-term records on reef and lagoon environment. Detailed topography of the island Diseases on trees difficult to measure as all trees cannot be accessed Socio-economic data of Fulhadhoo and nearby atolls</td>
<td>Baseline snapshots of the site taken to design mitigation measures Open area level surveys undertaken Sample assessment surveys undertaken on selected trees Primary data collection will be time consuming; Secondary sources will be used</td>
</tr>
</tbody>
</table>
2 PROJECT DESCRIPTION

2.1 Project Outline and Project Site Plan

The proposed site plan is presented in Appendix B. A Reduced version of the site plan is provided in Figure 2.1.

The scope of the project is to clear land required for road construction, and transplanting as much of the removed trees on the newly reclaimed island on Bolidhuffaru Reef. As noted in Chapter 1, the project components are divided into stages as follows:

STAGE I – Preliminary Works

1. Mobilization
2. Nursery setup
3. Marking trees to be removed and site set out

STAGE II – Vegetation Removal and Transport

4. Vegetation removal and temporary storage
5. Backfilling and levelling
6. Transport to destination sites

STAGE III – Transplanting at destination sites

7. Receiving and handling plants
8. Planting
9. Maintenance

STAGE IV - Demobilization

Details of the proposed project components are outlined in the next section.
EIA for the proposed Land Clearing and Tree Relocation Project in Fulhadhoo, Baa Atoll

Figure 2.1: Proposed vegetation removal Site Plan (Reduced version)
2.2 Existing Site Conditions

Fulhadhoo Island is a highly modified environment due to human habitation. The settlement is located on the eastern half of the island and is the built-up half of the island. The western half contains undeveloped areas but the vegetation is heavily modified with forestry areas.

The proposed site (road) for vegetation removal contains both forestry areas and natural vegetation zones.

The proposed transport routes mainly will be undertaken using existing dirt roads and the main landing area will not require additional dredging. It is possible to beach the landing craft on the beach during medium to high tides.

The proposed sites are located on the outskirts of the existing settlement. It is unlikely that the trucks carrying the trees will have to go through the settlement.

There is a protected marine area (Corbin Reef Wreck) on the outer reef rim on the northern side.

2.3 Detailed Project Outline and Work Methodology

2.3.1 Preliminary Works

2.3.1.1 Mobilization

Mobilization will begin once the EIA has been approved. Project is expected to mobilize the following equipment:

Table 2.1: Estimated Equipment List at removal site

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Estimated Number</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landing Craft / Barge</td>
<td>1</td>
<td>To transport equipment to site and to transport trees to transplantation site.</td>
</tr>
<tr>
<td>Excavator</td>
<td>2</td>
<td>One excavator for loading at removal site and one for loading at barge</td>
</tr>
<tr>
<td>Truck</td>
<td>1</td>
<td>To shuttle between uprooting site and loading area</td>
</tr>
</tbody>
</table>

There will be about 10-15 persons on site involved in the project. All will be accommodated in rented properties on the island.
2.3.1.2 Nursery

There is an existing nursery on Goidhoo Island being used for the Bolidhuffaru Project which may be used to store some of the smaller trees before they are transported to the transplantation site. The site is already one of the largest nurseries in the region.

2.3.1.3 Marking trees

Areas that need to be cleared will be marked using flags and ropes. Large trees, especially all coconut palms that need to be removed will be tagged using a ribbon and will be counted. Undergrowth removal is required for this activity (see next section).

2.3.2 Vegetation Removal and transport

2.3.2.1 Quantity of vegetation to be removed

The exact number and quantity of each species are not available due the poor accessibility at the proposed sites. Accessing these sites will require undergrowth removal which should be undertaken after the EIA is completed. Estimates of the vegetation cover based on aerial surveys and transect surveys are summarized in the Table below.

<table>
<thead>
<tr>
<th>Dhivehi Name</th>
<th>English Name</th>
<th>No. of trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dhivehi ruh</td>
<td>Coconut Palms – Medium to large (&gt;5 m)</td>
<td>115-120</td>
</tr>
<tr>
<td>Dhivehi ruh</td>
<td>Coconut Palms – small (&lt; 5 m)</td>
<td>20-30</td>
</tr>
<tr>
<td>Dhivehi ruh</td>
<td>Coconut Palms – young (&lt;1 m)</td>
<td>&gt;200</td>
</tr>
<tr>
<td>Hirundhu</td>
<td>Portia tree</td>
<td>10-15</td>
</tr>
<tr>
<td>Dhigga</td>
<td>Sea Hibiscus</td>
<td>10-15</td>
</tr>
<tr>
<td>Midhili</td>
<td>Country almond</td>
<td>4-7</td>
</tr>
<tr>
<td>Boakashikeyo</td>
<td>Screw pine</td>
<td>&gt; 50</td>
</tr>
<tr>
<td>Funa</td>
<td>Alexander Laurel Wood</td>
<td>5-8</td>
</tr>
<tr>
<td>Uni</td>
<td>Beach gardenia</td>
<td>15-20</td>
</tr>
<tr>
<td>Magoo</td>
<td>Sea Lettuce</td>
<td>&gt;50</td>
</tr>
</tbody>
</table>

It is estimated that 115-120 mature palms and about 20-30 smaller palms will be removed. There are numerous young palms less than 1 m grown in bunches which are also useful for replanting. These smaller palms will be used to plant two palms for every mature palm removed.

About 40-50 hardwood trees may need to be removed. About 70 shrubs are expected to be removed, 80% of which comprises of Magoo and Boakshikeyo.
Thus, it is estimated that about 245-260 trees and plants fall within the foot print of the proposed road. The total number of palms to be removed is between 135-150 palms.

All trees that are useable for replanting will be transported out of the island for replanting. Young coconut palms may be replanted on Fulhadhoo Island to meet the regulatory requirement of planting two palms for each mature palm removed.

2.3.2.2 Vegetation removal methods

Small to Medium-sized and Trees Removal

The following steps will be followed:

1. Cut a trench through the root-ball on two sides and front of tree about 300 mm from trunk - leave sand in trench.
2. Carefully cut the roots on the side.
3. Lift and remove the trees manually.
4. Lay the tree down on an angle to allow removal of lower leaves with the other leaves to be tied up for transporting by barge.

The following steps can also be followed for small to medium-sized trees that do not require to be transported as a whole.

1. Cut the branches from the tree at relevant size
2. Place the cut branches in transport vehicles and transport to the nursery.

Coconut Palms

The following steps will be followed:

1. Cut a trench through the root-ball on two sides and front of coconut about 800 mm from trunk - leave sand in trench.
2. Carefully cut the roots on the side of the Coconut tree.
3. Wrap a lifting sling (specified as webbing type and not rope or wire) several times around the trunk and hang the two looped ends onto the excavator bucket hook.
4. Gradually lift the bucket up to put tension on the sling checking that it is secure, then carefully tilt the trunk from side to side to release the root-ball from the hole.
5. Lift the Palm out of the hole.
6. Lay the palm down on an angle to allow removal of lower leaves (about 1/2 to 2/3 of the oldest leaves) with the other leaves to be tied up for transporting by barge.
**Mature Trees**

The following steps will be followed:

1. A trench will be dug approximately 100-200mm inside the edge of the proposed final root ball size and to the depth of the lowest lateral roots. All roots should be cut cleanly. The excavated soil can be replaced unamended or mixed with some peatmoss. In exposed situation, three or four roots may be left un- severed to stabilise the tree; otherwise stays or guys should be used.
2. Wrap a lifting sling (specified as webbing type and not rope or wire) several times around the trunk and hang the two looped ends onto the excavator bucket hook.
3. Gradually lift the bucket up to put tension on the sling checking that it is secure, then carefully tilt the trunk from side to side to release the root-ball from the hole.
4. Lift the Palm out of the hole.
5. Trim the leaves

2.3.2.3 **Transportation within the island**

All coconut palms will be transported on trucks to the landing craft site. The landing site is located on the southern side of the island closer to the main jetty. The transport routes are identified on Figure 2.1 and Appendix B. The project will use a dirt road used to access the jetty area of the island. The only additional roads that will require travelling will be when backfilling the cleared areas. Dredge waste from the north side jetty area may be transported to the land clearing sites using the shortest routes.

When placing trees on truck or in trailers, the trunk and branches will be supported and padded and the foliage will be at the rear of the vehicle to avoid wind damage. Old tyres, pallets, blankets may also be used. The load will be secured to the truck.

The contractor notes that the proposed landing area is deep enough to land the proposed landing craft, at the very least during higher tides.

2.3.2.4 **Backfilling and levelling**

The trenches and holes dug out to uproot the coconut palms and large trees will be backfilled with sand. It is estimated that about 300-400 m³ of sand would be required to backfill the holes.

Materials for backfilling will be sought from the proposed borrow areas on the northwestern lagoon as shown in Appendix B. Dredging will be done by an excavator loaded on a sand bed (see next section). Material will be left to dry before being used for backfilling. The backfilled areas will be levelled to ground level.
2.3.2.5 Transport to destination sites

The time spent between digging and replanting should be as short as possible to minimise drying out of the root ball. If the tree has to sit on the back of a truck for a while, the root ball will be covered with Hessian.

Access the landing site will have to use the main (and only) natural reef pass on the SW corner of Goidhoo Atoll. The self-propelled landing craft will be able to navigate put of the reef pass and travel direct to the transplantation site – Bolidhuffaru Reef. The travel distance between Goidhoo and Bolidhuffaru is 108 km.

The receiving site is at present a barren reclaimed land. The site has a reef entrance and adequate depth to land the barge directly on to the island.

2.3.3 Transplanting at destination sites

2.3.3.1 Receiving and handling plants

Plants will be received at the site via barges. Excavators will carefully remove the trees using excavator and placed on trucks and transported as described in 2.3.2.3.

The planting whole will be dug before the arrival of plants.

2.3.3.2 Planting

Planting will be undertaken immediately after the trees arrive at the site. The following steps will be followed:

1. After untying the leaves place the palm into a pre-dug hole large enough to allow for the root-ball and 100-150 mm of soil mix on all sides and top. If it is a tall palm it may need to be planted 300-500 mm below the finished ground surface for added support from wind (but not into the water table).
2. Add 100-150mm of soil mix into the base of the hole and lower the palm. Backfill the hole while hosing to fill all voids and eliminate air pockets. After removing the slings use the bucket to firm down the soil. A shallow mound may be placed around the base of the tree to aid watering.
3. While the tree establishes roots support the trunk by securing 3 props attached in such a manner as not to damage the bark.
4. A light feed of High Nitrogen fertilizer can now be watered in. The root-ball must now be kept uniformly moist for a period of 4-6 months with weekly watering after that. A fertilising routine using a 8-2-12-4Mg slow release fertilizer or equivalent at a rate of 70 grams per 1m2 every three months should now commence.
An alternate fertilizer mix should be watered into the root zone every 3 months.

Planting depth is critical: the tree must be slightly higher than original to allow for subsidence and must not be planted into the water table.

The most critical time for watering is immediately after replanting. To assist in wetting, a small amount of non-toxic wetting agent may be added to the root ball. Also to help with root initiation, a solution of liquid rooting hormone may be used.

Support may be necessary by using stakes. These should be placed outside to root ball and the trunk protected from the ties or cables. Large trees may have to be cabled to building or other trees, or to in ground concrete blocks. The tension on cables should be checked and adjusted as the tree settles; turnbuckles may be used for adjusting cables.

2.3.3.3 Maintenance

The aftercare of transplanted trees is critical for their quick re-establishment and long-term survival. The following shall be observed:

a. It is most important to maintain aerated but moist conditions.

b. Trees should not be fertilized until they have had at least one started to put on new growth in their new position.

c. Avoid any practice that may damage the growing root system.

d. Keep the surrounding soil and root ball weed-free and mulched.

e. Adjust ties and remove them if stability is satisfactory. Remove dead wood and control and serious outbreaks of pests or disease.

Transplanted trees on unfinished building sites are particularly vulnerable to damage by run-off, compaction, waste fuel or cement and vehicle damage; therefore, ensure adequate protection and fence off if necessary.

It required, a misting system may be installed in the tree to minimize transpiration losses.

2.3.4 Sourcing backfill sand

2.3.4.1 Scope of Works

This component mainly involves dredging an area of the lagoon to source sand that may be required to backfill the holes left from removing trees and palms.

Details of the potential borrow area are presented in Appendix B and Figure 2.1.
2.3.4.2 Justifications

Need for dredging

Sand may be required to backfill the holes left behind after removing the trees. The usual practice in the Maldives is to level the surroundings to source the sand and create an even ground. However, there may be holes too large to achieve this, especially when the density of tree removal area is high. In these situations, sand has to be sourced from outside the site. There are two options: excavate an area within the island or to excavate the lagoon. Excavating within the island will need them to be again backfilled at a later stage. When a contractor is mobilized with heavy equipment, the Council wants to undertake excess backfilling by dredging from within the lagoon, so that the burden on backfilling in avoided by the Council in the future.

Location

The proposed location has been finalized based in consultation with the Council. It is an area where the locals use as a harbour basin and has been dredged in the past. The Council would like to dredge the area to be used for small vessel mooring.

Design

The proposed design is to create a simple square area with adequate depth for boat access.

Equipment

Dredging will be undertaken with an excavator as it is the only practical option for a small scale job such as this. The excavator will be mounted on sand beds and transported to the beach via trucks. All temporary sand beds are to be removed upon completion of works.

2.3.4.3 Design Details

Sand requirements

The estimated volume of sand required for the project is between 300-400 cbm. The volume depends on the eventual size of the hole left behind and if there is no sufficient material on the site to level the area. The project assumes that 2.62 cbm is required per large hole.

Dredge Area and Volume

The proposed borrow area foot print is 280 sq m. Dredge depth is -2.0 to -2.5 m MSL. The yield from the proposed sites is 300-420 cbm. Any additional requirements will be achieved by deepening the area to -3.0.
There is also an optional area on the southern side which could be used for dredging. An EIA has already been approved to construct a jetty and to dredge a channel on the south side. However, since this project is already in the Government funding process, the Council prefers to dredge the unfunded northern side.

**Quality and characteristics of fill material**

The surveys were not based on drilling and therefore will only provide an indication of the material on the top 0.5 m of the seabed. Given the high cost of marine borehole drilling no such studies have been carried out. Thus, at the moment, the guarantees are based on experiences from other similar projects, previous dredging activities. Experience indicates that reef strata up to 3 m is fairly uniform comprising mainly sand to coarse sand. It may be practical to use these material for backfilling without further cleaning.

2.3.4.4 **Dredging Method**

Dredging will begin by excavator mounted on a sand bed. The dredge material will be transported to the backfilling site via trucks. The excavators will have a bucket size of about 1.5 m$^3$.

Where practical, all material dredged may be temporarily stored for 2-3 day to let the salt water drain. It will then be moved to backfill areas on trucks (see next section). Where temporary storage is not practical, the material will be moved directly to backfill sites. Temporary storage areas have not been defined by the council yet but are expected to be adjacent to the dredged site away from the shoreline.

Transportation will be via trucks to the designated backfill areas on trucks.

2.3.4.5 **Emergency Plan for Spills**

No marine spills are anticipated as the works are to be carried out by an excavator. Refuelling the excavators will be done on land. Fuel barrels will be kept in a bunded area with necessary mats.

2.4 **Labour**

2.4.1 **Labour Requirements and Availability**

The tentative list of labour requirements is given in Table 2.3.

*Table 2.3: List of labour requirements for the project*

<table>
<thead>
<tr>
<th>Activity or work group</th>
<th>Specialists</th>
<th>Labourers</th>
</tr>
</thead>
</table>

*Prepared by: CDE Consulting*
Specialist labour will be required to undertake specific tasks. All personnel will belong to the contractor. Staff will be distributed between removal and planting sites. Teams at removal sites are expected to be between 15-20 persons.

2.4.2 Housing of Temporary Labour

Majority of the workforce will be accommodated on rented houses in Fulhadhoo Island. The accommodation on the planting sites are mixed with some housed in temporary accommodation on Bolidhuffaru and some shuttling between Male’ and the site.

2.4.3 Services

The Contractor is expected to provide workers with meals and appropriate entertainment facilities including radio and television. The utilities and entertainment facilities on the island are expected to be utilised.

2.5 Environmental Management

2.5.1 Site Office and Temporary Accommodation

As noted above, the rented facilities in Fulhadhoo Island will be initially used for accommodation and site office.

A site office and temporary accommodation blocks will be constructed at Bolidhuffaru Island.

2.5.2 Utilities

The project does not require constant electricity for project works. However fuel will be brought with the proponent and stored at a bunded location. As the staff will be accommodated at least houses power and other utility services are obtained from local service providers.
2.5.3 Pollution Control Measures

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

- Machinery will be properly tuned and maintained to reduce emissions and minimize risk of spills/leaks.
- Fuel storage will be bunded
- Spill kits will be maintained around island to handle any liquid spills
- Septic tanks will be utilized for sewage and wastewater disposal during construction period
- All paints, lubricants, and other chemicals used on site will be stored in secure and bunded location to minimize risk of spill

2.5.4 Health and Safety Measures

The following health and safety measures will be implemented during the construction stage.

- Contractor would ensure that Health and Safety procedures are complied.
- Tree removal and transplanting activities would be carried out under the supervision of a suitably experienced person.
- All reasonable precautions will be taken for the safety of employees, and equipment will be operated by competent persons.
- Health checks will be administered before work commences
- Warning signs, barricades or warning devices will be provided and used.
- Necessary safety gear will be worn at all times.
- Fire extinguishing equipment would be readily available and employees will be trained in its use.
- Oxygen, acetylene or LPG bottles will not be left free-standing.
- First aid kits will be made available on site
- The removal and replanting sites will be properly closed to unauthorised personnel

2.5.5 Emergency Spill Response Plan

An emergency response plan for chemical and oil spills would be in place before construction commenced. It would include preventive and preparatory measures, including:

- Placement of any fuel storage areas away from sensitive environment
- Storage in secure, bunded locations
- Training of employees on good environmental practice and response protocols
- Installing warning signs and barricades where needed
• Installing response kits at accessible locations. The kit would include absorbents, personal protective equipment and clean-up tools.
• Acquiring material safety data sheets for all hazardous chemicals

Additionally, the response plan would include:

• Risk assessment, including identification of hazards, potential triggers, contaminant pathways, and impact thresholds for different chemicals
• Response procedure, defining roles and responsibilities of key personnel
• Communication protocols- among responsible personnel, and to authorities and neighbours, if required

2.5.6 Fire Prevention

Fire extinguishing equipment would be readily available and employees will be trained in its use. In general, water-based fire extinguishers would be used.

2.5.7 Waste Management Plan

About 90% of the medium to large trees are expected to be transported to Bolidhuffaru Island for transplantation. However, this is subject to inspection for diseases, pests and tree damage. If there are trees outside the acceptable limits defined by the Proponent on Bolidhuffaru Reef resort development project, it will have to be disposed and replanted elsewhere on Fulhadhoo Island. Most the shrubs are also expected to be transplanted, subject to the above conditions.

The remaining green waste from shrubs, trimmed leaves, trimmed roots, cut branches and tree stumps will have to be managed as part of the project.

It is difficult to estimate the amount of green waste at this stage as there is a high percentage of transplantation, wherever practical. The worst case scenario where about 30% of the trees removed are rejected due to diseases, pests and damage is expected to yield about 320-350 m³ of disposable green waste.

The waste generated from clearing the trees will be sorted to reusable and disposable green wastes. The segregated reusable waste will be allowed to be taken by the island community under the supervision of the contractor. The disposable green waste will burnt in a designated area of the project site, preferably closer to the existing waste management site. All remaining material will be transported to Thilafushi during demobilization.

All other wastes would be general domestic waste arising from material consumption by construction workforce. These will be managed according to Environment Ministry Regulations.
and it would be the Contractor’s responsibility to dispose of all construction-related waste during demobilisation along with any other waste. The Contractor will be required to clear all areas of work.

2.5.8 Compliance to Tree Removal Regulations

The project plans to replant as many trees as possible. For each mature palm removed the project plans to install two palms. The project plans to do so by planting the young coconut palms (less than 3 feet) on Fulhadhoo Island and on Bolidhuffaru Reef. There are many smaller plants within the undergrowth which can be planted to achieve this objective. The location for planting on Fulhadhoo Island shall be determined by the Island Council.

2.6 Project Schedule and Life Span

Mobilisation for the project will begin after the EIA is approved. It is anticipated that the completion of the whole project will take approximately 3-4 weeks. The preliminary work plan is provided in Appendix D. The actual details may be dependent on the final contractor.

2.6.1 Work Sequence

The initial phase of the project will include identifying and marking the trees that need to be removed.

Project mobilization will begin after the EIA is approved. Initial clearing will be on the undergrowth. Tree removal will be undertaken on a just-in-time-removal basis, where trees will be removed in time for the shuttling barge to arrive on site.

The last phase of the project will be to backfill the removed areas. This is planned to be undertaken when tree removal works are completed.

Demobilisation and site clearance will be the final activity of the construction program.

2.7 Summary of Project Inputs and Outputs

The types of materials that will go into the development and from where and how this will be obtained are given in Table 2.4 and the type of outputs (products and waste streams) and what is expected to happen to the outputs are given in Table 2.5.

Table 2.4: Major Project Inputs

<table>
<thead>
<tr>
<th>Input resource(s)</th>
<th>Source/Type</th>
<th>How to obtain resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers (30-35)</td>
<td>Local and foreign, mainly foreign</td>
<td>Contractor Staff</td>
</tr>
<tr>
<td>Engineers and Site</td>
<td>Local and foreign</td>
<td>Contractor Staff</td>
</tr>
</tbody>
</table>
supervisors (3-5)

Water supply (at removal sites) to dampen the ground if dust becomes an issue at removal sites

<table>
<thead>
<tr>
<th>Supervisors (3-5)</th>
<th>Water supply (at removal sites) to dampen the ground if dust becomes an issue at removal sites</th>
<th>Water supply (at replanting sites)</th>
<th>Desalinated water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Well water</td>
<td>Well water</td>
<td>50 m³/day desalination plant installed specifically for watering</td>
</tr>
</tbody>
</table>

Electricity/Energy

Distributed power

<table>
<thead>
<tr>
<th>Electricity/Energy</th>
<th>Distributed power</th>
<th>Distributed power</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Utility service provider on Fulhadhoo and Bolidhuffaru</td>
<td></td>
</tr>
</tbody>
</table>

Machinery (both sites)

Barges (x2), Excavators (x4), trucks (x4)

<table>
<thead>
<tr>
<th>Machinery (both sites)</th>
<th>Barges (x2), Excavators (x4), trucks (x4)</th>
<th>Barges (x2), Excavators (x4), trucks (x4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Import or hire locally where available</td>
<td>Import or hire locally where available</td>
</tr>
</tbody>
</table>

Food and Beverage

Mainly imported sources except a few locally available products.

<table>
<thead>
<tr>
<th>Food and Beverage</th>
<th>Mainly imported sources except a few locally available products.</th>
<th>Mainly imported sources except a few locally available products.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Import and purchase locally</td>
<td>Import and purchase locally</td>
</tr>
</tbody>
</table>

Firefighting equipment

Carbon Dioxide and Foam Fire Extinguishers, etc.

<table>
<thead>
<tr>
<th>Firefighting equipment</th>
<th>Carbon Dioxide and Foam Fire Extinguishers, etc.</th>
<th>Carbon Dioxide and Foam Fire Extinguishers, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Local suppliers</td>
<td>Local suppliers</td>
</tr>
</tbody>
</table>

Fuel

Light Diesel, Petrol, Lubricants

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Light Diesel, Petrol, Lubricants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Local suppliers</td>
</tr>
</tbody>
</table>

**Table 2.5: Major Project Outputs**

<table>
<thead>
<tr>
<th>Products and waste materials</th>
<th>Anticipated quantities</th>
<th>Method of disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green waste from site</td>
<td>Large quantity (estimated between 320-350 cbm)</td>
<td>Palms and large trees sent to Bolidhuffaru islands for transplanting Smaller plants transported to Bolidhuffaru Island or nursery on Goidhoo. Remaining waste burnt or mulched on site and used for nursery and landscaping needs.</td>
</tr>
<tr>
<td>Dredge waste</td>
<td>small quantity (300-400 cbm)</td>
<td>Backfilling</td>
</tr>
<tr>
<td>Waste oil</td>
<td>Small quantities (&lt;10 litres)</td>
<td>incinerated</td>
</tr>
<tr>
<td>Hazardous waste (diesel)</td>
<td>Small quantities (&lt;10 litres)</td>
<td>Barrelled and sent to designated landfill as part of overall hazardous waste management programme of the island</td>
</tr>
</tbody>
</table>
2.8 Demobilization

Demobilization plan depends on the contractor. In general, the proponent advocates a phased demobilization plan to commence in the last month of the contract. Machinery transported from Male’ will have to be demobilized on one specific date.
3 POLICY AND LEGAL FRAMEWORK

These legal and policy provisions have to be fully respected in carrying out the proposed development. All contractors and sub-contractors will be informed of these requirements. This project conforms to all relevant laws and regulations of the Maldives.

3.1 Relevant Legislation

3.1.1 Environment Protection and Preservation Act (Act no. 4/93)

The Environmental Protection and Preservation Act (4/93) enacted on 19 March 1993 is the framework law related to environment protection in the Maldives. The authority responsible for the Environment Act is the Ministry of Environment and Energy.

Articles 2, 4, 5, 6, 7, and 8 of the law are relevant to the Fulhadhoo Land Clearing Project.

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

*The project developers and contractors shall abide by any guidelines or advice given by the concerned Government authorities for the project.*

Article 4 states that the Ministry of Environment shall be responsible for identifying protected areas and natural reserves and for drawing up the necessary rules and regulations for their protections and preservation.

*The project developers and contractors shall ensure that there is no negative impact from the proposed project on sensitive environments in the vicinity or protected species (See Section 3.2.4).*

According to Article 5 (a) of the Act, an Environmental Impact Assessment study shall be submitted to the Ministry of Environment before implementing any development project that may have a potential impact on the environment.

According to Article 5 (b), The Ministry of Environment shall formulate the guidelines for EIA and shall determine the projects that need such assessment as mentioned in paragraph (a) of this clause.

*This report is prepared to fulfil this clause.*
According to Article 6, the Ministry of Environment has the authority to terminate any project that has any undesirable impact on the environment. A project so terminated shall not receive any compensation.

All project developer and contractors shall be aware of this provision and contractors shall take all practical measures to ensure there is no irreversible and significant negative impact of the projects on the environment.

Article 7 of the EPPA (4/93) states that any type of waste, oil, poisonous gases or any substances that may have harmful effects on the environment shall not be disposed within the territory of the Maldives. In cases where the disposal of the substances becomes absolutely necessary, they shall be disposed only within the areas designated for the purpose by the government. If such waste is to be incinerated, appropriate precaution should be taken to avoid any harm to the health of the population.

All project contractors shall comply with the Environmental Management Plan presented in this report, which specifies how the wastes, oil and gases generated by the project will be disposed.

Article 8 of the EPPA (4/93) states that Hazardous/ Toxic or Nuclear Wastes that is harmful to human health and the environment shall not be disposed anywhere within the territory of the country.

Any hazardous wastes that may be generated from this project shall be transferred to the designated waste site in Thilafushi for disposal according to Government regulations and standards. It should not be disposed on the Island, as it does not have the necessary facility.

### 3.1.2 Plant Protection Act (2011)

The Plant Protection Act enacted on 12 December 2011 aims to prevent production and distribution of species and substances that harm plants and trees, promote acceptable phytosanitary standards, facilitate trade of plants and trees and their parts, and to dictate other relevant guidelines.

Article 19(a) states that any import of plants, parts of plants and any other related regulated substances into Maldives should have a phytosanitary certificate issued in accordance with this Act or by the National Plant Protection Authority (NPPO) of the country it was exported from.

Plants, parts of plants, and chemicals such as fertilizers and pesticides required for this project will be imported after obtaining the necessary phytosanitary certificates.
3.1.3 Land Act

The Land Act provides for allocation and releasing of land for different needs as well as releasing of public land for housing. The Act also states the conditions that govern the using of, owning, selling, renting and transferring of ownership of public and private land.

*The proposed sites on the island earmarked for development has been identified as part of the road development of the island as per the approved land use plan of the island. The project has approvals from Island Council and Ministry of Housing to clear the land (See Appendix C).*

3.1.4 Tourism Act (Act no. 2/99)

The main law on tourism in the Maldives (Act no. 15/79) was passed by the Citizen’s Majlis in November 1979, outlining the basic regulations for the resorts on registration and operation, and tax policies. The original law had seven clauses in it and amendments were made to the original law through law no: 11/80, 14/80, 4/82, 6/83 and 2/87. The present law (2/99) came into force on the first of November 1999.

*The project shall comply with the Tourism Act in terms of its title to build and operate a resort on the Bolidhuffaru Island, development concept and operational standards. This project should specifically comply in relation to importing vegetation and landscaping.*

With the Tourism Law as the basis, a number of regulations, standards and controls have been specified by the Ministry of Tourism, for operations within the tourism sector. The book of tourism regulations comprises of important regulatory measures including Building Standards, Sanitation Standards, Disposal of Garbage, Carrying Capacity, Electricity Code and Tourist Behaviour.

*The project shall comply with all the relevant Tourism Regulations with regard to its concept designs, and landscaping.*

The Tourism Related Environment Impact Assessment Regulation (regulation 2015/R-157) was gazetted on 3rd August 2015. This regulation addresses all issues related to the EIA process for all tourism related development activities.

*The project shall comply with this regulation, and further information about this regulation is provided in the next section. This project already has an EIA approval for the resort development component. This EIA only addresses tree sourcing, transport and transplanting.*

A tourism planning permission has to be obtained from the Ministry of Tourism, before undertaking any tourism related project. Such permission often requires a study of the environment and the likely impacts.
Accordingly, the concept design of the proposed tourist resort development in Bolidhuffaru has been approved by the Ministry of Tourism. No further approvals required for the concept.

3.1.5 Employment Act (2/2008)

The Employment Act is the legal framework to govern the rights and responsibilities of the migrant workers in the Maldives is included in the Employment Act (2/2008) that was ratified and signed into law in May 2008. The Employment Act provides for the creation of a Labour Relations Authority, an Employment Tribunal and an Advisory Board on wages.

To date, four amendments have been brought to the Employment Act (2/2008). All contractors shall be required to undertake ethical recruitment and responsible employment of workers during the construction stage of the project.

During the operation stage an ethical recruitment and responsible employment policy and system will be developed and implemented. Amendments were made through the following Acts: 14/2008; 12/2010; 3/2014; 14/2015.

All contractors shall be required to undertake ethical recruitment and responsible employment of workers during the construction stage of the project.

During the operation stage an ethical recruitment and responsible employment policy and system will be developed and implemented.

3.1.6 Immigration Act (1/2007)

The Maldives Immigration Act (1/2007) lays down the rules for entry, departure and deportation of foreign nationals. Article 15 of the Act provides for work visa: the permit to remain in the Maldives for the duration of a work permit granted to a foreign national visiting the Maldives for the purpose of working, where a work permit has been obtained by that foreign national consistent with the regulations of the concerned Government authority.

It is anticipated that a number of foreign migrant workers will be employed for this project. Special emphasis will need to be given to ensure that all workers have the relevant work visas and proper documentation while working in the Maldives.

3.1.7 Anti-Human Trafficking Act (12/2013)

The Anti-Human Trafficking Act passed by the parliament on 03 December 2013 and ratified on 08 December 2013 makes trafficking in persons a criminal offence in the Maldives. The purposes of the Act are to: prevent trafficking of persons through and across the Maldives; establish the crimes of trafficking in persons and prescribe punishments; provide for prosecution
of perpetrators of trafficking in persons; provide protection and assistance to victims of human trafficking; promote and protect the human rights of trafficked victims; and engage with local and international NGOs working against human trafficking.

The Act defines the crimes of trafficking, exploitation, and debt bondage. According to this Act, forced labour and fraudulent recruitment are considered human trafficking. The Act specifies the penalties for perpetrators of trafficking. The penalty for trafficking offence is a jail imprisonment up to 10 years that can be extended to 15 years if children are involved.

*Foreign migrant workers are anticipated to be employed for this project. It is important to ensure that all contractors abide by stringent measures to ensure there is no exploitation of foreign migrant workers. Special attention shall be given to ensure wages are paid in full and on time; the travel documents of workers are not held by contractors against the will of the workers, foreign migrant workers are not required to pay recruitment fees, there is no forced labour and all workers are treated with dignity and respect.*

### 3.2 Relevant Regulations and Guidelines

#### 3.2.1 Environmental Impact Assessment Regulations 2012

Environmental Impact Assessment regulations were issued by Environment Environmental Impact Assessment regulations were issued by Environment Ministry on 8 May 2012. The first step in environmental assessment process involves screening of the project to be classified as one that requires an EIA or not. Based on this decision, the Ministry then decides the scope of the EIA, which is discussed with the proponent and the EIA consultants in a “scoping meeting”. The consultants then undertake the EIA starting with baseline studies, impact prediction and finally reporting the findings with impact mitigation and monitoring programme. This report follows the principles and procedures for EIA outlined in the EIA regulations.

The EIA report is reviewed by MEE following which an EIA Decision Note is given to the proponent who will have to implement the Decision Note accordingly. As a condition of approval, appropriate environmental monitoring may be required and the proponent shall have to report monitoring data at required intervals to the Ministry. The project proponent is committed to implement all impact mitigation measures that are specified in this EIA report. Furthermore, the proponent is committed to environmental monitoring and shall fulfil environmental monitoring requirements that may be specified in the EIA decision note as a condition for project approval.

*This report complies with the EIA regulations*
3.2.2 Tourism Related Environmental Impact Assessment Regulation 2015

The Tourism Related Environmental Impact Assessment regulation was issued by the Ministry of Tourism on 3rd August 2015. The first step in environmental assessment process involves screening of the project to be classified as one that requires an EIA or not. Based on this decision, the Ministry, in consultation with the consultant and the proponent, decides the scope of the EIA. The consultant undertakes the EIA.

The EIA report is reviewed by MoT following which an EIA Decision Note is issued to the proponent. As a condition of approval, appropriate environmental monitoring may be required and the proponent shall have to report monitoring data at required intervals to the Ministry. The project proponent is committed to implement all impact mitigation measures that are specified in this EIA report. Furthermore, the proponent shall commit to environmental monitoring and shall fulfil environmental monitoring requirements that may be specified in the EIA decision note as a condition for project approval.

This report follows the principles and procedures for EIA outlined in this regulation.

According to Article 6 (a) of the Act, an Environmental Impact Assessment study shall be submitted to the Ministry of Tourism before implementing any tourism related development; including new projects, redevelopment projects, major renovation works, or any other development project that may have a potential impact on the environment.

This report is prepared to fulfil this clause.

According to Article 20 (a), the Ministry of Tourism has the authority to terminate any project;

- If it does not have an approved EIA decision note,
- If the decision note has been annulled, or
- If any of the EIA components has been breached

All project developer and contractors shall be aware of this provision and contractors shall take all practical measures to ensure there is no irreversible and significant negative impact of the projects on the environment.

The project already has an EIA approval for the overall resort development project. It is stated in the original EIA that the landscaping component will require a separate EIA or an Addendum once the source islands are identified. This report also forms part of this submission required by MoT. MoT accepts EIAs approved by EPA if multiple components span across the jurisdictions of both EIA regulations 2012 and Tourism EIA regulations 2015.
3.2.3 Regulation on Sand and Coral Mining

Regulation on sand mining covers sand mining from uninhabited islands that have been leased; sand mining from the coastal zone of other uninhabited islands; and aggregate mining from uninhabited islands that have been leased and from the coastal zone of other uninhabited islands.

Coral mining from house reef and atoll rim has been banned through a directive from President’s Office dated 26 September 1990.

*Sand should not be mined from any part of an existing island. Sand should also not be mined from within 100 ft. of the vegetation of the existing Fulhadhoo Island. The current distance from vegetation line is 105 m. Please see regulation on dredging and reclamation for further controls.*

3.2.4 Regulation on Cutting Down, Uprooting, Digging Out and Export of Trees and Palms from One Island to Another

Pursuant to the Environment Protection and Preservation Act of Maldives 1993, the Environment Ministry made a bylaw with the purpose of educating developers about the importance of trees including best management practices for maintaining trees and provide standards for preservation of trees in the Maldives and set down rules and regulations to be adhered to prior to commencing felling, uprooting, digging out and exporting of trees and palms from one island to another in Maldives.

The by law states that the cutting down, uprooting, digging out and export of trees and palms from one island to another can only be done if it is absolutely necessary and there is no other alternative. It further states that for every tree or palm removed in the Maldives two more should be planted and grown in the island.

The by law prohibits the removal of the following tree types:

- The coastal vegetation growing around the islands extending to about 15 meters into the island
- All the trees and palms growing in mangrove and wetlands spreading to 15 meters of land area;
- All the trees that are in a Government protected areas;
- Trees that are being protected by the Government in order to protect species of animal/organisms that live in such trees; and
- Trees/palms that is abnormal in structure.
This project does not require removal of prohibited vegetation. However, the Proponent is required to plant two young palms for each mature coconut palm removed.

3.2.5 Regulation on Dredging and Land Reclamation

The regulation of Dredging and Land Reclamation was published on 2 April 2013 with the aim of minimising environmental impacts associated with dredging activities in islands and reefs across Maldives.

- The regulation defines the rationales acceptable for dredging as those related to approved development activities on inhabited islands and economic islands. It defines that those activities should be if utmost necessity for dredging to be considered.
- All dredging and reclamation activities must be approved by EPA in writing. The process includes the submission of project information to EPA along with a scaled before and after map.
- The regulation defines rationales for reclamation as those absolutely necessary for social, economic or safety purposes.
- Beach replenishment is restricted from 10 m of the registered shoreline in resort islands.
- Dredging is restricted in the following areas:
  - 500 m from the ocean side reef edge
  - 50 m from any island vegetation line
  - An environmentally sensitive site.
- Land reclamation is restricted within 200 m of a sensitive area.
- Land reclamation cannot exceed 30% of the house reef area.

The proposed dredging design has been prepared based on this regulation but has the following limitations (See Figure 3.1).

- The proposed borrow site falls within 500 m of the reef edge. However, all dredging work on the island so far has been within this limit due to the geography of the island.
- A section of the site falls within 50 m of shoreline but this is because there is an existing basin within this distance.

EPA provides exceptions to the regulation based on socio-economic needs. Special permission for the Dredging and Reclamation permit will be required by EPA to proceed with the project.
3.2.6 Waste Management Regulation 2013

Waste Management Regulation (WMR) was published on August 2013 and came into effect in February 2014. It will be implemented by EPA. The aim of WMR is to implement the national waste policy, which contains specific provisions to:

- Implement measures to minimize impacts on human health
- Formulate and implement waste management standards
- Implement an integrated framework for sustainable waste management
- Encourage waste minimisation, reuse and recycling
- Implement Polluter-Pays Principle
- Introduce Extended Producer Responsibility

WMR contains four main sections:

- Waste management standards: Defines standards for waste collection, transfer, treatment, storage, waste site management, landfills and managing hazardous waste.
- Waste management Permits: Defines approval procedures for waste sites
- Waste transfer: Standards and permits required for waste transport on land and sea, including trans-boundary movements.
- Reporting requirements: Defines reporting and monitoring requirements and procedures.
- Enforcement: Defines procedures to implement WRM and penalties for non-compliance.

The proponent shall register the waste site and any vessels used for transporting waste to Thilafushi.

The proponent should also ensure compliance from the subcontractors in handling and transport of waste from the island to the designated waste site.

3.2.7 Regulation on Conservation of Old Trees

This regulation aims at identifying ways to manage protected trees in the Maldives. The reason for the formulation of the law is due to the increased cutting down of trees resulting in the loss of the islands natural, biological wellness and greenness. And due to the extinction of some types of trees at island level and rapid reduction in the amount of certain types of trees at national level and also to comply with the convention on biological diversity.

Under this regulation, trees may be protected for the following reasons;
1. Age
   a. Trees aged 50-100 years
   b. Trees older than 100 years
2. Abundance of a tree at national or local level to protect endangered species
3. Ecological and cultural significance
4. Request from community

Ministry of Environment is responsible for assigning protected status for trees that fall into the above categories. The regulation mandates Ministry of Environment to maintain an updated public registry of all protected trees.

*There are no identifiable protected trees in the project footprint. Contractors should take special care to avoid harm to any trees protected under this regulation.*

### 3.2.8 The Environmental Liability Regulation (Regulation 2011/R-9)

This law is pursuant to Article 22 of national constitution that states that protection, preservation and maintenance of the Maldivian natural environment, the richness of the living species, the natural resources and the beauty of the Maldives for the present generations as well as for the future generations is a basic obligation of the Maldivian government. The government shall enforce that the activities conducted in order to gain economic and social development should be of sustainable nature that protect the environment and such activities shall not deteriorate the environment, endanger any species, damage the environment, and shall not waste any natural resources.

This regulation is also pursuant to Environment Protection and Preservation Act of Maldives (4/93). The regulation is aimed at maintaining equal standards for reprimanding and enforcing environmental liabilities, fines for those who violate the rules and regulations and give guidance to those who are involved in the implementation process of the regulations pursuant to Preservation Act of Maldives (4/93).

One of the key objectives of the environmental liability regulation is also to practice polluter-pay-principles in the Maldives.

*All project developer and contractors shall be aware of this provision and contractors shall take all practical measures to ensure that all relevant laws and regulations, and the EMP proposed in this EIA is followed.*
3.2.9 Compliance

In general, the proposed developments are in compliance with the laws and regulations described above. Where there is a special requirement to comply, the EMP identifies measures and mechanisms required to comply.

3.3 Relevant Guidelines

3.3.1 Guidelines for Cutting Down, Uprooting, Digging Out and Export of Trees and Palms from One Island to Another

This guideline, published on 6 June 2017, outlines the standards that should be followed in undertaking the activities specified in 5(a) of the Regulation on cutting down, uprooting, digging out and export of trees and palms from one island to the other and provides the guidelines for approving such activities.

The guideline states that approval for cutting down, uprooting, digging out and export of trees and palms from one island to the other shall only be given to projects that meet the following conditions;

- Land clearance is necessitated by a public need such as agriculture, construction of social centre etc
- Funds are available for undertaking the activities
- Project has written approval from relevant Government authorities

The regulation further states that prior approval from EPA is required before undertaking any of the above-mentioned activities. The proponent is required to lodge an application to EPA with the following information;

- Types, numbers and sizes of trees and palms in the project footprint
- Location map of all trees and palms planned for removal and relocation
- List of protected trees in the project footprint

An Environmental Impact Assessment (EIA) report is required to be submitted to and approved from EPA for any such activities that involve removal of more than 200 palms and trees or involves vegetation clearance of more than 8250 sqm of land from an area that does not have any protected trees or prohibited trees under the Regulation on cutting down, uprooting, digging out and export of trees and palms from one island to the other. Projects that involve removal of less than 200 palms or trees or land clearance of an area less than 8250 sqm, can proceed with approval from EPA with suggested mitigation measures provided the area has no protected or prohibited palms and trees.
The proposed project area does not have any identifiable protected or prohibited trees. The land use plan of the proposed areas for vegetation clearance has been approved by Ministry of Housing and Infrastructure (MHI). There is also a separate approval for vegetation removal from MHI. This EIA report is submitted to EPA to obtain the necessary approval for undertaking the proposed activities.

A separate application will be lodged with the EPA before starting work.

3.3.2 Announcement on prevention of spread of Hispid Beetle ((IUL)-30-1/30/2014/1)

Pursuant to article 5(i) of the Plant Protection Act, a public announcement was made by Ministry of Fisheries and Agriculture to prevent spread of Hispid Beetle, a pest known to have devastating impacts on palm trees, across atolls of the Maldives. The announcement was made in response to reports of widespread Hispid Beetle infestation in a number of northern atolls of Maldives. Since Hispid Beetles spread from one island to the other with transfer of infested palms or its parts, the announcement prohibits the transfer of palm trees and parts of palm trees out from the following atolls which were reported to have Hispid Beetles:

- Noonu atoll
- Raa Atoll
- Kaafu Atoll
- Alif Alif Atoll
- Alif Dhaalu Atoll

Baa atoll is not one of the quarantined atolls for palm tree relocation, hence the project is in compliance with the announcement.

3.4 Environmental Permits Required for the Project

3.4.1 Approval of the concept and site plan

The Island Council will have to approve the concept plan and site plan for the proposed project before the EIA could be approved.

This project has conditional approval from Island Council (See Appendix D).

3.4.2 Land clearing for built environment needs

The Ministry of Housing will have to approve the concept plan and site plan for the land clearing before the EIA could be approved.

This project has conditional approval from MHI (See Appendix D).
3.4.3 Environmental Impact Assessment (EIA) Decision Note

The most important environmental permit to initiate project work would be a decision regarding this EIA. The EIA Decision Note, as it is referred to, shall govern the manner in which the project activities must be undertaken. This EIA report assists decision makers in understanding the existing environment and potential impacts of the project. Therefore, the Decision Note may only be given to the Proponent after a review of this document following which the Ministry may request for further information or provide a decision if further information is not required. In some cases, where there are no major environmental impacts associated with the project, the Ministry may provide the Decision Note while at the same time requesting for further information.

3.4.4 Dredging and Reclamation Permit

Prior to any costal work that requires dredging or reclamation, a special permit has to be taken from the EPA. A specific form published by EPA has to be completed and submitted for the approval.

*EPA issues Dredging and Reclamation approval at the time of issuing Decision Note*

3.4.5 Land clearing from EPA

An application will have to be lodged to EPA for land clearing before work can commence.

*Approval from EPA will be required after EIA approval.*

3.5 Responsible Institutions

The main government institutions that have roles and responsibilities relevant to this project are summarised below.

3.5.1 Ministry of Environment and Energy

The Ministry of Environment is mandated for the effective implementation of the Environmental Protection Act of the country and has the statutory power over issues related to the environment. It has the central control over the environment protection, management, conservation and environmental emergencies. The Ministry operates mainly at a policy level and the more regulatory and technical assessment activities are mandated to the Environmental Protection Agency (EPA). In this respect EPA has now been mandated to manage all issues relating to Environmental Impact Assessment of individual projects.
The Ministry of Environment also seeks the advice of National Commission for the Protection of Environment (NCPE) on all significant environmental matters. The commission is appointed by the president and is mandated to advice the Minister of Environment on environmental matters such as environment assessment, planning and management, and political decisions with regard to the protection of environment.

### 3.5.2 Atoll Council

Under the Decentralization Act, Baa Atoll has elected Atoll Council comprising representatives from the islands within the atoll. Baa Atoll Council is located in Eydhafushi Island. The Council Office is the main focal point of Government Ministries in Baa Atoll and they co-ordinate and liaises with Government Ministries and elected island councils on all issues relating to the Atoll.

*A copy of this EIA will have to be submitted to Baa Atoll Council prior to submission to EPA.*

### 3.5.3 Island Council

The Island council of Fulhadhoo with its 3 elected members on a three year term, are mandated to coordinate with the government authorities on behalf of the locals. The island council is in favour of the proposed project.

### 3.5.4 Ministry of Tourism

The Ministry of Tourism is main agency responsible for approving and overseeing the development of a resort property in Bolidhuffaru Reef. The concept for the resort development has been approved by the ministry. An EIA has been approved for the overall project. EIA Addendum is required when then tree sources are identified for landscaping. This EIA serves as an adequate Addendum for the landscaping components requiring trees sourced from Fulhadhoo.

### 3.6 Guiding Policies and Documents

#### 3.6.1 National Environmental Action Plan II (NEAP II)

The aim of NEAP II is to protect and preserve the environment of the Maldives and to sustainably manage the country’s natural resources for the collective benefit and enjoyment of present and future generations.

Accordingly, the key strategies of the NEAP II are:

- Continuous assessment of the state of the environment in the Maldives, including impacts of human activities on land, atmosphere, freshwater, lagoons, reefs and the ocean; and the effects of these activities on human well-being
Development and implementation of management methods suitable for the natural and social environment of the Maldives and maintain or enhance environmental quality and protect human health, while at the same time using resources on a sustainable basis.

Ensure stakeholder participation in the decision making process by consultation and collaboration with all relevant sectors of society.

Preparation and implementation of comprehensive national environmental legislation in order to provide for responsible and effective management of the environment.

Adhering to international and regional environmental conventions and agreements and implementation of commitments embodied in such conventions.

Furthermore, NEAP II specifies priority actions in the following areas:

- Climate change and sea level rise; coastal zone management;
- Biological diversity conservation; integrated reef resources management;
- Integrated water resources management;
- Management of solid waste and sewerage;
- Pollution control and management of hazardous waste;
- Sustainable tourism development;
- Land resources management and sustainable agriculture;
- Human settlement and urbanization.

### 3.6.2 Waste Management Policy

The aim of the waste management policy is to formulate and implement guidelines and means for solid waste management in order to maintain a healthy environment. Accordingly, the key elements of the policy include:

- Ensure safe disposal of solid waste and encourage recycling and reduction of waste generated;
- Develop guidelines on waste management and disposal and advocate to enforce such guidelines through inter-sectoral collaboration;
- Ensure safe disposal of chemical, hazardous and industrial waste.
The proponents of this project must be aware of the policy and all solid and hazardous waste
produced in this project should be disposed according to the Environmental Management Plan
for the project, which reflects the principles of the Waste Management Policy.

3.7 International Conventions

3.7.1 Convention on Biological Diversity

The Maldives is a party to the United Nations Convention on Biological Diversity. The objective
of the convention is “the conservation of biological diversity, the sustainable use of its
components and the fair and equitable sharing of the benefits arising out of the utilization of
genetic resources, including by appropriate access to genetic resources and by appropriate
transfer of relevant technologies, taking into account all rights over those resources and to
technologies, and by appropriate funding”.

The proposed development activities outlined in this project does not fall on any area recognised
for its ecological value. However removal of trees will adversely impact existing ecosystem at
this location. There will be an overall improvement in biodiversity at the local and national level
since the major trees uprooted during land clearance will be transplanted in the reclaimed island
of Boldihuffaru in Kaafu Atoll. Furthermore, to mitigate loss of palms and trees, two will be
replanted on the island for every tree removed.

3.7.2 International Plant Protection Convention

The Maldives has become a party to the International Plant Protection Convention (IPPC) as a
step to protecting native plant species in the Maldives from the risk of diseases introduced by
imported plant varieties. The Maldives adhered to the IPPC on 3 October 2006 and the
Convention requires that certificates of phytosanitary condition and origin of consignments of
plants and plant products be used for import and export of plants and plant materials.
Contracting parties have the full authority to regulate entry of plants and plant products and may
prescribe restrictions on imports or prohibit importation of particular plants or plant products.
Thus it is advisable that the proponent be aware of the requirements of IPPC and obtains the
necessary phytosanitary certificates if any plants are to be imported to stabilise the beach or for
landscaping.

3.7.3 UNFCCC and Kyoto Protocol

The Maldives is a party to the United Nations Framework Convention on Climate Change and
the Kyoto Protocol to the UNFCCC. The objective of the Convention is to achieve, in
accordance with the relevant provisions of the Convention, stabilization of greenhouse gas
concentrations in the atmosphere at a level that would prevent dangerous anthropogenic
interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

The IPCC defines mitigation “as an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases.” The greenhouse gas inventory of the Maldives forms an integral part of the First National Communication of the Maldives to the UNFCCC. In March 2009, the President of the Maldives has announced the target to make Maldives carbon neutral by 2020. Hence, in the implementation of the project, careful attention needs to be given to ensure energy efficiency and reduce transport related fuel consumption. Furthermore, planting of beach vegetation would help in mitigation of greenhouse gas emissions from the project.

The IPCC defines adaptation “as an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects.” Various type of adaptation include anticipatory and reactive adaptation; private and public adaptation; and autonomous and planned adaptation. The adaptation policies and strategies of the Maldives are given in the Maldives National Adaptation Programme of Action (NAPA).

3.7.4 Convention on International Trade in Endangered Species of Wild Fauna and Flora (12th March 2013)

CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.
4 EXISTING ENVIRONMENT

4.1 Physical Environment

4.1.1 Meteorology

4.1.1.1 Climate

The climate in Maldives is warm and humid, typical of the tropics. The average temperature ranges between 25°C to 30°C and relative humidity varies from 73 percent to 85 precent. The annual average rainfall is approximately 1,948mm. As Maldives lies on the equator, Maldives receives plenty of sunshine throughout the year. Significant variation is observed in the climate between the northern and the southern atolls. The annual average rainfall in the southern atolls is higher than the northern atolls. In addition, greater extremes of temperature are also recorded in the southern atolls. On average southern atolls receive 2704 hours of sunshine each year. Table 4.1 provides a summary of key meteorological findings for Maldives. The nearest meteorological station is National Meteorological Centre on Hulhule’ Island. This study uses National Metrological Centre due to more comprehensive data.

Table 4.1: Key Meteorological Information of the Maldives

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Rainfall</td>
<td>9.1mm/day in May, November 1.1mm/day in February</td>
</tr>
<tr>
<td>Maximum Rainfall</td>
<td>184.5 mm/day in October 1994</td>
</tr>
<tr>
<td>Average air temperature</td>
<td>30.0°C in November 1973 31.7°C in April</td>
</tr>
<tr>
<td>Extreme Air Temperature</td>
<td>34.1°C in April 1973 17.2°C in April 1978</td>
</tr>
<tr>
<td>Average wind speed</td>
<td>3.7 m/s in March 5.7 m/s in January, June</td>
</tr>
<tr>
<td>Maximum wind speed</td>
<td>W 31.9 m/s in November 1978</td>
</tr>
<tr>
<td>Average air pressure</td>
<td>1012 mb in December 1010 mb in April</td>
</tr>
</tbody>
</table>
4.1.1.2 Monsoons

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

4.1.1.3 Winds

The winds that occur across Maldives are mostly determined by the monsoon seasons. The two monsoons are considered mild given that Maldives is located close to the equator. As a result, strong winds and gales are infrequent although storms and line squalls can occur, usually in the period May to July. During stormy conditions gusts of up to 60 knots have been recorded at Male’.

Wind has been uniform in speed and direction over the past twenty-plus monsoon seasons in the Maldives (Naseer, 2003). Wind speed is usually higher in central region of Maldives during both monsoons, with a maximum wind speed recorded at 18 ms$^{-1}$ for the period 1975 to 2001. Mean wind speed as highest during the months May and October in the central region. Wind analysis indicates that the monsoon is considerably stronger in central and northern region of Maldives compared to the south (Naseer, 2003).

Besides the annual monsoonal wind variations there are occasional tropical climatic disturbances (tropical storms or low intensity tropical cyclones) in the central region which increases wind speeds up to 110 km/h, precipitation to 30 to 40 cm over a 24 hour period and storm surges up to 3 m in open ocean (UNDP, 2006).

Table 4.2 summarises the wind conditions in central Maldives throughout a year. Medium term meteorological data from Hulhule meteorological centre (see Figure 4.1, Figure 4.2 and Figure 4.3) and findings from long-term Comprehensive Ocean-Atmosphere Data Set (COADS) are used in this analysis.
Table 4.2: Summary of General Wind Conditions from National Meteorological Centre

<table>
<thead>
<tr>
<th>Season</th>
<th>Month</th>
<th>Wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>NE - Monsoon</td>
<td>December</td>
<td>Predominantly from NW-NE.</td>
</tr>
<tr>
<td></td>
<td>January</td>
<td>High Speeds from W</td>
</tr>
<tr>
<td></td>
<td>February</td>
<td></td>
</tr>
<tr>
<td>Transition Period 1</td>
<td>March</td>
<td>From all directions. Mainly W.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High Speeds from W.</td>
</tr>
<tr>
<td></td>
<td>April</td>
<td></td>
</tr>
<tr>
<td>SW - Monsoon</td>
<td>May</td>
<td>Mainly from W.</td>
</tr>
<tr>
<td></td>
<td>June</td>
<td>High Speeds from W.</td>
</tr>
<tr>
<td></td>
<td>July</td>
<td></td>
</tr>
<tr>
<td></td>
<td>August</td>
<td></td>
</tr>
<tr>
<td></td>
<td>September</td>
<td></td>
</tr>
<tr>
<td>Transition Period 2</td>
<td>October</td>
<td>Mainly from W.</td>
</tr>
<tr>
<td></td>
<td>November</td>
<td>High Speeds from W</td>
</tr>
</tbody>
</table>

Figure 4.1 Monthly Frequencies of Wind Direction in Central Maldives based on National Meteorological Center 10 year Data (adapted from Naseer, 2003).
Figure 4.2: 24 Year Wind Frequency Recorded at National Meteorological Center.

Figure 4.3: Mean Daily Wind Speed and Direction Recorded at National Meteorological Centre (1978 – 2004)

The Disaster Risk Profile of Maldives (UNDP, 2006) reports 11 cyclonic events over the Maldives in the last 128 years and only one event over the central Maldives. All of these events were of category 1 cyclones. There have been no cyclonic events since 1993.
Fulhadhoo Island is located in a moderate to low risk cyclonic hazard zone which has the potential for a maximum probable cyclonic wind speed of 55.9 kts (UNDP, 2006).

The project site is expected to receive regular annual strong winds during the peak SW monsoon.

4.1.1.4 Rainfall

The average annual rainfall for the archipelago is 2,124 mm. There are regional variations in average annual rainfall: southern atolls receive approximately 2,280 mm, and northern atolls receive approximately 1,790 mm annually (MEC, 2004). Mean monthly rainfall also varies substantially throughout the year with the dry season getting considerably less rainfall. This pattern is less prominent in the southern half, however. The proportions of flood and drought years are relatively small throughout the archipelago, and the southern half is less prone to drought (UNDP, 2006).

The mean annual rainfall in Hulhule’ is 1991.5 mm with a Standard Deviation of 316.4 mm and the mean monthly rainfall is 191.6 mm. Rainfall varies throughout the year with mean highest rainfall during October, December and May and lowest between February and April (See Figure 4.4).

![Mean Monthly Rainfall in Hulhule'](image)

*Figure 4.4: Mean Monthly Rainfall in Hulhule’ (1975-2004)*

Analysis of daily maximum annual rainfall data shows high variability, including extremes (see Figure 4.5 below). However, no significant long term trends are evident in the Hulhule data.
The probable maximum precipitations predicted for Hulhule’ by UNDP (2006) are shown in Table 4.3.

Table 4.3 Probable Maximum Precipitation for various Return periods in Hulhule’

<table>
<thead>
<tr>
<th>Station</th>
<th>Return Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50 year 100 year 200 year 500 year</td>
</tr>
<tr>
<td>Hulhule’</td>
<td>187.4 203.6 219.8 241.1</td>
</tr>
</tbody>
</table>

Source (UNDP, 2006)

4.1.1.5 Temperature

Daily temperatures of Maldives vary little throughout the year with a mean annual temperature of 28°C. The annual mean maximum temperature recorded for Male’ during the period 1967-1995 was 30.4°C and the annual mean minimum temperature for the same period was 25.7°C. The highest recorded temperature for Male’ was 34.1°C on 16th and 28th of April 1973. The hottest month recorded was April 1975 with a maximum monthly average temperature of 32.7°C, the next highest being 32.6°C in April 1998. The lowest minimum average temperature of 23.7°C was recorded in July 1992.
There is considerable inter annual variability in extreme temperatures for Hulhule as shown in Figure 4.6. A maximum temperature of at least 33.5°C is rare at Hulhule and has a return period of 20 yrs (Hay, 2006).

![Figure 4.6 Maximum Temperature by year in Hulhule - 1975-2005 (Source: Hay, 2006)](image)

**4.1.2 Hydrology**

**4.1.2.1 Waves**

There are two major types of waves observed along the islands of Maldives. The first type is wave generated by local monsoon wind with a period of 3-8 seconds and the second type is swells generated by distance storms with a period of 14-20 seconds [Kench et. al (2006), DHI(1999), Binnie Black & Veatch (2000), Lanka Hydraulics (1988a & 1998b)]. The local monsoon predominantly generates wind waves which are typically strongest during April-July in the south-west monsoon period. Wave data for Male and Hulhulé between June 1988 and January 1990 (Lanka Hydraulics 1988a & 1998b) shows that the maximum significant wave height (Hs) recorded for June was 1.23 m with a mean period (Tm) of 7.53s. The maximum recorded Hs for July was 1.51 m with a Tm of 7.74s. The mean wave periods were 5.0 – 9.0s and the peak wave periods were within 8.0 – 13.0s.

Maldives experiences occasional flooding caused by long distance swell waves that are generated by South Indian Ocean storms (Goda 1988). The swell waves of height 3 meters that flooded Male’ and Hulhulé’ in 1987 are said to have originated from a low pressure system off west coast of Australia (refer the next section for more detail). In addition, Maldives have recently been subject to earthquake generated tsunami reaching heights of 4.0m on land (UNEP,
2005). Historical wave data from Indian Ocean countries show that tsunamis have occurred in more than 1 occasion, most notable has been the 1883 tsunami resulting from the volcanic explosion of Karakatoa (Choi et al., 2003).

There are two major types of waves reaching Fulhadhoo Island: long distance swells waves and monsoonal wind waves (see Figure 4.7). It is exposed to wind generated waves during both monsoons and during transition periods (see Figure 4.7). The local monsoonal wind waves generated during the SW monsoon affects the northern and southern lagoon approaching at an angle to the shoreline. Similarly, during the NE monsoon strong wind waves and swells effect on the northern rim of the reef. It also affects the northern shoreline.

In general, the proposed borrow site is located in calm zone but can be moderately rough during peak NE and SW monsoons.

4.1.2.2 Swell Waves and Storm Surges

Waves studies around Maldives have identified the presence of swell waves approaching predominantly from a southwest to a southerly direction Kench et. al (2006), Young (1999), DHI(1999), Binnie Black & Veatch (2000) and Naseer (2003). The long distance swell waves approach mainly from a SW direction (See Figure 4.7) and is dominant for most part of the year (Young, 1999). These waves come with a wave period of 14-20 seconds with a maximum height of 3.0 m in open ocean. The island’s southern shoreline is partially exposed to SW swells due to refraction through the atoll reef pass on the southwest corner of Goidhoo Atoll Waves generated from abnormal events could travel against the predominant swell propagation patterns (Goda, 1998), causing flooding on the eastern and southern islands of Maldives (UNDP, 2009).

The predominant swells approaching from the SE has limited influence on the shoreline of the island.

4.1.2.3 Currents

Currents that affect the reef system of Fulhadhoo Reef can be caused by tidal currents, wind-induced currents and wave-induced currents. It is presumed that generally current flow through the country is defined by the two-monsoon season winds. Westward flowing currents are dominant from January to March with the change in current flow pattern taking place in April and December (Kench et. al, 2006). In April the westward currents become weak while the eastward currents start to take over. In December the eastward currents are weak with the westward currents becoming more prominent. Hence, currents within the site are very likely to be heavily influenced by the monsoons.

The estimated patterns in current flow during NE monsoon are presented in Figure 4.8.
In-situ current assessment was undertaken on the project site during December, representing the NE monsoon conditions. Observations were undertaken using drogue method on a single day, measuring only during flood tide. Measurements were undertaken as a grid.

The current flow during January was generally southerly direction. The speed of flow on the reef flat slows down to less than 0.1 m/s at the project site.

### 4.1.2.4 Tidal Pattern

Water levels at the site vary mainly in response to tides, storm surge or tsunamis. Tides in the Maldives are mixed and semi-diurnal/diurnal. Tidal variations are referred to the standard station in at Hulhulé Island. Typical spring and neap tidal ranges are approximately 1.0m and 0.3m, respectively (MEC, 2004). Maximum spring tidal range in Hulhulé is approximately 1.1m. There is also a 0.2 m seasonal fluctuation in regional mean sea level, with an increase of about 0.1m during February to April and a decrease of 0.1m during September to November. Table 4.4 summarizes the tidal elevations reported at Hulhulé, which is representative of tidal conditions at the project site.

#### Table 4.4: Tidal Variations at Male’ International Airport(Source: MEC, 2004)

<table>
<thead>
<tr>
<th>Tide Level</th>
<th>Referred to Mean Sea level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest Astronomical Tide (HAT)</td>
<td>+0.64</td>
</tr>
<tr>
<td>Mean Higher High Water (MHHW)</td>
<td>+0.34</td>
</tr>
<tr>
<td>Mean Lower High Water (MLHW)</td>
<td>+0.14</td>
</tr>
<tr>
<td>Mean Sea Level (MSL)</td>
<td>0.00</td>
</tr>
<tr>
<td>Mean Higher Low Water (MHLW)</td>
<td>-0.16</td>
</tr>
<tr>
<td>Mean Lower Low Water (MHLW)</td>
<td>-0.36</td>
</tr>
<tr>
<td>Lowest Astronomical Tide (LAT)</td>
<td>-0.56</td>
</tr>
</tbody>
</table>
Figure 4.7: Estimated wave patterns around the proposed site

- Wind waves approaching from NW and W during SW monsoon;
- Diffracted SW monsoon swell waves approaching through the Goidhoo reef pass;
- Very Strong NE monsoon wind waves periodic swells; island exposed directly to Indian Ocean swells.
Figure 4.8: Observed current flow patterns on the reef during January 2018
4.1.3 Marine water quality assessment

The primary objective of the marine water quality sampling was to determine the baseline conditions of the marine water near the proposed project locations.

Water samples were collected in 1500ml PET bottles from two locations. pH, Conductivity, Total Dissolved Solids, and Salinity was tested using handheld multi-parameter probe. Remaining parameters were tested at MWSC’s Quality Assurance Laboratory.

The following table shows the test results of the marine water collected on 25th December 2017. Laboratory results are attached in Appendix G.

Marine water qualities for majority of the parameters tested appear to be within acceptable ranges at all sites. Turbidity and Total Suspended Solid level of both samples was very low.

Table 4.5: Marine water quality assessment results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>SW1</th>
<th>SW2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical appearance</td>
<td>Clear with particles</td>
<td>Clear with particles</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td>7.9</td>
<td>8.08</td>
</tr>
<tr>
<td>Salinity (‰)</td>
<td></td>
<td>35.53</td>
<td>35.39</td>
</tr>
<tr>
<td>Total Dissolved Solids (mg/L)</td>
<td></td>
<td>34,986.80</td>
<td>34,865.57</td>
</tr>
<tr>
<td>Conductivity (µS/cm)</td>
<td></td>
<td>55,309</td>
<td>55,002</td>
</tr>
<tr>
<td>Total Suspended Solids (mg/L)</td>
<td></td>
<td>&lt;5*</td>
<td>&lt;5*</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td></td>
<td>0.932</td>
<td>0.740</td>
</tr>
</tbody>
</table>

*LoQ: Limit of Quantification: 5 mg/L

4.1.4 Ground water quality assessment

The primary objective of the ground water quality sampling was to determine the baseline conditions of the ground water at the project sites.

Water samples were collected in 1500ml PET bottles from two locations. pH, Conductivity, Total Dissolved Solids, and Salinity was tested using handheld multi-parameter probe. Remaining parameters were tested at MWSC’s Quality Assurance Laboratory.
Table 4.6: Ground water quality assessment results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GW1</td>
</tr>
<tr>
<td>Physical appearance</td>
<td>Clear with particles</td>
</tr>
<tr>
<td>pH</td>
<td>7.19</td>
</tr>
<tr>
<td>Salinity ($/oo$)</td>
<td>1.05</td>
</tr>
<tr>
<td>Total Dissolved Solids (mg/L)</td>
<td>1348.697</td>
</tr>
<tr>
<td>Conductivity ($\mu$S/cm)</td>
<td>2163</td>
</tr>
<tr>
<td>Nitrate (mg/L)</td>
<td>29.4</td>
</tr>
<tr>
<td>Phosphate (mg/L)</td>
<td>0.35</td>
</tr>
</tbody>
</table>

The pH of both samples were neutral, and salinity level of both were very low. However nitrate level of sample GW1 was very high at 29.4 mg/L. However level of phosphate in this sample was low.

4.1.5  Bathymetry

A detailed bathymetric survey of the proposed borrow area and alternative borrow area was undertaken during December 2017. Survey results have been summarised in bathy charts presented in Appendix F.

The proposed borrow site as an average depth of -1.0 m MSL

4.1.6  Soil

In order to analyze the soil profile of the area, an existing bore hole (2ft x 2ft) was surveyed (See Appendix E: survey location map) from the island. The soil conditions of the site were similar to soil conditions of other islands across the Maldives, consisting considerable quantities of unweathered corals as parent materials, coral rocks and sand.

There was a shallow layer of black soil observed as top soil (10cm), just underneath the layer of grass growing on top. The topsoil was followed by a transition layer of black-to-fine white zone (15cm) and a deep layer of fine white sand (40cm) before reaching the hardpan layer (20cm) at a depth of 0.85 meters. The hardpan was followed by a second layer of fine white sand (20cm) before reaching the water table at a depth of 1.05 meters.

The pH of the water sample taken at the site was 7.19. The soil is generally classified as poor and deficient in nitrogenous nutrients, potassium and several other micronutrients; particularly iron, manganese and zinc. Though the phosphorus content of the soils is high it is present mostly in the form of calcium phosphate and, thus, remains unavailable to plants.
4.1.7 Land Use

Fulhadhoo is an inhabited island with a total land area of approximately 24.8 hectares (within vegetation line). The island is approximately 1.7km long and 0.25 km wide at its widest point. The island is located along an E-W direction. Similar to other inhabited islands of Maldives, the land area of Fulhadhoo is used for a range of purposes that are associated with human settlement. A land use plan has been prepared by the island council and approved by Ministry of Housing and Infrastructure (refer to Appendix I). Following land uses have been identified from this land use plan and observed during the field visit:

- The existing settlement area is concentrated around the eastern half of the island. The current settlement area is approximately 6.4 Ha. Within this area, most of the land area is used for housing and infrastructure. There is a football field located on the southwest of this residential zone.

- There are vast areas of densely vegetated uninhabited areas on the west of the settlement area and smaller areas on the east of settlement. More than 50% of the land area of Fulhadhoo is forest area. The existing land use of these areas could best be summed up as common property resources, where the inhabitants collect firewood, coconuts, wood and medicinal plants for personal use. Within the forest area on the eastern side, there is small area cleared and used as cemetery.

- In addition the following land uses have been proposed in the land use plan:
  - Plantation and livestock production area to be developed the eastern side of the island.
  - Ooredoo antennae adjacent to the cemetery
  - All coastal vegetation around the island will be dedicated as environment protection zones and will not be cleared for any developments in the future.
  - The forestry area on the western half of the island will be maintained as open green spaces.

The present land use plan of the island is presented in Appendix I.
4.2 Biological Environment

4.2.1 Terrestrial ecology

4.2.1.1 Flora

General characteristics

The proposed project site is a single road stretching from the inhabited area of the island towards the western beach (thundi) of the island along the northern shoreline. There is an existing road slightly south of the proposed road towards the center of the island.

Most of the vegetation present consists of coconut palms (*Cocos nucifera*) and other common species such as Midhili (*Terminalia catappa*), Funa (*Calophyllum inophyllum*), Dhiggaa (*Hibiscus tiliaceus*), Magoo (*Scaevola taccada*), and Boa-kashikeyo (*Pandanus tectoris*). The rest of the species are found in very few numbers and none of the areas have been used by the public much as locals and tourists alike prefer to use the beach on the southern side of the island.

No unique trees, (very old trees or vegetation groups) were observed along the proposed road. Neither the council or locals expressed any concerns for relocating and trees within the island, as the community have large areas of vegetation present on the island even today. Some elder folk did express their concerns for gathering dried palm leaves, however majority of the public and the local council expressed that there are enough areas on the island to source these from.

An inventory of the flora found at the project site in Baa Fulhadhoo is presented in Table 4.7.

Vegetation Types

For the purposes of this assessment, the major groups of vegetation can be classed into the following categories of vegetation and land use. The main reason for this adoption is the specific nature of vegetation in small coral islands. Vegetation classification was undertaken using remote sensing and GIS software based on the methodology outlined at the start of this section. The results of the vegetation classification are presented is Appendix H.

1. Coconut Dominated Forest: Dominated by palms (*Cocos nucifera*) with the occasional hardwood species such as Dhiggaa (*Hibiscus tiliaceus*) Hirundhu (*Thespesia populnea*) and kashi-keyo (*Pandanus tectorius*) dominating the under-storey.

2. Coconut Grove: Small pockets (groves) of pure palm trees (*Cocos nucifera*) with minimal under-growth.
3. Littoral Edge Scrubland: Upper canopy dominated by scattered palms (*Cocos nucifera*), with the under-storey dominated by Kashi-keyo (*Pandanus tectorius*) and Magoo (*Scaevola taccada*).

4. Sub-littoral Thicket: Densely vegetated hardwood species such as Funa (*Calophylum inophyllum*), Uni (*Guettarda speciosa*), Kashi-keyo (*Pandanus tectorius*) and Midhili (*Terminalia catappa*).
### Table 4.7: Vegetation inventory of Project Sites and Estimates of Removal Required

<table>
<thead>
<tr>
<th>#</th>
<th>Family</th>
<th>Scientific Name</th>
<th>English Name</th>
<th>Dhivehi</th>
<th>Quantity for Removal</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Arecaceae</td>
<td><em>Cocos nucifera</em></td>
<td>Coconut palm</td>
<td>Dhivehi ruh</td>
<td>115 (medium to tall)</td>
<td>Additional 20+ smaller palm trees were observed in the undergrowth.</td>
</tr>
<tr>
<td>2</td>
<td>Combretaceae</td>
<td><em>Terminalia catappa</em></td>
<td>Country almond</td>
<td>Midhili</td>
<td>4-7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Malvaceae</td>
<td><em>Hibiscus tiliaceus</em></td>
<td>Sea Hibiscus</td>
<td>Dhigga</td>
<td>10-14</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Malvaceae</td>
<td><em>Thespesia populnea</em></td>
<td>Portia tree</td>
<td>Hirundhu</td>
<td>10-14</td>
<td>A total of 53 medium-to-large hardwood trees may need to be removed for the project. All trees falling within the road footprints will be removed or relocated by the contractor. This includes mainly Funa and Uni.</td>
</tr>
<tr>
<td>5</td>
<td>Goodeniaceae</td>
<td><em>Scaevolla taccada</em></td>
<td>Sea Lettuce</td>
<td>Magoo</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Calophyllaceae</td>
<td><em>Calophyllum inophyllum</em></td>
<td>Alexander Wood</td>
<td>Funa</td>
<td>15-20</td>
<td>An additional 70+ shrubs may also need to be removed for the project, of which 60% comprises of Boa-kashikeyo and Magoo.</td>
</tr>
<tr>
<td>7</td>
<td>Lamiaceae</td>
<td><em>Premna serratifolia</em></td>
<td>Premna</td>
<td>Dhakan’dha</td>
<td>5-10</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Pandanaceae</td>
<td><em>Pandanus tectoris</em></td>
<td>Screw pine</td>
<td>Boa kashikeyo</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Rubiaceae</td>
<td><em>Guettarda speciosa</em></td>
<td>Beach gardenia</td>
<td>Uni</td>
<td>15-20</td>
<td></td>
</tr>
</tbody>
</table>

*Multiple plants found in the area (in excess of 50+)*
4.2.1.2 Fauna

General Characteristics

Baa Fulhadhoo had a very low level of faunal biodiversity present during the field visit, especially in terms of bird species.

As the occurrence fauna was found to be minimal during the brief survey period, faunal survey was carried out based on similar conditions found elsewhere in the Maldives, and local accounts on species found at the location.

An inventory of the fauna found at the proposed project site in Baa Fulhadhoo is presented in Table 4.8.

Birds

The most commonly observed species on the island is the Kaalhu (*Corvus Linnaeus*) and the only resident birds on the island are the Koveli (*Eudynamys scolopaceus*) and the Kambili (*Amaurornis phoenicurus*).

Some of the sea-faring and migratory birds known to frequent the island include; Maakanaa (*Ardea cinerea*), Dhandifulhu dhooni (*Phaethon lebturus*) and Findhana (*Actitis hypoleucos*). However, due to the short amount of time that is usually spent during field visits, the number and type of species recorded may not be completely accurate to study avian fauna of the island. In order to complete a detailed study of birds found on this island, it will require several months of observation.

Reptiles and Mammals

Records of reptiles and mammals are minimal. The only terrestrial mammals recorded on site were the Fruit bat (*Pteropus giganteus ariel*), the rat (*Rattus norvegicus*) and the domestic cat (*Felis sp.*).

Only five reptile species were identified: namely one gecko (*Hemidactylus frenatus*), the White-spotted supple skink (*Lygosoma albopunctata*), the common wolf snake (*Lycodon aulicus*), the Island blind snake (*Ramphotyphlos braminus*) and the Common garden lizard (*Calotes versicolor*).

Though some of these species were not spotted on site, based on previous understandings on Maldivian biodiversity, it is safe to assume that these species will be present on an island of this size and nature.
No other reptiles or mammals were recorded at the site.

**Crustaceans and Amphibians**

Crustaceans observed on the island include the Stalk-eyed Ghost crab (*Ocypode ceratophtalmus*), the Little Ghost crab (*Ocypode cordimana*) and the Variable Land Hermit Crab (*Coenobita variabilis*) found on the beach.

No amphibians were observed during the field visit.

4.2.1.3  **Pest & Diseases**

Pest and diseases found at the project location were identified during the floral and faunal assessment walks.

An inventory of the pest and diseases found on at the project site in Baa Fulhadhoo is presented in Table 4.9.

**Pests**

Among animal pests, rats (*Rattus norvegicus*) are usually considered the most notable pest on every island. Another potential animal pest on the island could be the Fruit bat (*Pteropus giganteus ariel*). The species reside mainly among the several large Banyan Trees (*Ficus benghalensis*) feeding on the berries.

Among insect pests, the most detrimental species are the Rhinocerous beetle (*Oryctes rhinoceros*). The species can cause devastating effects on the coconut palms if left unattended. However, there were no signs of the presence of the deadlier Coconut hispine beetle (*Brontispa longissima*) on the island.

Mosquitoes (Culicoidea family) are moderately high on the island but mainly inside the densely vegetated areas of the island.

**Diseases**

No floral diseases were observed at the site.
### Table 4.8: Fauna inventory of Baa Fuladhoo

<table>
<thead>
<tr>
<th>#</th>
<th>Category</th>
<th>Name(s)</th>
<th>English</th>
<th>Dhivehi</th>
<th>Distribution (ACFOR)</th>
<th>IUCN Red List (Category)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Class</td>
<td>Order</td>
<td>Family</td>
<td>Species</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Crustaceans</td>
<td>Malacostraca</td>
<td>Decapoda</td>
<td>Ocypodida</td>
<td>Ocypode ceratophthalmus</td>
<td>Stalk-eyed ghost crab</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>Coenobitida</td>
<td>Coenobita variabilis</td>
<td>Little ghost crab</td>
</tr>
<tr>
<td>3</td>
<td>Birds</td>
<td>Aves</td>
<td></td>
<td>Coenobitida</td>
<td>Coenobita variabilis</td>
<td>Variable land hermit crab</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Cuculiformes</td>
<td>Scolopacida</td>
<td>Cuculidae</td>
<td>Eudynamys scolopaceus</td>
<td>Asian koel</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Charadriiformes</td>
<td>Scolopacida</td>
<td>Actitis</td>
<td>Actitis hypoleucos</td>
<td>Common sandpiper</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Gruiformes</td>
<td>Rallidae</td>
<td>Amaurornis</td>
<td>Amaurornis phoenicus</td>
<td>White-breasted waterhen</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Pelecaniformes</td>
<td>Ardeidae</td>
<td>Ardea</td>
<td>Ardea cinerea</td>
<td>Grey heron</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Phaethontiformes</td>
<td>Phaethontidae</td>
<td>Phaethon</td>
<td>Phaethon lebattus</td>
<td>White-tailed tropicbird</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Passeriformes</td>
<td>Corvidae</td>
<td>Corvus</td>
<td>Corvus linnaeus</td>
<td>Crow</td>
</tr>
<tr>
<td>10</td>
<td>Mammals</td>
<td>Mammalia</td>
<td>Chiroptheria</td>
<td>Pteropodida</td>
<td>Pteropus giganteus ariel</td>
<td>Indian Flying Fox</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>Rodentia</td>
<td>Muridae</td>
<td>Rattus</td>
<td>Rattus norvegicus</td>
<td>Rat</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>Carnivora</td>
<td>Felidae</td>
<td>Felis</td>
<td>Felis sp.</td>
<td>Domestic cat</td>
</tr>
<tr>
<td>13</td>
<td>Reptiles</td>
<td>Reptilia</td>
<td>Agamidae</td>
<td>Calotes</td>
<td>Calotes versicolor</td>
<td>Common garden lizard</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>Gekkonidae</td>
<td>Hemidactylus sp.</td>
<td>Lycodons</td>
<td>Lygodon aulicus</td>
<td>Common Wolf Snake</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>Scincedae</td>
<td>Lygosoma albopunctata</td>
<td>Lygosoma</td>
<td>Lygosoma albopunctata</td>
<td>White-spotted Supple Skink</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>Typhlopidae</td>
<td>Ramphophylos braminus</td>
<td>-</td>
<td>-</td>
<td>Island blind snake</td>
</tr>
</tbody>
</table>

**NOTE:**
- ACFOR: A: Abundant; C: Common; F: Frequent; O: Occasional; R: Rare
- IUCN: EX: Extinct; EW: Extinct in the wild; CR: Critically endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern; DD: Data deficient; NE: Not evaluated
Table 4.9: Inventory of Pests and Diseases observed at the proposed project site in Baa Fulhadhoo

<table>
<thead>
<tr>
<th>#</th>
<th>Category</th>
<th>Class</th>
<th>Order</th>
<th>Family</th>
<th>Species</th>
<th>English</th>
<th>Dhivehi</th>
<th>Distribution (ACFOR)</th>
<th>Host Species / areas</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pests</td>
<td>Insecta</td>
<td>-</td>
<td>-</td>
<td>Unidentified</td>
<td>Ants</td>
<td>Hini (kalhu)</td>
<td>C</td>
<td>General Environment</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>Unidentified</td>
<td>Spiders</td>
<td>Makunu</td>
<td>O</td>
<td>General Environment</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>Oryctes rhinoceros</td>
<td>Rhinoceros Beetle</td>
<td>Ruku Madi</td>
<td>O</td>
<td>Palm trees</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Diptera</td>
<td>Culicoidea</td>
<td>-</td>
<td>Unidentified</td>
<td>Mosquito</td>
<td>Madhiri</td>
<td>A</td>
<td>General Environment / water bodies</td>
<td>Invasive if unattended</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Mammalia</td>
<td>-</td>
<td>-</td>
<td>Rattus norvegicus</td>
<td>Rat</td>
<td>Meedhaa</td>
<td>A</td>
<td>General Environment</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>Pteropus giganteus ariel</td>
<td>Fruit Bat</td>
<td>Vaa</td>
<td>A</td>
<td>General Environment</td>
<td>-</td>
</tr>
</tbody>
</table>

NOTE: ACFOR: A: Abundant; C: Common; F: Frequent; O: Occasional; R: Rare
4.2.1.4 Vegetation Pictorial Summary

Figure 4.9: Kureddhi and Magoo are the most dominant species along the shorelines

Figure 4.10: The undergrowth along the proposed road is very dense with multiple shrub species

Figure 4.11: Uni is one of the more common hardwood species observed along the proposed road

Figure 4.12: A large grass field observed on the western side of the island

Figure 4.13: Thick pockets of Boa-kashikeyo is observed along the proposed road

Figure 4.14: Rhinoceros beetle is the most common pest problem observed in the palm trees
4.2.2 Marine Environment

4.2.2.1 Visual Snorkelling Survey

Visual snorkelling surveys were carried out at select locations of the lagoon.

Site 1 – Harbour Area

The average depth within the surveyed area was 3 m. Visibility within this area was good, extending over 20 meters, indication of good water clarity.

This area was predominantly made up of coral sand (~90%) interspersed with rock and coral rubble. Small patches of funnel weed (*Padina commersonii*) were observed scattered across at this location.

Fish life and diversity was generally poor at this location, main fish type observed were Emperor Fishes.

Figure 4.15: Seabed observed along the basin area

Site 2 – Southern Jetty

The average depth at this location was 0.5 m – 1.2 m below MSL.

This site is predominantly made up of sand interspersed with small coral rubble pieces. Small patches of *Thalassia hemprichii*, and *Padia commersonii* (Funnel Weed) were observed at this site. Small isolated colonies of branching type corals were observed within the seagrass patches.

No significant fish life was observed at this site during the survey.
4.2.3 Marine protected areas and sensitive sites

Baa Atoll has been declared a UNESCO Biosphere Reserve and came into effect on 28 June 2011. The Biosphere Reserve introduced a Zonation System with a view to balance anthropogenic uses and ecological sustainability. The underlying principle is that the Atolls’ “biological and non-biological resources are protected, but managed through a zonation system that provides provisions for different uses and activities to be undertaken in the different zones whilst minimizing detrimental threats and user conflicts”1.

The zonation system was adopted the UNESCO World Biosphere Reserve zonation criteria and protocols. It includes a three-tiered zonation covering the following1:

- Core Areas (highly protected and managed areas where only non-damaging, non-extractive use is allowed),
- Buffer Zones (managed areas where some types of activities are allowed), and
- Transitional Areas (multiple use areas where sustainable activities are allowed)

The Baa Atoll Biosphere Reserve zoning map is shown in Figure 4.17. The Proposed project area falls within a Transitional Zone and International Union for Conservation of Nature (IUCN) Protected Area Zoning Category VI is applied to this zone. As per Category VI definition these are “areas that conserve ecosystems and habitats, together with associated cultural values and traditional natural resource management systems”. Thus, sustainable land clearing is possible within this zone. This will mean planting two palms for each palms removed and clearing only the areas required.

There are also two Marine Protected Areas and two Terrestrial Protected Areas within a 10 km radius. None of these sites are expected to be impacted significantly from the proposed project.

---

EIA for the proposed Land Clearing and Tree Relocation Project in Fulhadhoo, Baa Atoll

Figure 4.17: Baa Atoll Biosphere Reserved Zoning Map

<table>
<thead>
<tr>
<th>Area Name</th>
<th>Core Area (ha)</th>
<th>Buffer (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mendhoo</td>
<td>583.8</td>
<td>58.3</td>
</tr>
<tr>
<td>2 Dhigali Haa</td>
<td>32.19</td>
<td>59.25</td>
</tr>
<tr>
<td>3 Hatifaru</td>
<td>467.5</td>
<td>192.6</td>
</tr>
<tr>
<td>4 Angafaru</td>
<td>590.8</td>
<td>227.9</td>
</tr>
<tr>
<td>5 Maahuruvathi</td>
<td>1520</td>
<td>352.6</td>
</tr>
<tr>
<td>6 Raaathalaa</td>
<td>502.0</td>
<td>200.0</td>
</tr>
<tr>
<td>7 Olhugiri</td>
<td>41.95</td>
<td>6.135</td>
</tr>
<tr>
<td>8 Gooldhoo Koaru</td>
<td>10.34</td>
<td>3.566</td>
</tr>
<tr>
<td>9 Dhurakandu</td>
<td>22.6</td>
<td>33.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3050</strong></td>
<td><strong>1658</strong></td>
</tr>
</tbody>
</table>

Percent of Atoll: 2.1% 1.14%

Figure 4.17: Baa Atoll Biosphere Reserved Zoning Map
4.3 Hazard Vulnerability of the Site

According to the UNDP Disaster Risk Assessment Report of Maldives in 2006, proposed extension of Fulhadhoo is located in an area exposed to tsunamis, wind storms, storm surges and swell waves. It does not identify the island as being exposed to heavy rainfall flooding.

The following parameters can be deduced for the Male’ Region based on Disaster Assessment Report and the Detailed Island Risk Assessment Reports (UNDP, 2009).

**Tsunami:** Maximum probable wave height range 2.50-3.20

**Cyclone or storm (wind):** Probable maximum wind speed 84.2 knots (category 2 cyclone).

**Storm surge:** predicted storm surge height – 0.45; predicted storm tide height 1.38.

**Rainfall:** probable maximum daily rainfall for Hanimaadhoo for a 500 year return period 175.6 mm

Based on these parameters, field surveys and planned design parameters of the island, the methodology for risk assessment identified in the Detailed Island Risk Assessment Reports (UNDP, 2009) and findings from Ali (2005) was used to assess the hazard risks on the site. However, the results should be treated with caution as this is a preliminary risk assessment. A more comprehensive assessment will require a longer time frame and a lot of data, which is beyond the scope of this EIA.

4.4 Socio-Economic Setting of B.Fulhadhoo

4.4.1.1 Population Characteristics

**Total Population**

According to results of Census 2014, Fulhadhoo has a total population of 187. Out of the total enumerated population in 2014, 102 were males and 85 were females. The population in 2014 was comprised of 174 Maldivians (90 males and 84 females) and 13 foreigners (12 males and 1 female). Figure below shows the total Maldivian population of the islands of Baa atoll in 2014.
Out of the 20 administrative atolls of Maldives, Baa atoll is among the 11 atolls with a total Maldivian population of less than 10,000 people. Population of Baa atoll is in the 4000-6000 range. The population of Baa atoll makes up 4.5% of the total population of all administrative atolls of Maldives.

Total Maldivian population of Baa atoll at the time of census 2014 was 8878. 8 out of the 13 inhabited islands of Baa atoll have populations with less than 500 people. Fulhadhoo is one of
these 8 islands and is also the second least populated island in the atoll. Fulhadhoo population makes up only 2 percent of the total population of Baa atoll.

**Population Density**

Fulhadhoo has a land area of approximately 26.5 Ha (Google earth, 2016). No reclamation has been undertaken so far in Fulhadhoo, hence the natural size of the island has been maintained. The island has not had any population pressures for land expansion since there are plenty of vacant land for settlement expansion. The currently population density of Fulhadhoo is 7 persons per hectare (based on total Maldivian population data of census 2014).

**Sex Ratio**

According to census 2014, there were more males than females in Fulhadhoo with a sex ratio of 107 males per 100 females (see figure below). Fulhadhoo had the second largest sex ratio in Baa atoll.

![Sex ratio of all the Islands of Baa Atoll](Source: National Bureau of Statistics, 2014)

**Population Structure**

Figure below shows the population pyramid of B. Fulhadhoo population based on census 2014.
Figure 4.21: Population Pyramid for Fulhadhoo, Census 2014 (Source: National Bureau of Statistics, 2014)

As can be seen from the figure, the most dominant age group in Fulhadhoo is 4-9 years age group for males and age groups 0-4, 25-29 and 65+ for females. The dependent population is at 36% comprising 28.6% children (0-14 years) and 7.4% elderly (65 years and above). The working age population comprises of more than half of the population with 64%.

4.4.1.2 Education

According to Fulhadhoo Island council (2018) there are 2 schools in Fulhadhoo; a preschool with a total of 9 students and a primary school with a total of 24 students.

4.4.1.3 Employment

Fulhadhoo Island is fishing, public sector employment, guesthouse business and retail business, according to information provided by Fulhadhoo Island Council (2018).

4.4.1.4 Infrastructure and Utility Services

Households

There were a total of 49 households in Fulhadhoo according to Census 2014 dataset.

Healthcare

According to the information provided by the Island Council in 2018, the main health care facility on the island is Fulhadhoo Health centre. The health centre had 1 general doctor and 2
nurses at the time the information was provided. There is 1 pharmacy on the island operated by State Trading Organization (STO).

**Utility Services**

There are no recent published reports on utilities of Fulhadhoo, thus all utility-sector related information has been provided on request by the Fulhadhoo Island Council.

Electricity for the island is provided by FENAKA Corporation. There are 2 generator sets each with a capacity of 80kw.

There is no sewerage network in Fulhadhoo Island. Sewage from individual households are managed with septic tanks.

Waste on the island is managed by WAMCO. The service has recently been introduced.

**Transport and other Services**

There is no harbour in Fulhadhoo Island. The main point of access to the island is a jetty located on the southern side of the island. According to information provided by island council in 2018, there are 8 boats and a total of 20 small dinghy/speed boats in the island.
5 IMPACT IDENTIFICATION

5.1 Introduction

Potential adverse and beneficial impacts of the proposed tree relocation project are identified and evaluated in this section.

Significant impacts are identified and evaluated in two stages. The first stage identifies the environmental and socio-economic components that may be impacted from key project activities. 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 project as 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 be undertaken at full-scale 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 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.

5.4 Boundaries of Affected Areas

The estimated boundaries of affected areas are summarised in Figure 5.1 below. These boundaries are based on physical conditions and work methods proposed in the project without any mitigation measures. The extents shown are not absolute and should be treated as the best-guess scenario based on past projects.

It has to be noted that these extents do not represent figures derived from sediment dispersal modelling. It is based purely on past experience from similar projects.
Figure 5.1: Estimated Affected Areas
Table 5.1: Impact Identification Matrix

<table>
<thead>
<tr>
<th>Project Activity</th>
<th>Ambient noise level</th>
<th>Ambient air quality</th>
<th>GHG emissions</th>
<th>Groundwater</th>
<th>Coastal Processes</th>
<th>Marine water</th>
<th>Terrestrial Flora and Fauna</th>
<th>Soil Condition</th>
<th>Marine Flora and Fauna</th>
<th>Landscape Integrity/Scenery</th>
<th>Natural Hazard Risk</th>
<th>Health and Safety</th>
<th>Demand for Resources and Services</th>
<th>Local Economy</th>
<th>Social Cohesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobilization and Site Preparation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>+</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Vegetation Clearing and Storage</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>+</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Dredging</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>+</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Backfilling and leveling</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Transportation of trees</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Waste Management</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Demobilization</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
### Table 5.2: Evaluation of key impacts on the natural and economic environment

<table>
<thead>
<tr>
<th>Impact area</th>
<th>Direct Impacts</th>
<th>Indirect/ Cumulative Impacts and Impact Interactions</th>
<th>Magnitude</th>
<th>Reversibility</th>
<th>Duration</th>
<th>Distribution</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient noise level</td>
<td>Exposure to loud noises generated from operation of equipment and machineries for tree removal have direct adverse health impacts, and may disturb, and disrupt behaviour of terrestrial fauna in the area (e.g. impede foraging and mating behaviour of birds).</td>
<td>Indirect adverse impact of noise pollution includes increase medical expenses, reduction in productivity of workers, and those exposed.</td>
<td>Minor negative</td>
<td>Reversible</td>
<td>Short term-intermittent (Project duration is very short and during this period equipment are not expected to be operated continuously for long periods)</td>
<td>Site level</td>
<td>Insignificant</td>
</tr>
<tr>
<td>Ambient air quality</td>
<td>Dust pollution, and degradation of air quality from dust and, emission from machineries, vessels, and vehicles used for tree removal and transportation.</td>
<td>Indirect impacts include adverse health impact to those exposed to high levels of dust, and toxic gases, increase in medical expenses, and</td>
<td>Minor negative</td>
<td>Reversible</td>
<td>Short term</td>
<td>Island level</td>
<td>Insignificant</td>
</tr>
<tr>
<td>Impact area</td>
<td>Direct Impacts</td>
<td>Indirect/ Cumulative Impacts and Impact Interactions</td>
<td>Magnitude</td>
<td>Reversibility</td>
<td>Duration</td>
<td>Distribution</td>
<td>Significance</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>------------------------------------------------------</td>
<td>-----------</td>
<td>---------------</td>
<td>-----------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td></td>
<td>reduction in of productivity of workers, and those exposed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GHG emissions</td>
<td>Increase in GHG in atmosphere due to GHG emission from construction equipment, vehicles, and vessels used for transportation contribute of global warming.</td>
<td>Cumulative increase in GHG level of atmosphere from various GHG emission sources in the country.</td>
<td>Minor negative (Emissions expected to be negligible)</td>
<td>Reversible in the long term</td>
<td>Short term</td>
<td>Global level</td>
<td>Insignificant</td>
</tr>
<tr>
<td>Groundwater</td>
<td>Accidental spillage of fuel, lubricants, etc. contaminate groundwater lens of the island.</td>
<td>Vegetation and soil at backfilling sites can be adversely affected.</td>
<td>Moderate negative</td>
<td>Irreversible</td>
<td>Long term</td>
<td>Site level</td>
<td>Insignificant</td>
</tr>
<tr>
<td></td>
<td>Salt intrusion from marine sand used for backfilling</td>
<td>Vegetation and soil at backfilling sites can be adversely affected.</td>
<td>Minor negative</td>
<td>Reversible over time</td>
<td>Long term</td>
<td>Site level</td>
<td>Insignificant</td>
</tr>
<tr>
<td>Coastal Processes</td>
<td>Potential changes to the flow velocity due deployment of temporary</td>
<td></td>
<td>Moderate negative</td>
<td>Reversible in the long term with costly</td>
<td>Long term</td>
<td>Site level</td>
<td>Moderate</td>
</tr>
<tr>
<td>Impact area</td>
<td>Direct Impacts</td>
<td>Indirect/ Cumulative Impacts and Impact Interactions</td>
<td>Magnitude</td>
<td>Reversibility</td>
<td>Duration</td>
<td>Distribution</td>
<td>Significance</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------</td>
<td>------------------</td>
<td>----------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Marine water</td>
<td>Excavator movement, and dredging is expected to generate sediment plumes, and reduce the overall quality of water.</td>
<td>Indirect impact on physiological fitness of marine organisms, and community composition of the marine ecosystem.</td>
<td>Moderate negative</td>
<td>Reversible</td>
<td>Short term</td>
<td>Island level</td>
<td>Major</td>
</tr>
<tr>
<td>Terrestrial Flora and Fauna</td>
<td>Direct loss of terrestrial flora from the project sites due to removal and relocation of palms and trees</td>
<td>Indirect impacts on composition of terrestrial ecosystem</td>
<td>Moderate negative</td>
<td>Irreversible</td>
<td>Long term</td>
<td>Site level</td>
<td>Moderate</td>
</tr>
</tbody>
</table>
## Impact area

<table>
<thead>
<tr>
<th>Impact area</th>
<th>Direct Impacts</th>
<th>Indirect/ Cumulative Impacts and Impact Interactions</th>
<th>Magnitude</th>
<th>Reversibility</th>
<th>Duration</th>
<th>Distribution</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Condition</td>
<td>Loss of habitat and disturbance to terrestrial fauna due to vegetation clearance and worker actions.</td>
<td>Indirect impacts on composition of terrestrial ecosystem</td>
<td>Moderate negative</td>
<td>Reversible</td>
<td>Short term</td>
<td>Site Level</td>
<td>Minor</td>
</tr>
<tr>
<td>Soil Condition</td>
<td>Contamination of soil from accidental spillage, leakage of fuel, lubricants etc. during operation of equipment and machinery</td>
<td>Indirect impacts include potential groundwater contamination, and plants in the area may take up contaminants leading to accumulation of contaminant in the food chain.</td>
<td>Moderately negative</td>
<td>Reversible with costly treatment and Remediation measures.</td>
<td>Long term</td>
<td>Site level</td>
<td>Moderate</td>
</tr>
<tr>
<td>Soil Condition</td>
<td>Salinization of soil due to salt intrusion from marine sand used for backfilling</td>
<td>Indirect impacts include potential groundwater contamination</td>
<td>Minor negative</td>
<td>Reversible over time</td>
<td>Long term</td>
<td>Site level</td>
<td>Insignificant</td>
</tr>
<tr>
<td>Soil Condition</td>
<td>Soil erosion due to exposed surface</td>
<td>Direct impacts on exposed soil</td>
<td>Minor negative</td>
<td>Reversible; Used as a road</td>
<td>Short term</td>
<td>Site level</td>
<td>Insignificant</td>
</tr>
</tbody>
</table>
### Impact area

**Marine Flora and Fauna**

- **Direct Impacts**: The benthic organisms and habitat of marine organisms in the direct footprint of excavator movement zone, dredging area will be lost. Direct physical damage to fishes, and other marine species such as turtle within the vicinity of these works.

- **Indirect/Cumulative Impacts and Impact Interactions**: Indirect impact on marine biodiversity includes stress on the marine ecosystem caused by sediment plumes, and turbidity generated by these works.

- **Magnitude**: Moderate
- **Reversibility**: Reversible in the long term.
- **Duration**: Long term
- **Distribution**: Site level
- **Significance**: Moderate

### Landscape Integrity/Scenery

- **Direct Impacts**: Loss of visual amenity due to vegetation removal

- **Magnitude**: Moderate
- **Reversibility**: Vegetation is cleared for constructing a road. Landscape scenery is expected to return with construction of the road.
- **Duration**: Short term
- **Distribution**: Site level
- **Significance**: Insignificant
### Impact area

<table>
<thead>
<tr>
<th>Impact area</th>
<th>Direct Impacts</th>
<th>Indirect/ Cumulative Impacts and Impact Interactions</th>
<th>Magnitude</th>
<th>Reversibility</th>
<th>Duration</th>
<th>Distribution</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Loss of visual amenity due to operation of equipment and due to waste</td>
<td>-</td>
<td>Minor</td>
<td>Reversible</td>
<td>Short term</td>
<td>Site level</td>
<td>Insignificant</td>
</tr>
<tr>
<td>Health and Safety</td>
<td>Accidents related to equipment handling, vehicle operation, handling of large palms and trees and pollution</td>
<td>Indirect impacts from contamination of water, air and soil.</td>
<td>Moderate</td>
<td>Possibly irreversible</td>
<td>Long term</td>
<td>Island level</td>
<td>Minor</td>
</tr>
<tr>
<td>Demand for Resources and Services</td>
<td>Increased demand for transport vessels, construction equipment and machinery, harbour and waste management services</td>
<td>Indirect impacts from worker accommodation</td>
<td>Moderate</td>
<td>Reversible</td>
<td>Short term</td>
<td>National level</td>
<td>Minor</td>
</tr>
<tr>
<td>Local Economy</td>
<td>Temporary employment opportunities for locals. Trade of food and beverages, and other daily necessities would also temporarily improve, with the influx of external workers.</td>
<td>-</td>
<td>Minor positive</td>
<td>Reversible</td>
<td>Short term</td>
<td>Island level</td>
<td>Minor</td>
</tr>
</tbody>
</table>
6 SIGNIFICANT IMPACTS AND MITIGATION MEASURES

6.1 Impacts on Natural Environment during Construction Phase

6.1.1 Ambient Noise Level, Air Quality and Greenhouse Gas Emissions

During the mobilisation of equipment and operation of heavy machinery, it is anticipated that noise will be generated within the vicinity of removal sites, transport routes and barge loading. In addition, dust and emissions, including greenhouse gases, from vehicle and machinery exhausts will degrade the air quality.

However, these adverse impacts will be short term and can be mitigated to avoid nuisance to the residents, and workers. With proper care in avoiding settlement areas, working during day light hours and other mitigation measures, it is unlikely that noise and air pollution impacts will cause long term effects such as human health risks leading to increased public and private health costs. While emitted greenhouse gases can persist in the atmosphere in the long term, the level of emission from this project is expected to be negligible.

6.1.2 Groundwater and Soil Condition

The most significant impact is expected to come from the proposed backfilling activity where marine sand, is going to be placed in the holes left after removal of trees. Sand will be left to dry on a designated site before being placed in the backfilling sites. Although much of the salt would have drained, the effects of salt may be present in the newly placed sand for months, depending on the intensity of the rainy seasons. There will be a chance of localized increase in salinity in groundwater and alkalinity in the soil. The salinity levels are expected to return to normal after the rainy reasons.

Following backfilling, soil will take some time to form. The exact timing is unknown as no such detailed studies have been undertaken in the Maldives. However, anecdotal evidence suggests that the soil system may take a number of years, perhaps in excess of 10 years to establish. Nonetheless, since the proposed site is a road soil does not need to return to normal conditions fit for plant growth.

During operation of equipment and machinery, oil, and other chemicals will need to be handled properly. Mishandling of fuel for activities such as refuelling, hydraulic liquid and oil changes, have led to localized pollution of soil and groundwater aquifer in some of the construction projects. This sort of pollution may sometimes have long-term irreversible effects, extending through the operations stage, since such contamination does not degrade itself and is expensive to clean up. The clean-up itself may require extensive groundwater extraction, which will cause impacts such as salt-water intrusion.
The large holes left on the ground after tree removal could assist in soil degradation if coupled with periods of heavy rainfall. However, since the backfilling and levelling will be undertaken shortly afterwards the impacts would be short-lived.

### 6.1.3 Terrestrial Flora and Fauna

Vegetation clearing is one of the most significant impacts of the proposed project. It is anticipated that about 115-120 mature palms and about 20-30 smaller palms will be removed from the proposed locations in Fulhadhoo. In addition about 40-50 hardwood trees may need to be removed. About 70 shrubs are expected to be removed, 80% of which comprises of Magoo and Boakshikeyo. All in all, it is estimated that about 245-260 trees and plants fall within the footprint of the proposed road. The total number of palms to be removed is between 135-150 palms.

This loss is irreversible, as the area has to be left cleared for development of the planned ring road. However, as far as the Island Council is concerned, this is an unavoidable loss as the area will have to be cleared in the future anyway.

Loss of vegetation means, loss of fauna that depend on those vegetation. Such species include birds, rats, fruit bats and invertebrates. This impact will be limited as the vegetation is removed as a narrow strip allowing time for fauna to move.

Loss of vegetation will also act to increase greenhouse gas emissions, since trees are a known carbon sink. The number of trees, as a percentage of the vegetation system on the island is very limited to have a significant impact. Moreover, most trees and palms are expected to be replanted elsewhere in the Maldives.

### 6.1.4 Impacts from transplantation

The project intends to transplant all possible trees to the newly reclaimed Bolidhuffaru Island. All vegetation removed will be inspected by horticulturalists and transported to the site directly on barges. The key impacts are as follows:

**Diseases**

Coconut palms in their natural state are subject to diseases. Importing palms affected by diseases can lead to poor aesthetics and health of the palms. The main reason for importing palms is to create a coral island landscape suitable for a resort island. The following diseases will be of concern.

a. **Bud rot:** Usually starts off with yellowing of one or two younger leaves and spreads to older leaves resulting in leaf spots covering entire leaf blade. In the later stages, the spindle withers and drops down. Ultimately, the entire crown falls
down and the palm dies. All sizes of palms are susceptible but smaller palms are more susceptible to permanent damage.

b. **Stem Bleeding:** Characterized by oozing dark reddish-brown liquid from the longitudinal cracks in the bark and wounds on the stem. They length of the ooze can range from a few inches to several feet. Lesions spread upwards as disease progresses. This disease can result in hollowing of trunk (due to decay of interior tissues) and reduced crown size in chronic cases.

c. **Leaf rot:** Usually starts off as brown spots on the leaves progressing to extensive rotting. Dried leaves can get blown of tree giving a ‘fan’ shape to the leaves. In acute cases the spear will fail to unfurl.

d. **Basal stem rot disease (Thanjavur wilt):** This disease usually attacks old or weak palms under stress conditions. It starts off with oozing of reddish brown liquid through cracks at the base of the trunk. The bark turns brittle and eventually the palm dies.

**Pests**

The following pests can become a major nuisance and affect the health of the transplanted trees, particularly coconut palms

a. **Coconut hispine beetle** (*Brontispa longissimi*): This is one of the most serious insect pests that have affected the coconut palms of Maldives. The larvae and adults of the elongated beetle feed on tissues of unopened leaf buds of the coconut palm, turning the leaves brown and decrease fruit production. The aesthetic impacts are devastating and the successive new leaves open up brown and already dead. The lush greenness disappears and is particularly problematic for a resort island. Successive severe defoliations will lead to death of the tree. It began in 1999 with an accidental import among ornamental trees that arrived from Malaysia to Sun Island Resort in South Ari Atoll. Since then, it has expanded uncontrollably to Noonu, Kaafu and Ari Atoll. Ministry of Fisheries and Agriculture has imposed an moratorium on relocating palms from the above listed atolls. Baa Atoll is not among the quarantined atolls and no effected trees were immediately identifiable during the surveys. Nonetheless, all palms need to be thoroughly checked for this pest before relocating them to Bolidhuffaru.

b. **Rhinoceros beetle** (*Oryctes rhinoceros*): Regarded as the second most serious insect for the coconut palms. The adult beetle bores into the unopened fronds and spathes. The attacked frond will show characteristic triangular cuts when fully opened and the central spindle appears cut or toppled. The aesthetic effect of this pest is also problematic for a resort island.

c. **Black-Headed caterpillar:** Results in dried up patches on the leaflets of the lower leaves, with only three or four of the youngest leaves at the centre of the grown remaining green.
d. Red Palm Weevil: Regarded as one of the most destructive pests of coconut palms. The hole can be seen on the stem with chewed up fibres protruding out. The grubs cause damage inside the stem or crown by feeding on soft tissues and often cause severe damage especially when a large number of them bore into the soft, growing parts. In case of severe infestation, the inside portion of trunk can be completely eaten leading to eventual death is severe cases.

**Tree Damage during transport**

Palms are monocots and do not have a cambium capable of generating new tissue to cover injured areas. The trunk can be injured during tree lifting and transportation. Hence, it is important to avoid any mechanical damage to the trunks of palms during the transplanting operation by avoiding rope or chains when wrapping around the tree.

Damage to root balls and reduced moisture in the root balls can result in stress to the trees.

Leaves that are left hanging during transport can be damaged.

**Tree survival after transplanting**

During transplantation, a successful re-establishment will largely depend on regeneration of roots, healthy condition of the roots, trunks and branches, and maintaining the necessary levels of moisture around the roots during transportation and after replanting.

Thus, irrigation and nutritional maintenance following relocation becomes essential Palms that have been subjected to continued stresses, particularly from severe nutritional or water deficiencies, often display a narrowing around the trunk corresponding to the period of time during which the stress occurred. Hence it is important to ensure that palms should quickly be re-established to recover from the transplanting stresses.

Lack of coordination during transport can hamper the survival rate of the trees. For example, if mechanisms to dig holes are not ready by the time the tress are transported, they would be left exposed for longer periods. When arriving trees are left for longer periods without planting or shade to the roots and leaves, the chances of survival decreases or at the very least shows intensive stress.

6.1.5 **Impacts from waste**

A significant volume of green waste may be generated from the project. There are two scenarios: (1) most of the trees are suitable for transplantation after inspection or; (2) a proportion of trees are rejected or are unsuitable for transport. Under scenario 1 the amount of green waste will be limited. Under scenario 2 there will be a need to be manage green waste to avoid a major
environmental problem on Fulhadhoo. There will be positive impacts on the community if these green waste are managed in a socially beneficial way such as composting or thatch weaving.

Waste may also be generated from dredging activities if there is a higher percentage of larger coral material.

Solid waste, waste water and sewage generated by the workforce is unlikely to have a major impact on the island.

6.1.6 Marine Water Quality

Excavator movement, on seabed and dredging will generate sediment plumes, leading to turbid water conditions in the area. However given the small scale of this project, sediment plumes generated from excavator operations is not expected to be significant to cause severe long term increase in turbidity level of waters at the project location.

Construction activities require the use of chemical substances such as fuel, oil, paints and handling of waste material. Accidental spillage of such substances, particularly during transportation or offloading, can lead to marine water contamination. Hence, special care should be taken to avoid accidental spills and leakage.

6.1.7 Marine Biodiversity

Dredging and excavator movement is expected to have direct and indirect adverse impacts on the marine flora and fauna. Baseline assessment undertaken for this assessment showed that the lagoon bottom at the proposed dredging area is predominantly made up of a coral sand, and seagrass patches.

Direct impacts on marine biodiversity include physical damage to seabed substratum, and loss of associated marine organisms such as seagrass, algae, molluscs, sea cucumbers etc. within the direct footprint of excavator movement area.

In addition, increased level of turbidity and suspended solid during dredging works in the area is expected induce stress on marine organisms. However as mentioned earlier given the small scale of this project and occurrence of thick seagrass bed within the footprint any sediment plume generated is expected to subside shortly. However caution needs to be taken to ensure sediment plume generation from the project activities are minimal.

6.1.8 Impact on Unique Habitats

The proposed project is not expected have direct adverse impacts on the nearest Protected Area (Goidhoo Koaru) or Corbin wreck.
6.1.9 Impact on visual amenity

The proposed project will affect the visual aesthetics of the project sites and the vicinity to some extent due to vegetation removal, dredging and presence of heavy vehicles and machinery. However, the impacts of vehicles and machinery will be short term and are reversible upon completion of the project.
EIA for the proposed Land Clearing and Tree Relocation Project in Fulhadhoo, Baa Atoll

Figure 6.1: Vegetation Removal footprint
6.2 Impacts on the Socio-economic Environment

6.2.1 Health and Safety

Health and safety risks arising from proposed project activities is high, especially due to the use of specialised equipment and machinery. Accidents related to equipment use can lead to injury, and fatalities. Accidental spills/leakage of hazardous substances can contaminate the site and pose risks to human health, including workers on the site and the local population. The project activities include measures to minimise risks to health and safety of workers.

6.2.2 Business and Employment Opportunities

The potential beneficial impacts of the proposed development are mainly socio-economic impacts. Socioeconomic benefits of the construction stage include:

- Employment opportunities during vegetation removal, dredging and backfilling works
- Business opportunity for local suppliers
- Opportunity for local contract workers
- Opportunity for locals to rent out property, equipment, machinery, vehicles and vessels.

6.2.3 Demand for resources and services

Waste generated from the project will increase the burden on island waste management infrastructure.

During mobilization and demobilization, it is expected that the island jetty will be used by the contractors for loading and unloading of equipment and machinery.

Operation of vehicles and machinery for vegetation removal and transport of trees to the replantation site will require significant amounts of fuel.

It is not expected that accommodation of the workforce will have a significant burden on the utility services of the island given the small number of workers involved and since local workers will be used for some works.
6.3 Mitigation Measures for Significant Adverse Impacts

6.3.1 Air and Noise Pollution

Project activities that can lead to air and noise pollution are operation of equipment and machinery.

Mitigation Measures

- Properly tune and maintain all vehicles and machinery
- Keep ground/soil damp to minimize dust/topsoil erosion by wind
- Conduct works during daytime to minimize nuisance to humans and fauna

6.3.2 Contamination of Marine Water, Groundwater and Land

Contamination of marine water, groundwater and land can occur during the proposed vegetation removal, dredging and backfilling works. Dredging activities have a particularly high potential for marine pollution. Contaminants can include fuels and chemicals used for different purposes including operation and maintenance of vehicles and machinery.

Activities that can lead to contamination of groundwater, soil and marine waters include:

- Accidental spillage of fuels and chemicals
- Improper stockpiling and disposal of waste

Mitigation Measures

- Oil, solid waste & hazardous waste handled carefully & transported in sealed containers.
- All fuel, lubricants, and other chemicals used on site stored in a secure and bunded location
- Keep spill cleanup materials readily available
- Train workers in spill prevention and cleanup, and designate responsible individuals
- Properly tune and maintain all machinery
- Carry out the works under 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 Solid Waste

Improper disposal of solid waste can contaminate the receiving environment.

Mitigation Measures
• Solid waste from the workforce temporarily stored in lidded bins on site
• Green waste sorted into reusable and disposable waste. All reusable green waste will be made available for island community.
• Regular disposal of waste material to the island waste disposal site

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

6.3.2.2 Fuel

Fuel spillage/leakage during handling and storage can also contaminate the receiving environment.

Mitigation Measures

• Fuel will be handled at sealed areas only.
• In transportation, the danger of spilling diesel fuel into the sea or the coral environment as well as on the island will be reduced by tight fittings and appropriate material.
• Precautions to avoid spilling of diesel fuel (filling up of tanks and canisters, refuelling of boats) will also be given by instructions to the staff ("handle fuel carefully, avoid spilling").
• Care should be taken in the refuelling process of boats to avoid any spillage of fuel.

These mitigation measures mainly involve routine maintenance activities, and do not include additional costs.

6.3.3 Loss of Terrestrial Vegetation and Fauna

All large trees, coconut palms and small plants removed from this project that are suitable for replantation will be replanted in Bolidhuffaru Island.

Mitigation Measures

• Small plants and undergrowth will be removed first to avoid damage during removal of large trees and palms
• Vegetation removed will be temporarily stored in a nursery on the island
• For each palm removed, two will be re-planted in designated locations within the island
• Clearly mark vegetation to be relocated and communicate to workers.
• Signs to guide workers to proper environmental care.
• Clear green waste to prevent pest infestations.

6.3.4 Contamination of Marine Water

Leakage or accidental spillage of fuel and other chemical during excavator operations can potentially contaminate the area.

Mitigation Measures

• Oil, solid waste & hazardous waste handled carefully & transported in sealed containers.
• Train workers in spill prevention and cleanup, and designate responsible individuals
• Properly tune and maintain all machinery
• Carry out construction activities under the supervision of a suitably experienced person

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

6.3.5 Removal of Marine Organisms / Marine Habitat Destruction

As mentioned in the previous section, the footprint of excavator operations is going to directly impact benthic organisms.

Mitigation Measures

• Prior to commencement of excavator operations all marine organisms that can practically be relocated should be relocated to nearby areas with similar conditions.
• Restrict movement of excavator, within a set boundary.

6.3.6 Changes to coastal processes

Mitigation Measures

• Undertake work during low tide hours
• Construct the sand beds only when required
• Remove the sand beds as soon as works are completed.

6.3.7 Occupational Health Impacts

Occupational health impacts may occur due to:

• Accidents during machine and equipment operation.
• Exposure to chemical contamination in water/ air.
• Drowning

Mitigation Measures
• All health and safety precautions described in Chapter 2 will be implemented. They include the following.
  o Health checks will be administered before work commences.
  o Warning signs, barricades or warning devices will be provided and used.
  o Necessary safety gear will be worn at all times. These include safety gloves, construction boots, facemasks, earmuffs, etc.
  o Fire extinguishing equipment would be readily available and employees will be trained in its use.
  o Oxygen, acetylene or LPG bottles will not be left freestanding.
  o First aid kits will be made available on site.
  o The work site will be properly closed to unauthorised personnel.
7 ALTERNATIVES

7.1 “No-project” Alternative

The no project option takes the following into account.

- The new road will not be cleared
- The existing road will be used
- The trees will not be transplanted to Bolidhuffaru reclamation project

The comparison of benefits of each alternative is provided in the table below.

Table 7.1 Summary of no project alternative

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Environmental problems related to vegetation removal including loss of biodiversity and forestry resources can be avoided.</td>
<td>- The current road will have to be replaced in the future anyway since it does not align with the land use plan of the island</td>
</tr>
<tr>
<td>- Potential issues of transporting plant diseases and pests from one island to another is avoided.</td>
<td>- Opportunity missed for the Island Council to avoid costs of road development from their own budget.</td>
</tr>
<tr>
<td></td>
<td>- Opportunity missed to reuse the removed plants to a site that is currently in need for trees for revegetation.</td>
</tr>
<tr>
<td></td>
<td>- Bolidhuffaru project seeking alternative sources which may not necessary be trees from areas that require urgent removal or importing from overseas.</td>
</tr>
</tbody>
</table>

Land clearing as proposed in this project is a necessity for the island for settlement growth. The current proposal to transplant the removed trees is an opportunity to reuse the trees for good use. The disadvantages of not using the opportunity to transplant the trees are higher than the advantages it presents for the Island Council.

It is recommended to proceed with the project with the mitigation measures proposed.

7.2 Alternative location for borrow site

The proposed borrow sites have been designed to meet the requirements for backfilling. It utilizes a site currently being used as a small vessel mooring area by the locals.
An alternative would be to dredge the south side basin where a new jetty and channel has been proposed (See Figure 7.1). The advantage of this option is that the project will use a previously planned and approved footprint for dredging. The disadvantage is the cumulative temporal impacts associated with dredging twice, which will add to the stress on corals within the vicinity.

From the Island Council’s perspective, the main jetty project is already planned and funded. They still have the issue of the north side basin which they would like to be deepened. The Council reports that south side jetty may be difficult to moor during SW monsoon and the proposed basin is too small to keep all the small vessels.

The proposed borrow site is within 32 m of the island shoreline. This is in contradiction to the Dredging and Reclamation Regulation. The reasons for proposing the current site is because it the existing mooring area and has been cleared in the past. Shifting the area to 50 m away will take it away from the main mooring area. For the project it is practical to shift the site 50 m away from shoreline. However, the Council would like to lodge a request EPA to dredge as proposed. EPA reserves the right to grant approvals to projects that conflict Dredging and Reclamation Regulation on socio-economic grounds. Alternative borrow site is shown in Figure 7.1

The proposed sand volume required is less than 500 cbm which is very small and will not be able to dredge a larger area. Therefore, the current site on the north as preferred by the Proponent is preferred. If the EPA does not grant the approval to dredge within 50 m, the alternative option of shifting the site outside 50 m shall be followed.

7.3 Alternative Tree Relocation Sites

The removed trees do not have to be transported to Bolidhuffaru reclamation project. There are many reclamation projects being undertaken in the Maldives that require trees. The contractor is free to take the trees any site they desire. However, this EIA only grants the right to remove the trees. If the EIA is approved, it will also allow the trees to be transported to Bolidhuffaru Reef. If the trees are to be transplanted to another site, an EIA Addendum is required with the details of the new location(s).

7.4 Alternative Green waste disposal options

At present the proposal is to replant all mature and transplantable trees to Bolidhuffaru reclamation project and the smaller pieces to a nursery on Goidhoo Atoll. The remaining green waste are to be burnt, or handed to interested locals for reuse. All residual material are to be taken to Thilafushi during demobilization.
There is a chance that some of the plants may be rejected by the Bolidhuffaru Project due to truck damage or diseases. In this scenario, the green waste on the island will increase. The Alternatives available are to consider an alternative site in need such as nearby Thulhaadhoo Island, where Ministry of Housing and Infrastructure has requested to consider if there are any trees left after taking to Bolidhuffaru Project. Any trees, apart from those with diseases, can be considered to be transported to Thulhaadhoo Island. However, this EIA has not evaluated Thulhaadhoo Islands’ natural environment to determine the impacts and mitigation measures.
Figure 7.1: Alternative borrow areas
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.
The following parties are involved in the EMP of this project:

- Project proponent (Island Council)
- Contractor
- Environmental consultant
- Environmental Protection Agency

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

8.2.1 Project proponent

- Execution of all project activities
8.2.2 Environmental Consultant

- Preparation of EMP
- Monitoring of performance of project activities according to the EMP
- 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 8 of this report)

8.2.3 Environmental Protection Agency

- Approval of Environmental Impact Assessment Report
- Review environmental monitoring report
- Intervention in the event of a breach in environmental permit conditions

8.3 Non-Conformances and Corrective Action

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.

8.4 Reporting

Reporting shall be undertaken to provide evidence of the ongoing implementation of the EMP and will cover any 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 environmental reporting process is summarized in the figure below. All non-compliances and complaints during the execution of the project are to be reported to the EPA. The environmental management plan for execution of the project is provided below.
Figure 8.2: Environmental Management Plan for construction and operation phase

Environmental Protection Agency
- Issues raised from periodic review of project
- Recording of complaints

Project proponent
- Training of personnel
- Environmental monitoring
- Recording of incidents
- Recording of complaints and follow up actions
- Review of EMP

Environmental consultant
- Training of personnel
- Environmental monitoring audits
- Review of EMP

Preparation of draft environmental report

Submission of report

Annual environmental monitoring report finalized
**Table 7.1: Environmental management plan for construction and operation phase**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Management measures</th>
<th>Responsible party</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training of staff and contractors</td>
<td>All construction workers and project management staff provided with information on general environmental issues, compliance with environmental permits and EMP. All staff involved with environmental monitoring provided with training in environmental monitoring procedures.</td>
<td>Proponent &amp; Environmental Consultant</td>
<td>Before commencement of construction activities</td>
</tr>
<tr>
<td>Documenting non-conformances and corrective actions</td>
<td>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 implemented, with systematic follow ups to ensure effectiveness of these measures</td>
<td>Proponent &amp; Environmental consultant</td>
<td>Continuous during construction phase</td>
</tr>
<tr>
<td>Managing marine environment impacts</td>
<td>Complete works in shortest time period possible Prepare contingencies for equipment failure. Carry out work in low tide hours, calm condition</td>
<td>Contractor</td>
<td>Continuous during construction phase</td>
</tr>
<tr>
<td>Control of water and soil contamination</td>
<td>Oil, solid waste &amp; hazardous waste handled carefully &amp; transported in sealed containers. All lubricants, and other chemicals used on site stored in a secure and bunded location General refuse stockpiled in one central area</td>
<td>Proponent</td>
<td>Continuous during construction phase</td>
</tr>
<tr>
<td>Activity</td>
<td>Management measures</td>
<td>Responsible party</td>
<td>Timing</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>------------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Properly tune and maintain all machinery</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Carry out construction activities under the supervision of a suitably experienced person</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste management</td>
<td>Give clear instruction regarding procedures for handling of waste during construction</td>
<td>Proponent/contractor</td>
<td>Continuous, during construction and operation phase</td>
</tr>
<tr>
<td></td>
<td>A clear waste management area established</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hazardous waste transported to waste management centre in Thilafushi.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel management</td>
<td>All areas on the island where diesel or other fuels are stored/handled as part of the project is to be sealed with a fuel-resistant impervious lining.</td>
<td>Proponent</td>
<td>Continuous throughout construction and operation phase</td>
</tr>
<tr>
<td></td>
<td>Precautions to avoid spilling of diesel fuel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal process impact minimization</td>
<td>Carry out work in low tide hours and in calm condition</td>
<td>Proponent</td>
<td>Continuous during construction phase</td>
</tr>
<tr>
<td></td>
<td>Complete works in shortest time period possible</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construct the temporary sand bed only when required</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Remove the sunbeds as soon as the work is completed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managing flora and fauna removal</td>
<td>The scheduling of the vegetation clearing activities</td>
<td>Proponent/Boldhuffaru Project Developer/contractor</td>
<td>Continuous during construction phase</td>
</tr>
<tr>
<td></td>
<td>clearing works will be carried out during day time</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plant two trees for every single large tree lost (except those transplanted)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Activity

<table>
<thead>
<tr>
<th>Management measures</th>
<th>Responsible party</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only remove trees in areas that will require clearing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strict guidelines and construction monitoring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural profiling of vegetation (receiving site)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use native species for landscaping as far as possible (receiving site)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manage and monitor effects of any introduced species on local biodiversity (receiving site)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor pest sightings and take action to control infestations (receiving site)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear green waste to prevent pest infestations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The root system should be watered to keep it wet and cemented before digging.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The roots should be kept wet during transportation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A monitoring mechanism to check the survival rate of trees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Where possible, leave the trees after cutting down for a few hours before transporting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implement health and safety precautions described in Section 2.8.5</td>
<td>Proponent</td>
<td>Continuous throughout construction and operation phase</td>
</tr>
<tr>
<td>Proper insulation in powerhouse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inform and consult all stakeholders at all stages of the project</td>
<td>Proponent</td>
<td>Continuous throughout construction and operation phase</td>
</tr>
</tbody>
</table>

**Occupational Health Impact management**

**Social Conflict**

Prepared by: CDE Consulting
<table>
<thead>
<tr>
<th>Activity</th>
<th>Management measures</th>
<th>Responsible party</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>management</td>
<td></td>
<td></td>
<td>operation phase</td>
</tr>
<tr>
<td>Supervision of project activities</td>
<td>Assign suitably experienced and qualified personnel to supervise the entire project and ensure that all activities are carried out with minimal adverse impact on the environment</td>
<td>Proponent</td>
<td>Before commencement of the project</td>
</tr>
</tbody>
</table>
9 ENVIRONMENTAL MONITORING PLAN

9.1 Introduction

This chapter will outline the monitoring plan for the proposed 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 9.1 are required before construction, if the construction activities begin 12 months after this EIA.

9.4 Monitoring during Construction Phase

Table 9.2 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 construction stage to ensure that environmental impacts are minimized.

1) Daily monitoring to ensure that the construction processes are not creating any significant dust 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) Daily inspection to ensure work sites are properly closed off, with all required health and safety measures are followed at the site.

5) Undertake daily assessment of the quantity of construction waste generated, and provide verification of its ultimate disposal.
### Table 9.1: Monitoring Schedule for pre-construction Stage (if required)

<table>
<thead>
<tr>
<th>Monitoring Attribute</th>
<th>Indicator</th>
<th>Methodology</th>
<th>Locations &amp; samples</th>
<th>Frequency</th>
<th>Applicable standard</th>
<th>Est. Total Costs MVR²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine Water Quality (Marine)</td>
<td>The following parameters will be tested: Temperature, pH, Salinity, Total Dissolved Solids, Conductivity, Nitrate, Total Suspended Solids, Turbidity</td>
<td>Onsite testing/ Laboratory analysis</td>
<td>Two Locations (sites SW1, and SW2) One sample for each site</td>
<td>Once prior to commencement of construction activities</td>
<td>Maldives EPA marine water monitoring standards</td>
<td>2,500</td>
</tr>
<tr>
<td>Ground water Quality</td>
<td>The following parameters will be tested: Temperature, pH, Salinity, Total Dissolved Solids, Conductivity, Nitrate, Phosphate.</td>
<td>Onsite testing/ Laboratory analysis</td>
<td>Four Locations (sites GW1, and GW2,) One sample From each site</td>
<td>Once prior to commencement of construction activities</td>
<td>Maldives EPA ground water monitoring standards</td>
<td>2,000</td>
</tr>
<tr>
<td>Coral Reef Health</td>
<td>Benthic substrate composition; including live coral cover. Fish species abundance</td>
<td>Visual Snorkeling Survey</td>
<td>Proposed sand borrow area</td>
<td>Once prior to commencement of construction activities</td>
<td>Maldives EPA coral reef health monitoring standards</td>
<td>2,500</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Vegetation Cover</td>
<td>Aerial Imagery</td>
<td>Entire Island,</td>
<td>Once prior to commencement of construction activities</td>
<td>Maldives EPA vegetation monitoring standards</td>
<td>8,000</td>
</tr>
</tbody>
</table>

### Table 9.2: Monitoring Schedule for Construction Stage

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>Indicator</th>
<th>Methodology</th>
<th>Locations &amp; samples</th>
<th>Frequency</th>
<th>Applicable</th>
<th>Est. Total</th>
</tr>
</thead>
</table>

² Does not include logistics, and consultant fees
## EIA for the proposed Land Clearing and Tree Relocation Project in Fulhadhoo, Baa Atoll

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>samples</th>
<th>standard</th>
<th>Costs MVR³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine Water Quality</td>
<td>Temperature, pH, Salinity, Total Dissolved Solids, Conductivity, Nitrate, Total Suspended Solids, Turbidity</td>
<td>Onsite testing/ Laboratory analysis; Two locations (sites SW1, and SW2) One sample for each site</td>
<td>Once upon completion of dredging works. Maldives EPA marine water monitoring standards</td>
<td>2,500</td>
</tr>
<tr>
<td>Ground Water Quality</td>
<td>The following parameters will be tested: Temperature, pH, Salinity, Total Dissolved Solids, Conductivity, Nitrate, Phosphate</td>
<td>Onsite testing/ Laboratory analysis; Four Locations (sites GW1, and GW2,)</td>
<td>Once upon completion of project Maldives EPA ground water monitoring standards</td>
<td>2,000</td>
</tr>
<tr>
<td>Coconut palms and trees relocated</td>
<td>Number of coconut palms and trees uprooted</td>
<td>Visual Observations and logs; Tree removal site</td>
<td>During uprooting and land clearing works - Costs to be included in contractor fees</td>
<td>³Does not include logistics, and consultant fees</td>
</tr>
<tr>
<td>Coconut palms and trees relocated</td>
<td>Number of coconut palms and trees relocated</td>
<td>Visual observations and logs; Tree relocated site</td>
<td>During transplantation works - Costs to be included in contractor fees</td>
<td>³Does not include logistics, and consultant fees</td>
</tr>
<tr>
<td>Marine Water Contamination</td>
<td>Oil spills (Surface layer of groundwater)</td>
<td>Visual observation; All area where oil is handled</td>
<td>Daily for the duration of the project NA Costs to be included in contractor fees</td>
<td>³Does not include logistics, and consultant fees</td>
</tr>
<tr>
<td></td>
<td>Oil leakage from machinery or vessels</td>
<td>Maintenance and tuning of all machinery &amp; vessels; All area where oil is handled Excavated area</td>
<td>Daily during the construction phase NA Costs to be included in contractor fees</td>
<td>³Does not include logistics, and consultant fees</td>
</tr>
<tr>
<td>Solid Waste monitoring</td>
<td>Waste generation levels</td>
<td>Daily log of waste quantities and records of ultimate disposal</td>
<td>Whole island</td>
<td>Daily during construction stage</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------</td>
<td>-------------------------------------------------------------</td>
<td>--------------</td>
<td>--------------------------------</td>
</tr>
</tbody>
</table>

*EIA for the proposed Land Clearing and Tree Relocation Project in Fulhadhoo, Baa Atoll*
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. 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

Estimated environmental monitoring cost of pre-construction stage (if required) is about MVR 35,000. Estimated monthly environmental monitoring cost for construction phase is approximately MVR 25,000.

Professional consultants will be hired to undertake the monitoring and the necessary equipment for monitoring will be procured.

Individual parameter costs are provided in the relevant tables above.

9.7 Commitment to Monitoring

The proponent is committed to undertake environmental monitoring as outlined in this report (see Appendix I).
10 STAKEHOLDER CONSULTATIONS

10.1 Introduction

Stakeholder consultations were conducted for this project to provide information about the proposed project and to seek their views on the project. During consultations, stakeholders were asked about their opinions or concerns regarding the project and their recommendations to address the key issues. During each consultation, the stakeholders were provided with the following information;

a. Project Location
b. Proponent of the project
c. Duration of the project
d. Purpose of the project
e. Brief description on the type of the building and construction method

The following stakeholders were consulted for this EIA;

1. Ministry of Environment and Energy
2. Ministry of Tourism
3. Ministry of Housing and Infrastructure
4. Baa Atoll Biosphere Reserve Office
5. B. Fulhadhoo Island Council
6. B. Fulhadhoo Island Public
7. B. Atoll Council
8. Developer accepting the trees (Vita Heights Limited)
9. Contractor (Salted Fibre Works Private Limited)
10.1.1 Ministry of Environment and Energy

Date: 26th December 2017

Time: 10:00am

Participants: Mohamed Zahir (Director General), Ahmed Anwar (Assistant Director)

Summary of discussion

- In the past, trees has been removed from other islands in the atoll such as Goidhoo for resorts purposes and no further CSR or other benefits have been provided to the community by the resorts or developers.
- The ministry requests written justifications for the proposed development maps provided by the council which identifies roads and housing areas that is proposed to be cleared.
- It was highlighted that trees that are older than 50 years in the proposed zone need to be identified, properly surveyed before development and additional trees surrounding the marked area should not be removed to make way for the proposed roads and developments.
- The ministry advised to take precaution and to practice the correct methodology in the transfer of trees. It was mentioned that the soil needs to be cleaned off the roots to minimize the loss of soil from the island and as per regulation and that all dug areas need to be levelled by the developer.
- It was noted that the compensation procedure for the removal of each palm by planting two trees in the island need to be properly identified, to ensure that the process takes place. The ministry directed to ensure that the compensation for the trees are given to the island.
- There are no specific regulations for Biosphere Reserves to follow when removing trees in the community islands. However, the ministry instructed to carry out a proper tree survey, and trees older than 50 years and protected trees are identified and acknowledged in the EIA.
10.1.2 Ministry of Tourism

Date: 26th December 2017

Time: 11:30am

Participants: Mohamed Sinan (Environment Officer), Ibrahim Fikree (Assistant Director)

Summary of discussion

- The Ministry receives many complaints regarding tree relocation projects. It was suggested that the required permits are received and regulations are followed so that the Ministry can respond to such complaints.
- The EIA of the resort will have a landscaping plan which would facilitate to assume the number of trees to be relocated.
- The EIAs for dredging outside tourism property boundaries are sent to EPA. The EIAs for reclamation and resort development is sent to Ministry of Tourism.
- The Ministry usually follows the following regulations
  - EIA Regulation 2012
  - Regulation on the Protection and Conservation of Environment in the Tourism Industry
  - Regulation on EIA reporting for resort, guest house, tourist hotels, yacht harbour development 2015
  - Regulation on cutting down, relocation and export of trees and coconut palms.
- The ministry has no objection if the required permits are received from the island councils, atoll councils and the relevant authorities.

10.1.3 Ministry of Housing and Infrastructure

Date: 28th December 2017

Time: 9:00am

Participants: Hussain Rasheed (Director), Nafha Aujaz (Environmental Analyst)

Summary of discussion

- Land permits (“bimuge huhdha”) are required for housing and road developments proposed by the island councils.
- The councils need to send a form (form requesting land permit for uses other than residential “dhiriulhun fiyavaa ehen beynunumah edhey form”) and a map with the locations identified to the Ministry of housing to get the land permit.
• A worthy use of the green waste was discussed. It was discussed that if Thulhaadhoo has incentive to plant the trees, the additional trees removed for path clearing can be sent for reclaimed area greening purposes. It was recommended to find ideal options to deal with green waste and additional trees removed rather than disposal.

10.1.4 Biosphere Reserve Office

Date: 27th December 2017

Time: 10:00am

Participants: Abdulla Shibau (Managing Director)

Summary of discussion

• The land uses proposed need to be approved from Ministry of Housing and Infrastructure.
• The entire footprint of the development needs to be identified which should include but not be limited to tree count, species count.
• Core areas in the Biosphere Reserve should not be affected by the project. There should not be any developments in core areas. There are no such objections since this project does not propose such a development.
• There is a tourism potential in Fulhadhoo due to the beautiful sandy beach at the western tip end of the island. The proposed road maybe for tourism purposes.
• There is already a path in Fulhadhoo leading to the western tip. Hence, the need for the proposed road also needs to be justified rather than developing the existing path.
• Atoll council should be informed about the proposed developments and prior to the beginning the work.
10.2 Meeting with Fulhadhoo Island Council

A meeting was held with B. Fulhadhoo Island Council on 25th December 2017 (11:15 to 12:15) at the council office. A brief information of the project was given by the team from CDE at the start of the meeting, and the outcomes of this meeting is given below.

Summary of findings

- They are aware of the project and has held previous meeting with EPA (scoping meeting) and has held talks with the general public on multiple occasions over the past 6 months including a meeting during the field visit as well.
- Only one road has been discussed and agreed upon between the contractor and the council. No agreement had been made on the compensation for the island, but preliminary talks were to deepen the existing harbour area on the north side of the island.
- The council stated that all the palm trees are of the council and no personal compensations need to be carried out for this project.
- The proposed area for dredging has been agreed upon by the council and the contractor.
- The council stated that none of the proposed vegetation removal zones or the borrow site of the project has any significant environmental significance.
- The island is famous for its beach area (southern shoreline) and has been featured internationally as Maldives #1 beach and the world’s 22nd most beautiful beach last year. The guesthouse industry on the island is booming and this road enables tourists and locals alike to reach the main beach area easily.
- Although there is an existing road, this road isn’t as wide, or properly compacted for most vehicles to use during all weather. Guesthouses would prefer to keep the new road also in a more greener and scenic way to make it more aesthetic for tourists.
- The island has empty space that the contractor can use to park any heavy vehicles and a landing craft area has also been designated for the project.
- The contractor has also been advised by the council to avoid using heavy vehicles inside the community area as much as possible.
- Although there were no major concerns for the project, the council did mention that during their meetings with the public regarding this project, a few of the elders on the island complained about getting less dried palm leaves. However, the council assured that there are enough vegetated zones for locals to gather palm leaves even if this road is to be developed.
### 10.3 Public Consultations

Door-to-door consultations were carried out in B. Fulhadhoo on 25-26th December 2017 to capture the views of the public regarding this project. Respondents were taken at random across all areas of the island and were interviewed after a brief explanation was given to them about the project. A total 15 person(s) were interviewed from the island. It is important to note that several members refused to put on record their name or address, however their views have been included in the summary below.

#### Summary of findings

Overall, public members of B. Fulhadhoo were very welcoming of this project as it is likely to benefit the entire community. The booming guesthouse industry on the island has been providing several income generating opportunities for the locals, and they feel any project that would make the island’s experience for tourists better would definitely benefit the locals as well. They also stated that this road will enable access for new housing areas. Some of the respondents did mention about the elders who complained about getting fewer palm leaves once the project is completed. However, almost all agreed that this wont be the case as there are enough coconut groves on the island to carry out this activity. Almost all respondents stated that the local council had already met with the public on a few occasions to explain the project and to gather their opinions.

#### Table 10-2 List of persons consulted from Fulhadhoo Island public

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Address</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ameen Faisal</td>
<td>Venus</td>
<td>Guest House owner</td>
</tr>
<tr>
<td>2</td>
<td>Ahmed Ayathullah</td>
<td>Snow Rose</td>
<td>Fenaka Worker</td>
</tr>
<tr>
<td>3</td>
<td>Thalhath Abdhul Razzaq</td>
<td>Lilymaage</td>
<td>Airport Worker</td>
</tr>
<tr>
<td>4</td>
<td>Zaidh Abdul Kareem</td>
<td>Vidhuvaruge</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Mohamed Faisal</td>
<td>Venus</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Ahmed Auf</td>
<td>Radiumge</td>
<td>Fisherman</td>
</tr>
</tbody>
</table>
10.4 Meeting with Baa Atoll Council

A meeting was held with Ba Atoll Council on 27th December 2017 (13:00 to 13:30) at the Atoll Council Building in B.Eydhafushi. A brief information of the project was given by the team from CDE at the start of the meeting, and the outcomes of this meeting is given below.

Summary of findings

The council was not aware of the project and this is the first time they heard about it. However, they do think any development to these islands is beneficial for their communities and the atoll as a whole. They believe that if such projects are carried out in consultation with the local councils it is good and the Atoll council will not interfere with such matters (e.g. how compensation is arranged, which roads to clear). If the Atoll council was to suggest anything, it would be to make a permanent channel near goihdoo to allow larger vessels to cross in and access the islands of Fulhadhoo and Fehendhoo. As they feel, dredging the existing channel to allow access to dinghy’s is only a temporary solution. However, the team from CDE did explain that the project requires very little amount of sand and the volume generated from a permanent channel would be too much and also costly for the project. No additional comments were raised during this meeting, and the council advised for those involved in the project to keep the atoll council informed about it, and to follow all necessary government regulations in implementing the project.

Table 10-3 List of persons consulted from Baa Atoll Council

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Designation</th>
<th>Office</th>
<th>Email</th>
<th>Mobile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mabrook Naseer</td>
<td>Council President</td>
<td>Baa Atoll Council</td>
<td><a href="mailto:mabrook@baa.gov.mv">mabrook@baa.gov.mv</a></td>
<td>9999828</td>
</tr>
<tr>
<td>2</td>
<td>Ahmed Afrah</td>
<td>Council Vice President</td>
<td>Baa Atoll Council</td>
<td><a href="mailto:afrah@baa.gov.mv">afrah@baa.gov.mv</a></td>
<td>9885511</td>
</tr>
<tr>
<td>3</td>
<td>Fathimath Nasra</td>
<td>Director General</td>
<td>Baa Atoll Council</td>
<td><a href="mailto:nasra@baa.gov.mv">nasra@baa.gov.mv</a></td>
<td>9997828</td>
</tr>
<tr>
<td>4</td>
<td>Moosa Faiz</td>
<td>Asst. Director</td>
<td>Baa Atoll Council</td>
<td><a href="mailto:faiz@baa.gov.mv">faiz@baa.gov.mv</a></td>
<td>9787307</td>
</tr>
<tr>
<td>5</td>
<td>Abdul Majeed Hassan</td>
<td>Admin Officer</td>
<td>Baa Atoll Council</td>
<td><a href="mailto:majeed@baa.gov.mv">majeed@baa.gov.mv</a></td>
<td>7880576</td>
</tr>
</tbody>
</table>
10.5 Meeting with Contractor (Salted Fibre Works Pvt Ltd)

The project contractor, Salted Fibre Works Pvt Ltd (SFW), was consulted on 22 February 2018 at 14:00hrs. The meeting was held at the SFW office (H.Hulhugali- 1st Floor) and was joined by Ms. Mariyam Mohamed (document/admin controller) of SFW. Contact details of Ms.Mariyam is provided below. The focus of this discussion was on the history of communications (demands and expectations) between the contractor and the island council and terms of agreement between these two parties.

Ms. Mariyam Mohamed
Document/Admin Controller
Salted Fibre Works Pvt Ltd
Email: mayan@saltedmaldives.com

Summary of discussion

- It was informed that the council initially had a list of demands from the contractor, which included construction of the island harbour, construction of 5 class rooms for Fulhadhoo School and deepening of the entrance channel. However, these could not be agreed upon since each of these demands on its own are huge undertakings with significant costs involved and are more appropriate for a government project. Moreover, the costs of these projects are not justified considering the small scale of the proposed project.
- Following negotiations, the council requested the contractor to deepen the boat mooring area on the northern side of the island as a compensation for this project. To accommodate this request, the contractor has selected this location as the borrow area for sourcing sand for backfilling works. The contractor noted that they are happy to dredge this area provided that the necessary approval is obtained from EPA.

10.6 Meeting with Developer (Vita Heights Company Limited)

Mr. Pedro Loza, the focal point from Vita Heights Company was consulted over phone and via email on 25th February 2018. The discussions focused on the need and demand for sourcing trees for Bolidhuffaru resort development project, and their concerns and recommendations regarding the relocation of trees from Fulhadhoo to Bolidhuffaru. Contact details of Mr. Pedro is provided below.

Ms. Pedro Loza
Vita Heights Company Limited
Summary of discussion

- Mr. Pedro explained that the tree relocation project is very important for the company as the landscaping component of Bolidhuffaru reclamation project is considered the hardest. The project needs over 3000 palms and trees and it is the developer’s desire to get as much native trees as possible.

- He also stated that the developer is aware of the environmental issues related to removing large quantities of trees so they only wish to source trees from places which require removal for various development purposes and from established nurseries.

- Vita Heights is also conscious of the risks of diseases and pest associated with tree transplantation and has placed stringent guidelines and measures to control what is imported to Bolidhuffaru Island.

- It was informed that all the works for this project are being done by a landscaping contractor. The contractor is responsible for sourcing the trees and making sure that all laws and regulations are followed while sourcing trees. Once the trees reaches Bolidhuffaru site Vita Heights will ensure that the environmental management measures are fully complied. They will also make sure that the receiving trees have the correct permits before accepting the trees.
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.

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.
- Absence of detailed topographic model

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. However, the level of uncertainty is partially minimised due to the experience of past dredging and reclamation projects in similar settings in the Maldives. Nevertheless, 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.
12 Conclusions

This report has evaluated the environmental impacts and potential mitigation measures for the proposed land clearing and tree relocation project in Fulhadhoo Island, Baa Atoll. This EIA submission seeks environmental approvals to commence the project.

The overall project involves land clearing and transplantation of trees from Fulhadhoo island to Bolidhuffaru resort. The project is a mutually benefitting arrangement between Fulhadhoo Island and the landscaping contractor of Bolidhuffaru resort development project. The island council is in need of clearing land to create an access road to the western end of the island but unable to do so due to the need for heavy equipment. The landscaping contractor of Bolidhuffaru resort has offered to clear the required land in return for the opportunity to transport the trees to Bolidhuffaru for transplantation. Reusing the trees removed from Fulhadhoo for landscaping of Bolidhuffaru island also helps prevent permanent biodiversity loss.

The main components of this project are mobilization and site setup; vegetation clearance; backfilling and levelling; transport and transplantation of trees; and demobilization.

Most components of the proposed developments are generally in conformance to the laws and regulations of the Maldives. The following non-compliance was identified and will require special approval from EPA.

- Non-compliance to Dredging and Reclamation Regulation. The proposed borrow site falls within 500 m of the reef edge. However, all dredging work on the island so far has been within this limit due to the geography of the island. A section of the site falls within 50 m of shoreline but this is because there is an existing basin within this distance.

Additional approvals are required for the following before commencement of project activities;

- Land clearing permit from EPA
- Dredging and reclamation approval from EPA

Fulhadhoo Island is a highly modified environment due to human habitation. The settlement is located on the eastern half of the island and is the built-up half of the island. The western half contains undeveloped areas but the vegetation is heavily modified with forestry areas. The proposed site (road) for vegetation removal contains both forestry areas and natural vegetation zones. The proposed dredging footprint is predominantly made up of coral sand and does not contain any live coral colonies.
The most significant impact of this project is the impact on terrestrial biodiversity. It is anticipated that approximately 245-260 trees and plants, including 135-150 palms may need to be removed from Fulhadhoo during land clearing. All trees that are useable for replanting will be transferred to Boldhuffaru resort and replanted. Impacts will also be felt on marine biodiversity due dredging and due to associated direct removal, turbidity and sedimentation; contamination of marine and ground water and soil due to accidental spillage/leakage of fuel and waste; salinization of ground water due to use of dredged sand for backfilling and risks to the health of construction workers.

Mitigation measures have been proposed to minimise anticipated impacts. These include replanting two trees for every tree removed from the Island at designated areas in Fulhadhoo, storing vegetation removed in a nursery, making reusable green waste available for the community, and restricting excavator movement within predefined routes.

Alternative options have been evaluated for the most significant impacts. Alternatives evaluated include the ‘No project’ alternative, alternative locations for borrow sites, alternative tree relocation sites, and alternative green waste disposal options.

A framework for environmental management has been developed for the project, in order to manage activities to reduce anticipated impacts and identify and address unanticipated impacts as soon as possible. A monitoring plan has been designed to monitor changes to different natural and social environmental aspects related to the project over time. The estimated monthly environmental monitoring cost for the project is approximately MVR 25,000.

Consultations were carried out with members of Fulhadhoo Island Council. Island community of Fulhadhoo, Baa Atoll Council, Baa Atoll Biosphere Reserve Office, Ministry of Tourism, Ministry of Housing and Infrastructure, Ministry of Environment and Energy, project contractor, and Boldhuffaru Resort Developer. Fulhadhoo Island Council and Fulhadhoo public were very welcoming of the project as it is believed that the project will benefit the entire community.

Environmental and socio-economic risks associated with the project are expected to be significantly reduced if the mitigation measures and monitoring programme presented in the report are properly implemented within the framework of the environmental management plan.

The project is expected to provide socio-economic benefits to the local community, tourism industry and the country as a whole. Thus, this report concludes that the project should be implemented on grounds of very high socio-economic benefits.
REFERENCES


APPENDIX A – Terms of Reference
Terms of Reference for Environmental Impact Assessment for the proposed Land Clearing Project, Fulhadhoo, Baa Atoll

The following is the Terms of Reference (ToR) following the scoping meeting held on 18th December 2017, for undertaking the EIA of the proposed land clearing project at Fulhadhoo Island, Baa Atoll. The proponent of the project is B. Fulhadhoo Council.

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 to the project** – 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 minimum A3 size scaled plan with indications of all the proposed sites. Specify the agreed boundaries of the study area for the Environment Impact Assessment highlighting the proposed coconut palm removal site and size of this site.

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

**Task 1. Description of the proposed project** – Provide a full description and justification of the relevant parts of the project, using maps at appropriate scales where necessary. The following should be provided (all inputs and outputs related to the proposed activities shall be justified):

- Specify materials, equipment, heavy machinery, staff estimate (quantity and period of time), key personnel positions, intermittent technical expertise required;
- Specific attention shall be paid to mobilization of machinery required for the project and how the transfer of trees will occur from one island to the other;
- Identify areas to be cleared on a map, providing justifications for removal, size of the area and a crude estimate of type of plants and numbers to be removed;
- Describe methods used in:
  a. Tree removal
  b. Transportation within island
  c. Transportation outside the island
  d. Backfilling holes and levelling
- Identify sites or islands where trees are to be relocated or transplanted
- Identify and justify locations from which sand will be sourced (if required) to back fill the holes. If dredging is involved, a dredging plan must be provided with appropriate approvals from the Island Council. Dredging areas must comply with the Dredging and Reclamation Regulation
- Waste Management Plan (at construction stage)
Task 2. Description of the environment – Assemble, evaluate and present the environmental baseline study/data regarding the study area and timing of the project (e.g. monsoon season). Identify baseline data gaps and identify studies and the level of detail to be carried out by consultant. Consideration of likely monitoring requirements should be borne in mind during survey planning, so that data collected is suitable for use as a baseline. As such all baseline data must be presented in such a way that they will be usefully applied to future monitoring.

All data must be collected as per the requirements of the EPA Data Collection Guidelines (published on www.epa.gov.mv). The report should outline detailed methodology of data collection utilized.

The baseline data will be collected before sampling and from at least two benchmarks. All survey locations shall be referenced with Geographic Positioning System (GPS) including water sampling points, lagoon surveys and vegetation transects for posterior data comparison. Information should be divided into the categories shown below:

**Climate**
- Temperature, rainfall, wind, waves (including extreme conditions)
- Risk of storm events;

**Geology and geomorphology (if any dredging is required to source backfill)**
- Depth Survey (use maps).
- Characteristics of seabed sediments to assess direct habitat destruction and turbidity impacts during dredging;

**Hydrography/hydrodynamics (if any dredging is required to source backfill)**
- Tidal ranges and tidal currents;
- Wave climate and wave induced currents;
- Wind induced (seasonal) currents;
- Sea water quality measuring these parameters: temperature, pH, salinity, turbidity, total suspended solids.
- Bathymetry of proposed sand borrow areas and alternative locations (if dredging required)

**Marine Ecology (if any dredging is required to source backfill)**
- Benthic and fish community monitoring at the project site;

**Terrestrial ecology**
- Ground water quality measuring these parameters: temperature, pH, salinity, phosphates, nitrates;
- Vegetation classification of Fulhadhoo Island
- Vegetation survey of the proposed project location, estimating the number, zones and type of trees (including, trees of extraordinary nature) and palms to be removed.

**Socio-economic environment**
- Compensation for locals, regarding tree ownership rights (if applicable).
- Demography: total population, sex ratio, density, growth and pressure on land and marine resources;
- Income situation and distribution
- Present the land use plan prepared for the island and whether the project is in line with the land use plan
- Identify other Natural resource use and zoning on the island

**Hazard vulnerability:**
- Vulnerability of area to rainfall flooding

Absence of facilities in the country to carry out the water quality tests will not exempt the proponent from the obligation to provide necessary data. 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 project, and identify the appropriate authority jurisdictions that will specifically apply to the project. Legal requirements:
- Approved land use plan
- Dredging permit from EPA, if dredging required.

Task 4. Potential impacts (environmental and socio-cultural) of proposed project, incl. all stages – The EIA report should identify all the impacts, direct and indirect, during and after construction, and evaluate the magnitude and significance of each. Particular attention shall be given to impacts associated with the following:

Impacts on the natural environment
- Impacts on ground water quality;
- Impacts on sea water quality (if dredging is required);
- Impacts on landscape integrity/scenery;
- Impacts on soil and soil erosion
- Impacts from transplantation

Impacts on the socio-economic environment
- Impact on locals regarding compensation for their tree ownership rights (if applicable)
- Impacts of increased demands on natural resources and services especially water supply, land availability, waste management, energy supply, harbour capacity;
- Level of protection against hazards like rainfall flooding and wind damage, etc.
- Social destabilization of the island community if there is no consensus on tree removal

Construction related hazards and risks
- Pollution of the natural environment (e.g. oil spills and construction waste);
- Risk of accidents and pollution on workers and local population, and
- Impacts on social values, norms and belief due to presence of workers on local population.

The methods used to identify the significance of the impacts shall be outlined. One or more of the following methods must be utilized in determining impacts; checklists, matrices, overlays, networks, expert systems and professional judgment. Justification must be provided to the selected methodologies. The report should outline the uncertainties in impact prediction and also outline all positive and negative/short and long-term impacts. Identify impacts that are cumulative and unavoidable. Use interaction matrices (E.g. Leopold Matrix) to assess the magnitude and significance of the impacts.

Task 5. Alternatives to proposed project – Describe alternatives including the “no action option” should be presented. Determine the best practical environmental options. Alternatives examined for the proposed project that would achieve the same objective including the “no action alternative”. This should include alternative sites, back fill methods, taking into account environmental, social and economic factors. The report should highlight how the location was determined. All alternatives must be compared according to international standards and commonly accepted standards as much as possible. The comparison should yield the preferred alternative for implementation. Mitigation options should be specified for each component of the proposed project.

Task 6. Mitigation and management of negative impacts – Identify possible measures to prevent or reduce significant negative impacts to acceptable levels. These will include both environmental and socio-economic mitigation measures with particular attention paid to sedimentation control and future changes in coastal processes. Cost the mitigation measures, equipment and resources required to implement those measures. The confirmation of commitment of the developer to implement the proposed mitigation measures shall also be included. An Environmental management plan for the proposed project, identifying responsible persons, their duties and commitments shall also be given. In cases where impacts are unavoidable arrangements to compensate for the environmental effect shall be given.
Task 7. Development of monitoring plan (see appendix) – Identify the critical issues requiring monitoring to ensure compliance to mitigation measures and present impact management and monitoring plan for ground water and sea water quality. Ecological monitoring will be submitted to the EPA to evaluate the damages during construction, after project completion and every six months thereafter, up to one year. The baseline study described in task 2 of section 2 of this document is required for data comparison. Detail of the monitoring program including the physical and biological parameters for monitoring, cost commitment from responsible person to conduct monitoring in the form of a commitment letter, detailed reporting scheduling, costs and methods of undertaking the monitoring program must be provided.

Task 8. Stakeholder consultation, Inter-Agency coordination and public/NGO participation) – Identify appropriate mechanisms for providing information on the development proposal and its progress to stakeholders, government authorities, NGOs, engineers/designers, development managers, staff and members of the general public. The EIA report should include a list of people/groups consulted and summary of major outcomes. The following parties should be consulted:

a. Ministry of Housing and Infrastructure
b. Ministry of Environment & Energy
c. Developers accepting trees from this project for replanting
d. Island Council
e. Fulhadhoo public
f. Ministry of Tourism
g. Biosphere Reserve Office
h. Contractors carrying out the project works

Presentation - The environmental impact assessment report, to be presented in digital format, will be concise and focus 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 environmental assessment report will be organized according to, but not necessarily limited by, the outline given in the Environmental Impact Assessment Regulations 2012 and subsequent amendments.

Relevant documentation, references for consultants – Include publicly available studies or references relevant to the current project to be used by the consultant.

Timeframe for submitting the EIA report – The developer must submit the completed EIA report within 6 months from the date of this Term of Reference.

Date: 18th December 2017
APPENDIX B – Site Plan
APPENDIX C – Approvals
Maldives Land and Survey Authority
Ministry of Housing and Infrastructure
Male', Republic of Maldives.

431-LIS/323/2017/1

[Signature]

Ameenee Magu,
Maafannu,
Male', 20392,
Republic of Maldives.
APPENDIX D – Work Plan
## PROJECT SCHEDULE AND LIFE SPAN

<table>
<thead>
<tr>
<th>Number</th>
<th>Activity Description</th>
<th>Year 1</th>
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<td>Week 1</td>
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<tr>
<td>1</td>
<td>Preliminaries</td>
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<tr>
<td>2</td>
<td>Mobilisation</td>
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</tr>
<tr>
<td>3</td>
<td>Vegetation Clearing</td>
<td>X</td>
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<td>4</td>
<td>Backfilling</td>
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<tr>
<td>5</td>
<td>Demobilization</td>
<td></td>
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</tbody>
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APPENDIX E – Survey Locations
APPENDIX F – Bathy Chart
APPENDIX G – Water Quality Results
# QLAB by Aurinko Pvt Ltd

4th Floor, H. Orchidmaage  
Ameer Ahmed Magu  
Malé, 20041  
Maldives  
TIN Number: 1053826GST501

## Customer Details

CDE Pvt. Ltd  
4th Floor, H. Orchidmaage  
Ameer Ahmed Magu  
Malé, 20041  
Maldives  
TIN Number: 1000417GST501

## Sample Details

- **Sample Type:** Sea Water & Ground Water  
- **Sampling date:** Monday, December 25, 2017  
- **Sampling time:** 11:00 AM  
- **Sampling by:** CDE Staff  
- **Sample location(s):** B. Fulhadhoo  
- **Sample Testing:** Qlab

## Test Results

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<th>Parameter</th>
<th>Unit</th>
<th>SW1</th>
<th>SW2</th>
<th>GW 1</th>
<th>GW 2</th>
<th>Method</th>
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<tr>
<td>Temperature</td>
<td>°C</td>
<td>26.4</td>
<td>26.3</td>
<td>27.2</td>
<td>27.3</td>
<td>YSI ProDSS Multi-Parameter Water Quality Meter</td>
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<tr>
<td>pH</td>
<td>-</td>
<td>7.9</td>
<td>8.08</td>
<td>7.19</td>
<td>6.98</td>
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<tr>
<td>Salinity</td>
<td>%</td>
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<td>35.39</td>
<td>1.05</td>
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<tr>
<td>Total Dissolved Solids</td>
<td>mg/L</td>
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<td>34865.570</td>
<td>1348.697</td>
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<td>Conductivity</td>
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<td>55309</td>
<td>55002</td>
<td>2163</td>
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<tr>
<td>Nitrate</td>
<td>mg/L</td>
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**Customer ID:** 132017  
**Report number:** 4-1012018  
**Report Date:** Sunday, February 4, 2018
# WATER QUALITY TEST REPORT

**Report No:** 506178107  
**Report date:** 02/01/2018  
**Test Requisition Form No:** 900182747  
**Sample(s) Received Date:** 26/12/2017  
**Date of Analysis:** 26/12/2017 - 27/12/2017

---

**Customer Information:**  
AURINKO PVT LTD  
ORCHIDMAAGE. 4TH FLOOR  
Ameenu Ahumadhu Magu  
Male', Maldives 20095

---

### Sample Description

<table>
<thead>
<tr>
<th>Sample Description</th>
<th>Fulhadhoo - SW 1</th>
<th>Fulhadhoo - SW 2</th>
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### Sample Type

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### Sample No

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<th>83195684</th>
<th>83195695</th>
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### Sampled Date

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<tr>
<th>Sampled Date</th>
<th>25/12/2017</th>
<th>25/12/2017</th>
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</table>

### TEST METHOD

<table>
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<tr>
<th>PARAMETER</th>
<th>UNIT</th>
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</thead>
<tbody>
<tr>
<td>Physical Appearance</td>
<td>Clear with particles</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>&lt;5 (LoQ 5 mg/L)</td>
</tr>
<tr>
<td>Turbidity</td>
<td>0.932</td>
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### ANALYSIS RESULT

<table>
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<tr>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method 8006 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)</td>
</tr>
<tr>
<td>HACH Nephelometric Method (adapted from HACH 2100N Turbidimeter User Manual)</td>
</tr>
</tbody>
</table>

### Keys:
- **mg/L**: Milligram Per Liter  
- **NTU**: Nephelometric Turbidity Unit

---

**Checked by**  
Aminath Sofa  
Assistant Laboratory Executive

**Approved by**  
Mohamed Eyman  
Assistant Manager, Quality

---

**Notes:**  
- **Sampling Authority:** Sampling was not done by MWSC Laboratory  
- **This report shall not be reproduced except in full, without written approval of MWSC**  
- **This test report is ONLY FOR THE SAMPLES TESTED.**  
  - Information provided by the customer

---

*************** END OF REPORT ***************
**WATER QUALITY TEST REPORT**

Report No: 900178108

---

**Customer Information:**

**AUFINCO PVT LTD**  
**ORCHIDMAAGE, 4TH FLOOR**  
**Ameeru Ahumadhu Magu**  
**Male', Maldives 20095**

---

**Sample Description**  
Fulhadhoo - GW 1  
Fulhadhoo - GW 2

**Sample Type**  
Ground Water  
Ground Water

**Sample No**  
83195696  
83195697

**Sampled Date**  
25/12/2017  
25/12/2017

---

**TEST METHOD**

**UNIT**

<table>
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<th>PARAMETER</th>
<th>ANALYSIS RESULT</th>
<th>TEST METHOD</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Appearance</td>
<td>Clear with particles</td>
<td>Pale yellow with particles</td>
<td>Method 8171 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)</td>
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<tr>
<td>Nitrate</td>
<td>29.4</td>
<td>9.1</td>
<td>Method 8048 (Adapted from HACH DR5000 Spectrophotometer procedure Manual)</td>
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<tr>
<td>Phosphate</td>
<td>0.35</td>
<td>0.31</td>
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</table>

**Keys: mg/L : Milligram Per Liter**

---

**Checked by**  
Aminath Sofia  
Assistant Laboratory Executive

---

**Approved by**  
Mohamed Eyman  
Assistant Manager, Quality

---

**Notes:**  
**Sampling Authority:** Sampling was not done by MWSC Laboratory  
This report shall not be reproduced except in full, without written approval of MWSC  
This test report is ONLY FOR THE SAMPLES TESTED.  
- Information provided by the customer

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

---

**Report date:** 02/01/2018  
**Test Requisition Form No:** 900182747  
**Sample(s) Received Date:** 26/12/2017  
**Date of Analysis:** 27/12/2017 - 27/12/2017

---

Page 1 of 1  
WQA/LAB/F-14, Rev 05
APPENDIX H – Vegetation Classification Results
Vegetation Classification

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Area (sq m)</th>
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</thead>
<tbody>
<tr>
<td>SLT</td>
<td>Sublittoral Thicket</td>
<td>2.94</td>
</tr>
<tr>
<td>OA</td>
<td>Open Areas</td>
<td>1.21</td>
</tr>
<tr>
<td>CDF</td>
<td>Coconut Dominated Forest</td>
<td>7.23</td>
</tr>
<tr>
<td>CG</td>
<td>Coconut Grove</td>
<td>1.98</td>
</tr>
<tr>
<td>LES</td>
<td>Littoral Edge Scrubland</td>
<td>5.06</td>
</tr>
<tr>
<td>BA</td>
<td>Built-up Area</td>
<td>6.42</td>
</tr>
</tbody>
</table>
APPENDIX I – Existing Landuse Master plan
LEGEND

EXISTING LAND USES:

- RESIDENTIAL ZONE
- INSTITUTIONAL & COMMUNITY ZONE
  1. ISLAND OFFICE
  2. SCHOOL
  3.1 - 3.2. MOSQUE
- SPORTS AND RECREATIONAL ZONE
  4. FOOTBALL FIELD
- UTILITY & MUNICIPAL SERVICES ZONE
  5. POWERHOUSE
  6. CEMETERY
  7. DHIRAAGU ANTENNA

PROPOSED LAND USES:

- OPEN / GREEN / BUFFER ZONE
- ENVIRONMENTAL PROTECTION ZONE (E.P.Z.)
- UTILITY & MUNICIPAL SERVICES ZONE
  8. OOREDOO ANTENNA
- AGRICULTURE
  9.1 PLANTATION AND LIVESTOCK PRODUCTION
APPENDIX J – 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. Mulege, 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  
CDE Consulting  
Republic of Maldives  
Head of environmental wing  
2008 to present  
Supervisor: Dr. Simad Saeed  
Phone: +(960) 7777445

Assistant Under-secretary, Spatial Planning  
Ministry of Planning and National Development  
Republic of Maldives  
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)

2002-2004  
Supervisor: Hon. Hamdun Hameed  
Phone: +(960) 332-3919

Project Manager, National Digital Mapping Project  
Ministry of Planning and National Development  
Republic of Maldives  
2005 (8 months)  
Supervisor: Hon. Hamdun Hameed  
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  
Ministry of Planning and National Development  
Republic of Maldives  
1994-1999  
Supervisor: Mr. Mohamed Hunaif  
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 (Vili) 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**: Conducted shoreline and vegetation line of Alimatha Tourist Resort, Vaavu Atoll, Maldives.
- **July 2003**: Conducted shoreline and vegetation line of Dhiggiri Tourist Resort, Vaavu Atoll, Maldives.
- **August 2003**: Developed the Initial Environmental Examination for the construction of Sun Decks along the southern beach of Kudarah Island Resort.
- **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.

Ahmed Shaig page 2
- **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 Albas 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.


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 Kanduugoigiri, 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.

June 2015: Environmental consultant for Nasandhura Palace Hotel Redevelopment EIA, 15-storey building, Male' City

June 2015: Environmental consultant for Male-Hulhule Bridge, Borehole Drilling EIA, Male' City

July 2015: Environmental consultant for Male-Hulhule Bridge EIA, Male' City

September 2015: Environmental consultant for Development of Tertiary Hospital in Hulhumale

July 2015: Environmental consultant for Development of 9-Storey Building for ADK, Male' City
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


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.

Science Education Centre, Male’, Maldives

References

Hamdun Hameed
Member of Parliament
Male’, Maldives
Tel: (+960) 3323414
minister@planning.gov.mv

Simad Saeed, Dr
Managing Director,
CDE Consulting
Male’, Maldives
Tel: +960 777 7445
Email: simad@cdc.com.mv

David King, Dr.
Associate Professor
James Cook University
Townsville, QLD, Australia, 4811
Tel: (+61) 747 81 4441, Fax: (+61) 747 81 5581
Email: david.king@jcu.edu.au

Peter Valentine
Head of School, TESAG Department
James Cook University
Townsville, QLD, Australia, 4811
Tel: (+61) 747 81 4441, Fax: (+61) 747 81 5581
Email: peter.valentine@jcu.edu.au
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
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”.

- 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 “Nakaivy”.
<table>
<thead>
<tr>
<th>Environmental Impact Assessment (EIA)</th>
<th>Proponent</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIA for the proposed Malé-Hulhulé bridge</td>
<td>Ministry of Housing and Infrastructure</td>
<td>July 2015</td>
</tr>
<tr>
<td>- Undertook the marine baseline assessment surveys, and prepared marine assessment report</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EIA for the proposed redevelopment of of Nasandhuraa Palace Hotel</td>
<td>Nasandhura Palace Hotel Investments Private Limited</td>
<td>June 2015</td>
</tr>
<tr>
<td>- Undertook the marine baseline assessment surveys</td>
<td></td>
<td></td>
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<tr>
<td>EIA for the proposed resort development in Madivaru,Kaafu Atoll</td>
<td>Shuaz Investment Private Limited</td>
<td>May 2015</td>
</tr>
<tr>
<td>- Undertook the marine baseline assessment surveys</td>
<td></td>
<td></td>
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<tr>
<td>EIA for the proposed Coral Reef rejuvenation project at Velaa Private Island</td>
<td>Velaa Private Island</td>
<td>March 2015</td>
</tr>
<tr>
<td>- Undertook the baseline assessment surveys, including stakeholder consultations. Complied the EIA report.</td>
<td></td>
<td></td>
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<tr>
<td>EIA for the proposed Coral Gardening at Shangri-La’s Villingili Resort &amp; Spa</td>
<td>Shangri-La’s Villingili Resort &amp; Spa</td>
<td>February 2015</td>
</tr>
<tr>
<td>- Undertook the baseline assessment surveys, including stakeholder consultations. Complied the EIA report.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EIA for the proposed sewerage system project at Kanditheem, Shaviyani</td>
<td>Male’ Water and Sewerage Company Pvt Ltd</td>
<td>April 2014</td>
</tr>
<tr>
<td>- Marine environment assessment and report for the EIA</td>
<td></td>
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<tr>
<td>EIA for the proposed beach replenishment project in Holiday Inn Resort Kandooma, Maldives, South Male' Atoll</td>
<td>Holiday Inn Resort Kandooma Maldives</td>
<td>April 2014</td>
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<tr>
<td>- Marine environment assessment and report for the EIA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EIA report for the proposed sewerage system at Maduvvari, Raa Atoll</td>
<td>Mr. Ibrahim Shazyl, Venture Maldives Pvt Ltd</td>
<td>February 2012</td>
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<tr>
<td>- Undertook the baseline assessment surveys, including stakeholder consultations. Complied the EIA report.</td>
<td></td>
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<tr>
<td>EIA report for the proposed installation and operation of desalination plant at Hithaadhoo, Baa Atoll</td>
<td>Mr. Ismail Shafeeu, Static Company Pvt Ltd</td>
<td>January 2012</td>
</tr>
<tr>
<td>- EIA report compilation.</td>
<td></td>
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</tr>
<tr>
<td>Project Description</td>
<td>Consultant/Client</td>
<td>Date</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>EIA report for the proposed Solid Waste Management facility at Thilafushi</td>
<td>Tatva Global Renewable Energy (Maldives) Private Limited</td>
<td>December 2011</td>
</tr>
<tr>
<td>- Baseline marine assessments and EIA report compilation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EIA for the development of a domestic airport on Koodoo, GA. Atoll</td>
<td>Bonavista (Maldives) Private Limited Singapore</td>
<td>October 2011</td>
</tr>
<tr>
<td>- Undertook baseline assessments for the EIA, and prepared the existing environment chapter for the EIA.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EIA prepared for the proposed harbor entrance channel dredging project in Bodufolhudhoo Island, North Ari Atoll</td>
<td>Ministry of Housing and Environment</td>
<td>August 2011</td>
</tr>
<tr>
<td>- Undertook the baseline assessments for the EIA, and prepared the existing environment chapter of the EIA and compiled the overall EIA report.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EIA prepared for the proposed re-development – phase I of Gasfinolhu Island Resort, Kaafu Atoll, Maldives</td>
<td>Mr. Hussain Afeef</td>
<td>July 2011</td>
</tr>
<tr>
<td>- Baseline marine assessments and report preparation for the EIA.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EIA prepared for the proposed re-construction of Shaviyani Foakaidhoo Harbour</td>
<td>Ministry of Housing and Environment</td>
<td>March 2011</td>
</tr>
<tr>
<td>- Undertook the marine baseline assessments and, prepared the marine assessment report for the EIA.</td>
<td></td>
<td></td>
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<tr>
<td>EIA for the sewerage system development in N. Miladhoo</td>
<td>Works Corporation Limited</td>
<td>September 2010</td>
</tr>
<tr>
<td>- Marine environment assessments</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CURRICULUM VITAE

SHAHDHA

Address: Ma.Mahal- 3F, Nikagasmagu Magu, Male’, Maldives
NID: A 234112
Telephone: + 960 9700169
Email: shahushiyam@gmail.com

Profile

Bachelor of Environments graduate with a major in environmental geography, politics and cultures. Excellent understanding of human-environment relationship, factors contributing to human vulnerabilities and strategies to build human capacity and resilience. Thorough knowledge of sustainable development principles and goals. Skilled in analyzing and assessing complex environmental and development issues and preparation of reports and relevant communication materials. Experienced in working with stakeholders at government, private sector, NGOs and local communities. Passionate about human development and working with community groups to achieve sustainable development goals.

Education

Bachelor of Environments (Major in Environmental Geographies, Politics and Cultures)
University of Melbourne, Melbourne, Australia
January 2012-December 2014

2007-2009

Cambridge GCE O-level, IGCSE Examinations and Secondary School Certificate (SSC) Examination,
H Dh. Atoll School, HDh.Vaikaradhoo, Republic of Maldives.
2004-2006

Employment Record

From March 2015 To : Present
Client: CDE Consulting Pvt Ltd
Positions held: Sustainable Development Consultant

From: February 2010 To: December 2011
Client: Indhira Gandhi Memorial Hospital
Positions held: Clinical Assistant

From: July 2009 To: November 2009
Client: HDh. Atoll School
Positions held: Relief Teacher

Professional Development and Memberships:

- Member of University of Melbourne Alumni Association
- Member of Maldives Australia Alumni
- Member of the University of Melbourne Australian Awards Club from September 2013 to December 2014
- Volunteer with Maldivian Red Crescent
- Volunteer with Volunteers for Environment and Social Harmony and Integration (VESHI)

Other Training:

- Completed Emergency Response Training conducted by Maldivian Red Crescent from 21-25 August 2016.
- Participated as an observer in the Sixth Regional 3R Forum for Asia and the Pacific from 16th August to 19th August 2015.
- Workshop on knowledge and information sharing on issues and challenges in implementing Water supply and Sewerage projects in Maldives on 13th August 2015
- Endorsement workshop of Maldives Intended Nationally Determined Contributions (INDC)-10th September 2015
- First National Dialogue on Intended Nationally Determined Contributions (INDCs) of the Maldives- 21st May 2015
- Standard course in First Aid at Faculty of Health Sciences, Maldives College of Higher Education 2010
Achievements

- Awarded Dean’s Honours Award Bachelor of Environments Year Level 3 by University of Melbourne in 2014
- Awarded Australian Development Scholarship in 2011
- Achieved fourth place among the National Top 10 Achievers in the Higher Secondary School Completion Examinations 2009.
- Achieved second place among the National Top 10 Achievers in the Secondary School Completion Examinations 2006.
- Awarded the Best All Round Student of H Dh. Atoll School in 2006.

Language Skills

<table>
<thead>
<tr>
<th>Language</th>
<th>Reading</th>
<th>Writing</th>
<th>Speaking</th>
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<tbody>
<tr>
<td>English</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
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<tr>
<td>Dhivehi</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

Computer Skills

Experience with Microsoft office word, excel, power point and project

Professional Work Experience

Name of assignment or project: Development of Island Level Waste Management Plans for Islands of Laamu Atoll  
Year: 2015  
Location: Laamu Atoll, Maldives  
Client: UNOPS- LECReD & CDE Consulting Private Limited  
Main project features: Preparation of island level waste management plans for the inhabited islands of Laamu Atoll  
Positions held: Associate Consultant  
Activities performed: Assisted in preparing methodology, designed questionnaires for household, government institutions, businesses, health care facilities and schools, visited the islands and undertook assessment of existing waste situation, undertook stakeholder consultations, surveyed households, visited Island Waste Management Centers and prepared Waste Management Centers report, prepared existing situation reports, prepared solid waste management plans, researched and contacted waste equipment suppliers, contributed to investment plan preparation.

Name of assignment or project: EIA for the Proposed 25-storey Building of IGMH  
Year: 2016  
Location: Male’, Maldives
Client: Indhira Gandhi Memorial Hospital  
Main project features: EIA for the proposed 25-storey Building of IGMH  
Positions held: Sustainable Development Consultant  
Activities performed: Undertook baseline surveys, stakeholder consultations, socioeconomic impact assessment, assessed waste impacts and prepared waste management plan, and contributed to EIA report writing.

Name of assignment or project: EIA for the development of Plots N3-56 and N3-57 under the Proposed 3000 housing units at Hulhumale’  
Year: 2016  
Location: Hulhumale’, Kaafu Atoll  
Client: Sea Life Global Inc Private Limited  
Main project features: EIA for the development of Plots N3-56 and N3-57 under the Proposed 3000 housing units at Hulhumale’  
Positions held: Sustainable Development Consultant  
Activities performed: Undertook baseline surveys, stakeholder consultations, and socioeconomic impact assessment, prepared waste management plan, and contributed to EIA report writing.

Name of assignment or project: EIA for the development of Plot N3-55 under the Proposed 3000 housing units at Hulhumale’  
Year: 2016  
Location: Hulhumale’, Kaafu Atoll  
Client: Sea Life Global Inc Private Limited  
Main project features: EIA for the development of Plot N3-55 under the Proposed 3000 housing units at Hulhumale’  
Positions held: Sustainable Development Consultant  
Activities performed: Undertook baseline surveys, stakeholder consultations, and socioeconomic impact assessment, prepared waste management plan and contributed to EIA report writing.

Name of assignment or project: EIA for the Proposed Nationwide Submarine Cable by Ooredoo Maldives  
Year: 2016  
Location: Maldives  
Client: Ooredoo Maldives  
Main project features: EIA for the Proposed Nationwide Submarine Cable by Ooredoo Maldives  
Positions held: Sustainable Development Consultant  
Activities performed: Undertook baseline surveys, stakeholder consultations, and socioeconomic impact assessment and contributed to EIA report writing.

Name of assignment or project: EIA for the Proposed Raffalhuhuraa Resort Development Project at Maifalhu, Kaafu Atoll  
Year: 2016  
Location: Kaafu Atoll  
Client: Mesa RF Private Limited  
Main project features: EIA for the Proposed Raffalhuhuraa Resort Development Project at Maifalhu, Kaafu Atoll
**Atoll**

**Positions held:** Sustainable Development Consultant

**Activities performed:** Undertook baseline surveys, stakeholder consultations, and socioeconomic impact assessment, assessed waste impacts and prepared waste management plan and contributed to EIA report writing.

**Name of assignment or project:** EIA for the Proposed Resort Development Project at Huruvalhi Island, Raa Atoll  
**Year:** 2016  
**Location:** Male’, Maldives  
**Client:** Mr. Amir Mansoor

**Main project features:** EIA for the Proposed Resort Development Project at Huruvalhi Island, Raa Atoll

**Positions held:** Sustainable Development Consultant

**Activities performed:** Undertook baseline surveys, stakeholder consultations, and socioeconomic impact assessment, assessed waste impacts and prepared waste management plan and contributed to EIA report writing.

**Name of assignment or project:** EIA for the Proposed Land Reclamation and Resort Development Project in Maagaa, North Ari Atoll  
**Year:** 2016  
**Location:** North Ari Atoll  
**Client:** Big Stone Private Limited

**Main project features:** EIA for the Proposed Land Reclamation and Resort Development Project in Maagaa, North Ari Atoll

**Positions held:** Sustainable Development Consultant

**Activities performed:** Undertook baseline surveys, stakeholder consultations, and socioeconomic impact assessment, assessed waste impacts and prepared waste management plan and contributed to EIA report writing.

**Name of assignment or project:** EIA for the Proposed Resort Development Project in Miriyandhoo, Baa Atoll  
**Year:** 2016  
**Location:** Baa Atoll  
**Client:** Miriyandhoo Maldives Resorts Private Limited

**Main project features:** EIA for the Proposed Resort Development Project in Miriyandhoo, Baa Atoll

**Positions held:** Sustainable Development Consultant

**Activities performed:** Undertook baseline surveys, stakeholder consultations, and socioeconomic impact assessment, assessed waste impacts and prepared waste management plan and contributed to EIA report writing.

**Name of assignment or project:** EIA for the Proposed Resort Development Project in Aluvifushi Island, Dhaalu Atoll
**Year**: 2016  
**Location**: Dhaalu Atoll  
**Client**: Ocean Islands Private Limited  
**Main project features**: EIA for the Proposed Resort Development Project in Aluvifushi Island, Dhaalu Atoll  
**Positions held**: Sustainable Development Consultant  
**Activities performed**: Undertook baseline surveys, stakeholder consultations, and socioeconomic impact assessment, assessed waste impacts and prepared waste management plan and contributed to EIA report writing.

**Name of assignment or project**: EIA for the Proposed Land Reclamation and Resort Development Project in Rasdhoo Madivaru, North Male’ Atoll  
**Year**: 2016  
**Location**: North Male’ Atoll  
**Client**: Veli Madivaru Private Limited  
**Main project features**: EIA for the Proposed Land Reclamation and Resort Development Project in Rasdhoo Madivaru, North Male’ Atoll  
**Positions held**: Sustainable Development Consultant  
**Activities performed**: Undertook baseline surveys, stakeholder consultations, and socioeconomic impact assessment, and contributed to EIA report writing.

**Name of assignment or project**: EIA for the proposed Hulhule’-Male’ Bridge Project  
**Year**: 2015  
**Location**: Male’ & Hulhule’, Maldives  
**Client**: Ministry of Housing and Environment, Maldives  
**Main project features**: EIA for the proposed Hulhule’-Male’ Bridge Project  
**Positions held**: Sustainable Development Consultant  
**Activities performed**: Undertook baseline transport and traffic surveys, contributed to designing methodology and survey questionnaires for public consultation, conducted stakeholder consultations, contributed to assessment of waste impacts and preparation of waste management plan and contributed to EIA report writing.

**Name of assignment or project**: EIA for the proposed test drilling For Hulhule’-Male’ Bridge construction project  
**Year**: 2015  
**Location**: Male’ & Hulhule’, Maldives  
**Client**: Ministry of Housing and Environment, Maldives  
**Main project features**: EIA for the proposed test drilling For Hulhule’-Male’ Bridge construction project  
**Positions held**: Sustainable Development Consultant  
**Activities performed**: Undertook baseline surveys, stakeholder consultations, and socioeconomic impact assessment and contributed to EIA report writing.

**Name of assignment or project**: EIA for the proposed redevelopment of Nasandhura Palace Hotel, Male’  
**Year**: 2015  
**Location**: Male’, Maldives  
**Client**: Nasandhura Palace Hotel Investments Private Limited  
**Main project features**: EIA for the proposed redevelopment of Nasandhura Palace Hotel, Male’  
**Positions held**: Sustainable Development Consultant
**Activities performed:** Undertook baseline surveys, stakeholder consultations, and socioeconomic impact assessment. Contributed to assessment of waste impacts and preparation of waste management plan and contributed to EIA report writing.

**Name of assignment or project:** EIA for the proposed construction of a 9-storey building at the compound of ADK Hospital, Sosun Magu, Male’, Maldives
**Year:** 2015
**Location:** Male’, Maldives
**Client:** ADK Hospital Private Limited
**Main project features:** EIA for the proposed construction of a 9-storey building at the compound of ADK Hospital, Sosun Magu, Male’, Maldives
**Positions held:** Sustainable Development Consultant
**Activities performed:** Undertook baseline surveys, stakeholder consultations, and socioeconomic impact assessment, assessed waste impacts and prepared waste management plan and contributed to EIA report writing.

**Name of assignment or project:** EIA for the proposed tourist development project at Madivaru Island, Kaafu Atoll
**Year:** 2015
**Location:** K. Madivaru, Maldives
**Client:** Shuaz Investment Private Limited
**Main project features:** EIA for the proposed tourist development project at Madivaru Island, Kaafu Atoll
**Positions held:** Sustainable Development Consultant
**Activities performed:** Contributed to writing the EIA Report

**Name of assignment or project:** EIA for the proposed land reclamation and resort development project in Ithaafushi Reef, South Male’ Atoll
**Year:** 2015
**Location:** Kaafu Atoll, Maldives
**Client:** Sumaityya Holdings Private Limited
**Main project features:** EIA for the proposed land reclamation and resort development project in Ithaafushi Reef, South Male’ Atoll
**Positions held:** Sustainable Development Consultant
**Activities performed:** Contributed to writing the EIA Report

**Name of assignment or project:** EIA for the proposed resort development in Bodukaashihuraa, Alifu Dhaalu Atoll, Maldives
**Year:** 2015
**Location:** Alifu Dhaalu Atoll, Maldives
**Client:** Millenium Capital Management Private Limited
**Main project features:** EIA for the proposed resort development in Bodukaashihuraa, Alifu Dhaalu Atoll, Maldives
**Positions held:** Sustainable Development Consultant
**Activities performed:** Undertook baseline surveys, undertook socioeconomic impact assessment and contributed to EIA report writing.

**Name of assignment or project:** EIA for the Development of a Tertiary Hospital at Hulhumale’
Year: 2015  
Location: Hulhumale’, Maldives  
Client: Tree Top Investment Private Limited  
Main project features: EIA for the Development of a tertiary hospital at Hulhumale’  
Positions held: Sustainable Development Consultant  
Activities performed: Undertook baseline surveys, undertook socioeconomic impact assessment and contributed to EIA report writing.

Name of assignment or project: EIA of the Shore protection project at HDh.Kulhudhuffushi  
Year: 2015  
Location: Haa Dhaalu Atoll, Maldives  
Client: Capital Investment and Finance & Ministry of Environment  
Main project features: EIA of the Shore protection project at HDh.Kulhudhuffushi  
Positions held: Sustainable Development Consultant  
Activities performed: Designed consultation methodology and questions, undertook socioeconomic impact assessment and contributed to EIA report writing.

Name of assignment or project: EIA of the Shore protection project at B.Thulhaadhoo  
Year: 2015  
Location: Baa Atoll, Maldives  
Client: Capital Investment and Finance & Ministry of Environment  
Main project features: EIA of the Shore protection project at B.Thulhaadhoo  
Positions held: Sustainable Development Consultant  
Activities performed: Designed consultation methodology and questions, undertook stakeholder consultations and socioeconomic impact assessment and contributed to EIA report writing.

Name of assignment or project: EIA of the channel dredging and beach replenishment activities at Canareef Resort Maldives, Addu City, Maldives  
Year: 2015  
Location: Addu City, Maldives  
Client: Canaries Resort Private Limited  
Main project features: EIA of the channel dredging and beach replenishment activities at Canareef Resort Maldives, Addu City, Maldives  
Positions held: Sustainable Development Consultant  
Activities performed: Designed consultation methodology and questions, undertook stakeholder consultations and socioeconomic impact assessment and contributed to EIA report writing.

Name of assignment or project: EIA for Resort Development at Kudadhoo Island, Lhaviyani Atoll  
Year: 2015  
Location: Lhaviyani Atoll Maldives  
Client: Chamapalars Private Limited  
Main project features: EIA for Resort Development at Kudadhoo Island, Lhaviyani Atoll  
Activities performed: Designed consultation methodology and questions, undertook stakeholder consultations and socioeconomic impact assessment and contributed to EIA report writing.
Name of assignment or project: Disaster Management Plan for Maldives Explorer Yatch
Year: 2015
Location: Maldives
Client: Capital Travel and Tours Private Limited
Main project features: Development of a disaster management plan for Maldives Explorer Yatch
Positions held: Sustainable Development Consultant
Activities performed: Undertook disaster risk assessment and prepared disaster management plan

Name of assignment or project: Maldives Visitor Survey February 2015
Year: 2015
Location: Maldives
Client: Ministry of Tourism
Main project features: Understanding tourist composition, reasons for visiting and tourist perception of Maldives.
Positions held: Enumerator
Activities performed: Supervised survey enumerators and undertook enumeration.

Name of assignment or project: Maldives Democracy Survey 2015
Year: 2015
Location: Maldives
Client: International Foundation for Electoral Systems (IFES)
Main project features: Assessment of the state of democracy in Maldives
Positions held: Enumerator
Activities performed: Supervised survey enumerators and undertook enumeration.

Name of assignment or project: Coastal Vulnerability and adaptation assessment of North Ari Atoll
Year: 2015
Location: North Ari Atoll Maldives
Client: International Union for Conservation on Nature (IUCN)
Main project features: Assessment of coastal vulnerability and adaptability of North Ari Atoll
Positions held: Sustainable Development Consultant
Activities performed: Designed survey questionnaires for government agencies and institutions

Name of assignment or project: Environmental Monitoring of Hulhule’-Male’ Bridge Project
Year: 2016- present
Location: Male’, Maldives
Client: CCCC Second Harbour Engineering Company Limited
Main project features: Environmental monitoring data collection as per the monitoring plan in the EIA report and preparation of monitoring reports
Positions held: Consultant – In charge of monitoring and reporting solid waste
Activities performed: Site visits, consultations with client and stakeholders about management of bridge construction waste, advising client on construction and domestic waste management at work sites and accommodation areas, preparation of waste audit methodology and preparation for quarterly waste audit
Name of assignment or project: Environmental and Social Performance Annual Monitoring of Shangri-La’s Vilingili Resort & Spas 2014
Year: 2015
Location: Addu Atoll, Maldives
Client: Shangri-La’s Vilingili Resort & Spa
Main project features: Annual monitoring of environmental and social parameters at Shangri-La’s Vilingili Resort & Spa
Positions held: Consultant – In charge of monitoring and reporting solid waste, noise and air pollution
Activities performed: Site visits, data collection, data analysis, report writing and advising the client

Name of assignment or project: Environmental Monitoring of Vilamendhoo Island Resort & Spa
Year: 2015
Location: Alifu Dhaalu, Maldives
Client: Vilamendhoo Island Resort & Spa
Main project features: Annual monitoring of environmental parameters at Vilamendhoo Island Resort & Spa
Positions held: Sustainable Development Consultant
Activities performed: Undertook solid waste monitoring, advice and reporting and beach and coastal area surveying

Name of assignment or project: Environmental Monitoring of Holiday Inn Resort Kandooma Maldives
Year: 2015
Location: Maldives
Client: Holiday Inn Resort Kandooma Maldives
Main project features: Environmental Monitoring of Holiday Inn Resort Kandooma Maldives
Positions held: Sustainable Development Consultant
Activities performed: Undertook beach and coastal surveying and reporting

Volunteer Work

Name of assignment or project: Introducing Green Healing Hospital Concept at ADh. Atoll Hospital
Year: 2016
Location: Alifu Dhaalu Atoll, Maldives
Client: ADh. Atoll Hospital & Volunteers for Environment and Social Harmony and Integration
Main project features: Waste audit of ADh. Atoll Hospital
Positions held: Consultant (volunteer)
Activities performed: Prepared methodology, visited the hospital and undertook assessment of existing waste situation at the hospital, undertook stakeholder consultations, conducted hospital waste audit, prepared waste audit report and presentation

Name of assignment or project: Environment Day 2015 Beach Cleanup at Lh.Kurendhoo
Year: 2015
Location: Lhaviyani Atoll, Maldives
Main project features: Beach cleanup and waste awareness for public of Lh.Kurendhoo
Positions held: Consultant (volunteer)

Activities performed: Took the initiative of a beach cleanup activity at Kurendhoo on the occasion of environment day, coordinated with island council to arrange the activity and mobilize the public, lead a team effort with other volunteers to get sponsors, lead the activity and conducted an awareness session on solid waste management

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe me, my qualifications, and my experience.

_________________________ Date: 20 October 2016
Ali Nishaman Nizar
G. Dhoores Villa, 20132
06th March 1988
(00) 960 778 5767
ali.nishaman@gmail.com

A strategic and creative thinker who has effective communication and writing skills, and is ready and willing to use my skills and knowledge to add significant value to aid in your organization’s development and enhance its values.

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

- 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.
- In charge of sourcing/developing innovative tools and methodologies for improving teamwork and cohesion at the office.
- Lead designer for iPad based surveys and in charge of the Data Management System for surveys.

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 Kilhl and Gn.Fuvahmulah Bandaara & Dhandimagu Kilhi.
- Specifically on the areas of terrestrial biodiversity and vegetation mapping.

CSR Consultant – Secure Bag Maldives Pvt Ltd (Jan 12 – Jan 13)
- In charge of all activities of the company to improve its CSR image.
- In charge of handling all the activities carried out on the company owned Private Island. This includes doing various agricultural activities such as hydroponics, goat keeping, poultry, orchid farming, land-based agriculture and agro-tourism. The task involves leading staff personnel of 13 employees on the island.
- Developed a home-based CSR project to organize and reduce household waste.
- Developed a school program to increase awareness of recycling.
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”
- In charge of planning, organizing and implementing all the activities under the agriculture component of the project.
- Planning and coordinating all agriculture and cooperative related training programs.
- Focal point for forming and mobilizing agriculture cooperatives in island based communities.
- Lead instructor for conducting Enumerator Training Programs and the Team leader for conducting baseline surveys for FADIP project
- Established 5 agricultural cooperatives in the Maldives and working closely towards the formation of several additional cooperatives.

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.
- Conducted training programs, workshops and awareness session at various venues.

Marketing Manager – BCube Signage Pvt Ltd (Aug 08 – Present)
- In charge of handling all marketing and client relations for the company.
- Designed layouts and concept notes for various publications and marketing campaigns.
- Lead focal point for all communications with the company's foreign suppliers and local clients.

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.
- Promoted general agriculture and other related activities using modern extension methodologies.
- Conducted training programs, workshops and awareness session at various venues.

- 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.
- Worked closely with community members, local officials and visiting consultants in understanding local environments.
- Studied the different vegetation types in the Maldives (30 islands, mostly including wetlands).

Graphic Designer – BCube Signage Pvt Ltd (Jan 04 – Oct 06)
- Designed various logos and graphics for several clients.
- Created layouts and concept designs for several clients
- Create routine layouts for signboards.
- Design graphic advertisements ready for print, billboard and signboards.
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
- 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 – 2nd 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
ENVIRONMENT IMPACT ASSESSMENT WORK

➢ Was a member of the team, and provided contributions to both the field work and report writing of the following EIA’s:

➢ Tourism Development Projects:
  ▪ Adh. Bodukaashihuraa Resort Development EIA
  ▪ B. Dhigufaruvinagandu Resort Development EIA
  ▪ K. Madivaru Resort Development EIA
  ▪ Lh. Fushifaru Resort Development EIA
  ▪ N. Thanburudhuffushi Picnic Island Development EIA
  ▪ K. Gasfinolhu Addendum EIA (Palm transplanting)
  ▪ K. Taj Vivanta Resort Shore Protection EIA

➢ Agricultural Development Projects:
  ▪ Sh. Madidhoo Agricultural Development EIA
  ▪ Lh. Maduvarri Agricultural Development EIA

➢ Airport Development Projects:
  ▪ R. Ifuru Airport Development EIA
  ▪ N. Maafaru Airport Development EIA

➢ Major public/private sector Projects:
  ▪ Tree Top Hospital Development EIA
  ▪ Nasandhura Palace Hotel Redevelopment EIA
  ▪ Male-Hulhule Bridge, Borehole Drilling EIA
  ▪ Male-Hulhule Bridge EIA
  ▪ Addu and Fuvahmulah ESIA for Wetland Project

ACADEMIC ACHIEVEMENTS

Cyprus Forestry College (2006 - 2008)

➢ Highest Overall Performance: Presidential Prize (2nd prize)
➢ Best Academic Performance: Nature Conservation
➢ Best Academic Performance: Ecology
➢ Best Botanical Collection
➢ Best Fire Protection Project
➢ Best Forest Management Project
➢ Best Nursery Management Project

Center for Higher Secondary Education (2004 - 2006)

➢ 10th place in the national Top Ten.


➢ 8th place in the national Top Ten.
➢ A Prefect
PROFESSIONAL ACHIEVEMENTS

- Designed and structured an online system to coordinate training programs and staff travel plans. This lead to an overall increase in the number of trainings by 400% from 2008 to 2009.
- Played active roles in the planning and organizing of key events and workshops such as:
  - Agriculture Fair 2009, Hdh.Kulhudhuhfushi
  - Farmers Day 2009, F.Nilandhoo
  - Food Security Workshop 2009, (In collaboration with Department of National Planning)
- Worked with a team from the Sultanate of Oman on a research program focusing on the local mango variety “Dhivehi Anbu”. The discovery of the Maldivian mango variety having a polyembryonic seed structure was one of the key findings of the research.
- Co-director and technical advisor for the Agriculture TV program, “dhanduveriya” for a full season, featuring over 13 episodes.
- Group leader in a materials development workshop for a course titled “Diploma in Sustainable Agriculture for Small States” for the Commonwealth of Learning, collaborating with 20 other experts from different parts of the world. My work was focused on writing specifically the chapters of “Agriculture Production Systems” and the “Importance of Working Together (CBPO’s)”.
- Team leader for the “Fisheries and Agriculture Diversification Program” (FADiP) baseline survey on the RIM’S Impact Questionnaires and the Project Questionnaire which included over 450 households in 4 different islands.
- Introduced an iPad-based real-time data entry system in 2014, that eliminated the need for paper-based questionnaire forms, reduced survey times, improved security features and provided real-time partial analytics on the data for our clients, at CDE. This system has since been replicated in over 5 separate surveys carried out by CDE.

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 (Community Consultation Expert, specifically on participatory approaches and conflict resolution exercises)
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
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*
AMINATH INAN ABDUL MUHSIN

CURRENT ADDRESS: Ma. Maaveyoge / 4th Floor, Male’ Maldives 20245 | PHONE: +9609807190 | EMAIL: inan.abdul@gmail.com
LinkedIn PROFILE: https://www.linkedin.com/in/aminath-inan-abdul-muhsin-90b42112a
DATE OF BIRTH: 19 November 1990
Nationality: Maldivian

ACADEMIC QUALIFICATIONS

B SC – Bachelors of Science (Environmental Science) January 2012 – December 2014
University of Western Sydney / Sydney, Australia.

Majors
General Biology, Conservation Biology, Zoology, Climate Change

Final Year Research Project
Investigating carotenoid regulatory pathways using a suppressor mutant screen

Supervisor and academic referee
Dr. Chris Cazzonelli, Senior Lecturer, Hawkesbury Institute of Environment

WORK EXPERIENCE

Sustainability Consultant
September 2017 – Present

Commerce, Development and Environment Pvt Ltd
Male’, Maldives

Roles and Responsibilities:
Assessing the sustainability of new developments such as reclamation, harbor development, housing, water and sewerage projects that may impact the environment;
Conducting field surveys and collecting data for Environmental Impact assessments, interpreting data, and report writing;
Managing legislative issues for clients and maintaining an awareness of how legislation impacts projects;
Maintaining effective communication with clients on a daily basis.

Project Officer
February 2017 – October 2017

Tekton Designs Private Limited
Consultancy service for Maldives Integrated Tourism Development Corporation
Male’, Maldives

Roles and Responsibilities:
Providing administrative and logistic support to project management unit
Evaluating the financial and technical proposals submitted by environmental impact assessment
consultancies to MITDC. Maintaining effective communication with regulatory agencies, contractor, EIA consultant, designers of the projects.

Structural Advisor and Consultant

Ministry of Environment and Energy  

April 2015 – January 2017

Roles and Responsibilities:

Coordinating logistics and providing structural advice for Ministry of Environment and Energy in the efforts to declare Maldives as a National Biosphere Reserve before 2017 as per the International pledge made by the Maldivian government at Rio 20+ conference in 2012.

Specific work

- Established and maintained external communications with other project partners (USAID Project REGENERATE, United Nations Development Project, Climate Change Adaptation Project, LecRED, Blue Marine Foundation, and Maldives National University), government agencies (Ministry of Tourism, Ministry of Fisheries and Agriculture, Marine Research Centre) engaged in project work and acting as the main focal point for Maldives as a Biosphere Reserve activity.
- Collaborated with IUCN Marine Project REGENRATE to align government policies in REGENRATE work plan and complement the Biosphere goal.
- Arranging and steering discussions and workshops with national and international stakeholders, inter-governmental dialogues between government agencies, ministerial discussions.
- Planning and conducting information sessions and awareness and outreach for general awareness of the Biosphere reserve concept.
- Drafted and coordinated in creating media communications designed to promote and inform the Biosphere Reserve concept.
- Drafted effective press-releases, magazine articles.
- Speak at relevant forums and TV programs relevant to Biosphere reserve Developed interactive digital material for executive presentations and reports to facilitate decision making
- Defined clear targets and objectives for annual work plans and communicated them to Ministry for review and approval
- Supervised and managed internships for the Maldives National University in data collation from Environmental Impact Assessments for the Biosphere Reserve.
- Prepare grant proposals for the project
- Handling all administrative work and logistics relevant to the biosphere reserve pledge.

Part-time lecturer

Maldives National University  

August – December 2016

Module: Biostatistics

Roles:

- Developed and delivered engaging lectures to undergraduate students
- Wrote course material such as homework assignments and handouts
- Wrote, administered and graded midterm and final examinations

Part-time lecturer
Mandhu College
October 2015 – January 2016

Module: Social and Environmental Education
Roles:
- Coached students on public speaking and presentation skills
- Developed and delivered engaging lectures to undergraduate students
- Wrote course material such as homework assignments and handouts
- Wrote, administered and graded midterm and final examinations

Administrative Officer
Judicial Service Commission
April 2010 – January 2012

Roles and Responsibilities:
- Manage administration tasks for committee meetings, including compiling agendas, preparing files, set up meeting calls, recording minutes and drafting correspondence based on meeting outcomes.
- Focal point for Allied Insurance company and handled all the insurance claims of the staff
- Keeping up-to-date the information of all the judges in Maldives
- File organization and administrative support such as letter and circular drafting and circulation
- Writing minutes for the Judicial service commission meetings.
- Adding material to file records and created new record
- Worked reception duties once every week which included responding to telephone and in-person requests for information, directing calls where appropriate and taking and delivering messages.
- Receiving incoming documents, keeping file records, scanning filing and organizing documents.

TRAININGS

1. Open Water Diver
2. Training of Trainers Turtle Watch 21st March 2016
   Training by Marine Research Centre
3. Introduction to Sustainable Consumption and Production in Asia 2016
   United Nations Institute for Training and Research UNITAR
4. IUCN Coral reef ecology apprenticeship 2015
   Assisted the Korallian Lab Scientific officers in their research and conducted a pilot research project
**PROFESSIONAL**

Mr. Abdulla Mohamed Didi
Former Deputy Minister
Ministry of Environment and Energy
Current Chairman
Crowe Horwath Maldives
Contact Number: +9607784181
abdulla.mohamed@crowehorwath.mv

Dr. Abdulla Naseer
Senior Policy Executive
Ministry of Environment and Energy
Contact Number: +9607788197
Email: Abdulla.naseer@environment.gov.mv

**ACADEMIC**

Dr. Chris Cazzonelli
Senior Lecturer / Researcher
Environmental Epigenetics Laboratory
Hawkesbury Institute for Environment
Contact number: +61245701752
Email: c.cazzonelli@westernsydney.edu.au

**MEMBERSHIPS AND CONFERENCES ATTENDED**

- Tourism Industry Forum – Speaker | Male’ 2016
- Laamu Climate Forum – Speaker –| Laamu Atoll 2015
- National Student’s Environmental Symposium – Ministry Representative | Male’ 2015
- AWMS – Australian Wildlife Management Society Annual – Participant | Brisbane 2014
- Cities of Future Earth – Participant | Canberra 2014
- Member of the Golden Key International Honour Society

**ACHIEVEMENTS AND AWARDS**

- Australian Development Scholarship Award -2012
- 6th place in National Top Ten - GCE O’ levels held in November 2006, 5 Distinctions.

**LANGUAGES**

Fluent in Dhivehi (Mother Tongue)
Fluent in English (IELTS score: 7.5 (7 January 2017))
CURRICULUM VITAE

Fathmath Shuhaina
NID: A166795
Date of Birth: 30 April 1988
Contact No#: 7989967

Career Objective:
To utilize my education, experience and become a progressive person who can take higher responsibilities in the future

Experience
Marine Environmental Specialist (October 2017 – till Present)
CDE Consulting

Marine Center Supervisor  (April 2011- January 2017)
Baros Maldives

Education and Certificates
Ongoing studies: Bachelor of Environmental Management at Maldives National University
Cambridge GCE O-level, IGCSE Examinations
PADI dive master
Emergency first responder

Referees
Elisa Fini
Resident Marine Biologist (Baros Maldives)

Verena Wiesbauer
Marine Biologist, Zoologist, EIA Consultant
AHMED MAHID
CIVIL AND ENVIRONMENTAL ENGINEER

PROFILE
I am a keen, self-motivated and hardworking individual who is always eager to learn new skills. I have an acute sense of responsibility, with an ethical outlook. I am able to work effectively in groups as well as carry out individual tasks through intensive research and an eye for innovation.

ENGINEERING SKILLS
- Hydrology
- Data Analysis
- Programming
- Water Distribution
- Environment & Sustainability

SOFTWARE SKILLS
- Microsoft Office
- Fortran
- MATLAB
- Rhinoceros/CAD
- R
- Python

EDUCATION
BACHELOR OF ENGINEERING (HONOURS)
The University of Adelaide
Class of 2016

The degree is a modification on civil engineering degrees, with a stronger focus on environment and sustainability. Researched Water Distribution Systems as an honours project.

A LEVELS/HIGH SCHOOL
Villa International High School & CHSE
Class of 2011

Studied Science Stream in highschool, finishing in 2011 as one of school’s top achievers and with National Top Achievers’ Award.
Subjects: Physics, Maths, Biology, Chemistry Cambridge Certificate of Proficiency in English (CPE).

O LEVELS/GRACE 10
Thaa. Atoll Education Centre
Class of 2008

Finished O levels in Science stream with National Top Achievers’ Award.

AWARDS AND ACHIEVEMENTS
- AUSTRALIAN AWARDS SCHOLAR 2013
- NATIONAL TOP ACHIEVERS’ AWARD 2009 & 2011

REFERENCES
DR AARON CARLO ZECCHIN
Senior Lecturer
The University of Adelaide
Email: azeccchin@civeng.adelaide.edu.au

LUKE KEATING HUGHES
Tutor, Dept. Of Mathematics
The University of Adelaide
Email: luke.keating.hughes@gmail.com

EXPERIENCE
RESEARCH ASSISTANT
The University of Adelaide, Australia
Jan 2016 - Feb 2016 [2 Months]
Worked as a research assistant in the School of Civil, Environmental and Mining Engineering, with water distribution systems as the main focus. The research objective was to use state estimation techniques to better find the water demands in networks.
APPENDIX K – Participant lists
<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Designation</th>
<th>Office</th>
<th>Email</th>
<th>Contact</th>
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**Meeting Attendance Form**

**Date:** 23/12/2017  
**Time:** 10.00 am  
**Details:** Pan African Reserve Office
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<td>Director</td>
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<td>Nafha Anjae</td>
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<td>Ibrahim Fiere</td>
<td>Assistant Director</td>
<td>MOT</td>
<td><a href="mailto:Ibrahim.Fiere@tourism.gov.mv">Ibrahim.Fiere@tourism.gov.mv</a></td>
<td>999 9816</td>
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<td>Mohamed Sinan</td>
<td>Envi. Officer</td>
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### Meeting Attendance Form

**Details:** Ban atul Bosphere Reserve Office

**Time:** 10:00am

**Date:** 28/12/2017

**Location:** CDE Consulting

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APPENDIX L – Commitment Letter and Declaration
Secretariat of the South Maalhosmadulu Fulhadhoo Council
Ba Fulhadhoo / Rep of Maldives

25 February 2018

Mr. Ibrahim Naeem
Director General
Environmental Protection Agency
Male’, Republic of Maldives.

Dear Sir,

Sub: EIA for land clearing and tree relocation in R. Fulhadhoo

As the proponent of the above mentioned project, we guarantee that we have read the report and to the best of our knowledge all non-technical information provided here are accurate and complete.

We also hereby confirm our commitment to carry out and bear costs of environmental mitigation measures and monitoring outlined in the EIA report.

Ahmed Asif
President of the Council’s
APPENDIX M – Proof of Submission to Atoll Council