ENVIRONMENTAL IMPACT ASSESSMENT

Proposed Transplantation of Coconut Palms

From Magoodhoo to Medhufaru (Soneva Jani)

Noonu Atoll, Maldives

Proponent: Hillside Villa Pvt. Ltd.

Sandcays

August 2018

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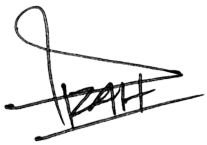
Consultant's Declaration

This EIA has been prepared according to the EIA Regulations. I certify that the statements in this Environmental Impact Assessment study are true, complete and correct to the best of my knowledge and abilities.



Hussain Fizah (EIA 01/2014)

Proponent's Declaration

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

HILLSIDE VILLA PRIVATE LIMITED
REP. OF MALDIVES
C-0391/2011

Ibrahim Asif
For Hillside Villa Pvt. Ltd.

Executive Summary

This report addresses the environmental impacts of the proposed project for the transplantation of about 500 coconut palms from N. Magoodhoo to N. Medhufaru. The primary objective of the project is to improve the overall landscape of Soneva Jani Resort, a luxury resort recently opened. The island lacks coconut palms and other mature trees and is in need of landscaping to improve its vegetation while Magoodhoo needs clearance for road and housing development needs. The project is proposed by Hillside Villa Pvt. Ltd., the current leaseholder of Soneva Jani, Medhufaru, Noonu Atoll, Maldives. The group has several years of experience in ecotourism development and management.

The project is expected to take no more than 6 months to complete. The areas from which trees would be removed have been identified in consultation with the Council and plot/tree owners. The trees would be removed by using excavator by carefully uprooting the tree so that it can be transplanted in Soneva Jani which is very close to Magoodhoo.

The main negative impacts of the project would be due to the use or movement of excavators and the loss of vegetation at given area causing short term distress to habitats. However, there are no significant fauna in the proposed areas. The project has several socio-economic benefits. These include the direct and indirect employment opportunities and creation of roads and clearing of building areas without loosing important vegetation as a direct result of the proposed project. It is from the proposed roads and proposed new house plots that the trees would be removed. The economic benefits to the coconut tree owners from the sale of the coconut palms could also be considered as a direct positive impact. Since the trees that would be transplanted have a zero mortality rate, the carbon sequestration from the trees would not be affected except for a short duration in which cutting off of some fronds would lead to a reduction in carbon sequestration, which would be negligible given that the bulk of the tree weight will remain with the tree. In addition, the Proponent would also plant several coconut trees in a nursery or through other means. These trees would provide further carbon sequestration benefitting the environment in a special way by absorbing atmospheric carbon and contributing to the national goal of carbon neutrality. This would also help to offset the atmospheric emissions from the use of machinery for the transport and transplanting process, which is a direct negative impact of the proposed project.

The holes that would be left after the digging would remain a public nuisance and health problem if they are not backfilled and levelled. Therefore, as an important mitigation measure, the holes would be filled with sand dredged from the existing harbour where a large area needs re-dredging in the harbour basin. This is not expected to have adverse impacts and the backfilling and levelling will further enhance the quality of the roads. The green waste from the project would also be taken to Vandhoo or Thilafushi or appropriately dealt with on site. Provisions are also made for supervision and monitoring of environmental impacts to understand the overall benefits and impacts of the project over the long term. The monitoring is proposed to be undertaken for a period of two years.

In conclusion, the socio-economic as well as environmental benefits of the project are greater than the negative impacts of deforestation including the impacts on terrestrial fauna from deforestation. In fact, the impact on fauna in the affected areas would be negligible given that there are no important terrestrial habitats to be affected by the project. However, there may be uncertainties and care should be taken at all times during the implementation of the project.

Due to the small scale of the project and the low significance and small spatial extent of the impacts and given that the project has major socio-economic benefits, it is recommended to allow the project to proceed as proposed.

ސާދާ ހުލާސާ

މި ރިޕޯޓަކީ ނ. މަގޫދޫ އިން ނ. މެދުފަރުގައި ހަދާފައިވާ ޓޫރިސްޓް ރިސޯޓަށް ގާތްގަނޑަކަށް 500 ރުއް ގެންގޮސް އިންދުމުގެ މަސައްކަތުން ތިމާވެށްޓަށް ކޮށްފާނެ ނޭދެވޭ އަސަރުތަކާއި ވީހާ ދުރުކުރުމަށް ހަމަޖެހިފައިވާ ދިރާސާ ރިޕޯޓެވެ. މެދުފަރަކީ ހުދުރަށެއް ގޮތުން ވެ، ރުއް މަދު ރަށަކަށްވާތީ، މި ރަށަށް ފަސް މިޔަދަށް ވަރަށް ބޭނުންވެފައެވެ. އަދި މަޤްޞަދު އަރަން އާބާދީ ސަރަހައްދުތަކުގައި ބިމާއި ގެދޮރު އިމާރާތްކުރުމަށް އޮތަށް ގަސްތަކުގެ ސަރަހަދު ނަގަންވާ ބޭނުންވެފައެވެ. މި މަޝްރޫޢުގެ އޮނަރަކީ ހިލް ސައިޑް ވިލާ ޕްރައިވެޓް ލިމިޓެޑެވެ.

މި މަޝްރޫޢު ކުރިއަށް ގެންދިޔުމުގައި 6 މަސްދުވަހަށްވުރެ ގިނަ ދުވަސް ނުނަގާނެ ކަމަށް ބެލެވެއެވެ. އަދި މި މަޝްރޫޢު ކުރިއަށް ގެންދާއިރު ރުއް ނަގާނީ އެކްސްކަވޭޓަރުގެ ބޭނުންކޮށްގެންނެވެ. އަދި މަޝްރޫޢުއަށް ބޭނުންވާ ރުއްތައް ހުރި ސަރަހައްދުތައް ވަނީ ކައުންސިލާއި ރަށުގެ ވެރިފަރާތާއި މަޝްވަރާކޮށްގެން ނިންމާފައެވެ.

މަޝްރޫޢު ހިނގާ ސަރަހައްދުތަކުގެ ތެރެއިން އެއްވެސް ސަރަހައްދަކީ ތިމާވެށީގެ ގޮތުން ހާއްސަ ސިފަތަކެއް ލިބިފައިވާ ސަރަހައްދު ތަކެއް ނޫނެވެ. މަގޫދޫއިން ރުއް ނަގާ ސަރަހައްދަކީ ގަސްބިސް އަދި ހާއްސަކަން ރުއްގިނަ ސަރަހައްދުތަކެކެވެ. އަދި ސްޓާފް ޖެހޭ ގިނަ ސަރަހައްދުތަކުގައި ރުއް ވަރަށްވެސް މަދެވެ.

މި މަޝްރޫޢުގައި ހިމެނޭ ކަންކަމުގެ ތެރެއިން މައިގަނޑު ގޮތެއްގައި ތިމާވެށްޓަށް ނޭދެވޭ އަސަރުކުރާނީ ހަމައެކަނި އެކްސްކަވޭޓަރު ބޭނުންކުރުމުގެ ސަބަބުން ކުރާ މަސައްކަތުން ސަރަހައްދުގެ ބިމުގެ ދިރޭތަކެތީގެ މާހައުލަށް އަންނާނެ ބަދަލުގެ ސަބަބުންނެވެ. ނަމަވެސް، ހުރިހާކަމެއް މަޝްރޫޢުގެ ސަރަހައްދުތަކުގައި ދިރުމަކާއި މަދުކަމަކާ ފާހަގަކުރެވިފައެވެ.

މަޝްރޫޢުގެ ސަބަބުން ލިބޭ އިޖްތިމާޢީ އަދި އިޤްތިޞާދީ ފައިދާތައް ގިނައެވެ. އެގޮތުން ވަޒީފާގެ ފުރުޞަތު، އަދި ކޮންޓްރެކްޓަރުން މަސައްކަތްކުރުމުގެ ފުރުޞަތު ހުޅުވިގެން ދިއުމާއި، ގަސް ވިއްކާ ފަރާތަށް ލިބޭ އާމްދަނީ އަދި މަގާއި ގޯޅި ދިރުމަށް ކުނިޖަހާފައިވާ ތަންތަން ސާފުކުރެވޭނެތީ އުކާލުމުގެ ހަރަދާއި ދެ ސަރަހައްދުން ތިމާވެށްޓަށް ކުރާނެ ނޭދެވޭ އަސަރު ކުޑަވެގެން ދިއުން ހިމެނެއެވެ. އަދި އެއްވެސް ތަނެއް މަސްރަފު ސަރުކާރުގެ ފުރުޞަތު ބޮޑުވެފައި ކާބަން ސީކުއެސްޓްރޭޝަން އަށް އިތުރުކަން ވާނެއެވެ. ގަސް ނެގުމުގެ ސަބަބުން އުފެދޭ ވަގުތީ އާންމުންނަށް އުދަގޫ ކަމަކަށް

ވެދާނެއެވެ. އެހެން ހައްލުކުރުމުގެ ގޮތުން ބަނދަރު ތެރެއަށް އެޅިފައިވާ ފެހީގެ ބޮޑު ބައެއް ބޭނުންކޮށްގެން އެފަދަ ވަގުތަކަށް ޗޮރުވާލެވިދާނެއެވެ.

މި މަޝްރޫޢުގެ ސަބަބުން ތިމާވެށްޓަށް ކޮށްފާނެ ނޭދެވޭ އަސަރު ކުޑަ ނަމަވެސް މަޝްރޫޢު ހޯދި ކުރިއަށް ގެންދާނީ ތިމާވެށްޓަށް ގެއްލުން އެންމެ ކުޑަ ގޮތަކަށް އަދި އިޖްތިމާޢީ ގޮތުން ލިބޭނެ ފައިދާ އިތުރުކުރުވާން ގޮތަކަށެވެ. މި މަޝްރޫޢުގެ ސަބަބުން ތިމާވެށްޓަށް އަސަރުކޮށްފާނެ މައިގަޑު ކަމަކީ ރުއް ނަގައިގެން ގެންގޮސް އެހެން ރަށެއްގައި އިންދާ ރުއްތަކުން ކަމަށްވާތީ، ނަގައި/ޖަހައި ރުކުގެ އަދަދާއި އެ ރުއްތަކަށް ރޯވަމުންދާ މިންވަރު ރިކަވަރުކުރުން ފުދަވައި ތިމާވެށްޓަށް އަސަރުކުރާނެ ބަދަލުތަކާއި ދެނެގަތުމަށް ކުރަން ޖެހޭ ދިރާސާ އެއް މޮނިޓަރކުރުމުގައި ފާހަގަކުރެވިފައެވެ. އަދި މީގެ ރިޕޯޓުން އެކަށައަޅާ މޮނިޓަރިންގ ޕްރޮގްރާމްގެ ތަފްޞީލު މި މަޝްރޫޢުގެ ބައި ހިމަނާފައިވެއެވެ.

މި މަޝްރޫޢުގެ ދަށުން ހުށަހަޅާފައިވާ ކަންކަމުގެ ސަބަބުން ތިމާވެށްޓަށް އަސަރުކޮށްފާނެ ކަމަށް ބެލެވޭ ކަންކަމާއި އެ ކަންކަމުން ކުރާނެ އަސަރު ކުޑަކުރުމަށް ހުށަހަޅާފައިވާ ކަންކަމަށް ރިޢާޔަތްކުރުމުން މި މަޝްރޫޢުގެ ސަބަބުން ތިމާވެށްޓަށް ކޮންމެވެސް މިންވަރަކަށް ނޭދެވޭ އަސަރު ކުރާނަމަވެސް ޖުމްލަކޮށް މުޅި މަޝްރޫޢަކީ އިޤްތިޞާދީ އަދި އިޖްތިމާޢީގޮތުން އޭގެ ފައިދާ ކުރާނެ މަޝްރޫޢެއްކަމަށްވާތީވެ. މިގޮތުން، މި މަޝްރޫޢުގެ ސަބަބުން ތިމާވެށްޓަށް ކުރާނެ ނޭދެވޭ އަސަރުތައް ވުރެ އިޖްތިމާޢީ އަދި އިޤްތިޞާދީ ފައިދާ ބޮޑުކަމަށް ދެކެވެއެވެ، މި މަޝްރޫޢު ހުށަހަޅާފައިވާ ގޮތަށް ކުރިއަށް ގެންދިއުން މުހިއްމު ކަމުގައި ދެކެމެވެ.

1 Introduction

1.1 Rationale

This Environmental Impact Assessment (EIA) report has been prepared in order to meet the requirements of Clause 5 of the Environmental Protection and Preservation Act of the Maldives to assess the impacts of proposed project for the transplantation of coconut palms from N. Magoodhoo to N. Medhufaru. This report will identify the potential impacts (both positive and negative) of the proposed project. The report will look at the justifications for undertaking the proposed project components. Alternatives to proposed components or activities in terms of location, design and environmental considerations would be suggested. A mitigation plan and monitoring programme before, during and after the works would also be included. Monitoring would ensure that the proposed activities are undertaken with caution and appropriate care so as to protect and preserve the natural and built environment of the areas in proximity to the site or those areas and environmental aspects affected by the development.

The major findings of this report are based on qualitative and quantitative assessments undertaken during site visit on 25 July 2018. However, due to unavailability of long term site-specific baseline data, the impact assessment methodology has been restricted to field data collected, consultations, impact matrices, experience and professional judgment. Internet sources have also been widely used. Since several projects of this sort have been undertaken in the past, documents and experiences from these projects have been reviewed and taken into consideration. Personnel experiences of the EIA Consultants; especially experiences with such development projects undertaken recently, have been taken into consideration.

1.2 Project Overview

The proposed project includes the transplantation of about 500 but not exceeding 700 coconut palms (cocos nucifera) from the island of Magoodhoo to the island of Medhufaru in Noonu Atoll. The two sites are close to each other. The project locations have been identified and the project would start soon after EIA approvals.

1.3 Scope of the EIA and Approach

The main scope of this EIA report as per the approved TOR is to broadly assess, identify, predict and document potential environmental impacts from the proposed project components. Hence importance is given to document the details, identify the main environmental impacts that are associated with the proposed components and address the legal requirements that need to be taken into consideration while implementing this project. This document also addresses the existing environmental condition of the project sites and foresees the ways in which potential environmental impacts will be managed, mitigated and reduced.

Hence the key aims of the report are to;

- Describe in detail the proposed project;
- Identify the need and justification for the proposed development;
- Describe the biophysical status of the existing environmental condition of the project sites based on the baseline data;
- Assess, identify and predict potential environmental impacts of the proposed development;
- Evaluate the significance and magnitude of impacts that will be generated; and identify and predict ways in which these environmental impacts will be prevented and removed through appropriate environmental management and mitigation measures;
- Develop a mechanism to closely monitor and understand the long-term effects and changes of the proposed development on the environment with respect to the available baseline information, mostly collected from field assessments and site visits;
- Provide legal protection with regards to the proposed development activities; and
- Review the predictions and assessments made on environmental impacts that are associated with the proposed development activities.

In general, the EIA report has been based upon the following sources of information:

- Review of available project documentation;
- Discussions with key personnel involved;
- Baseline environmental surveys;
- Environmental Impact Assessment Regulation
- Sandcays' previous experience of undertaking EIAs for projects in the Maldives; and
- Other EIAs for similar development projects that have been carried out in the Maldives.

1.4 Relevant Studies

In order to prepare this EIA, relevant EIA reports for reclamation and landscaping projects, and tree transplantation projects undertaken by Sandcays in the past have been carefully studied, which includes;

- EIA for the reclamation and landscaping for resort development at Maadhunifaru
- EIA for tree transplantation from Kaashidhoo to Bolifushi
- EIA for the reclamation of islands and tree transplantation for Kudavattarufalhu

The EIA Addendum for Soneva Jani resort development at Medhufaru carried out by Sandcays recently has also been considered.

1.5 EIA Team

This study was based mainly on data collected during field investigation missions in July 2018 by a team from Sandcays. The EIA report was compiled by Hussain Fizah assisted by Ahmed Zahid. Fizah is a registered EIA consultant with six years of experience while Zahid has had over 20 years of experience as an EIA consultant including several resort development and reclamation projects in the Maldives.

Established and widely accepted methods have been applied in this EIA study. Field studies have been undertaken using methods generally employed for EIA studies in the Maldives.

The methods used to identify, predict and assess impacts are based on matrices that have been established by the Consultants over a long period. In the matrix, the consultants assign a likert-scale number to represent the magnitude, significance, duration and spatial extent of the potential impact for each project activity against the key environmental and socio-economic components that the specific project activity may have an impact on. The product of the magnitude, significance, duration and spatial extent for each activity and component is summed up to measure the exact nature of the impacts by each activity and the overall impact of the proposed project is the sum of all activities.

The Terms of Reference (TOR) for this EIA has been attached as Appendix 1. This EIA has been prepared based on this term of reference.

2 Project Description

The proposed project involves the transplantation of about 500 but not exceeding 700 coconut palms from allocated areas of coconut plantations in N. Magoodhoo to N. Medhufaru (Soneva Jani) in order to meet the landscaping needs of the newly opened resort. Although the project involves the greening or landscaping of Medhufushi the project's main impact zone in terms of negative environmental impacts is N. Magoodhoo. Therefore, a separate EIA is considered for this project and to be submitted to the EPA instead of the EPA.

2.1 The Proponent

The project is proposed by Hillside Villa Pvt. Ltd., the primary leaseholder of the Soneva Jani resort at Medhufaru, Noonu Atoll.

2.2 Project Location and Boundaries

The project has two locations: the parent site from which coconut palms will be uprooted and the receiving or host site where the palm will be transplanted. Magoodhoo is the parent site, which is an inhabited island located northwest of Medhufaru (Soneva Jani resort) and Medhufaru is a recently opened resort island with poor vegetation cover especially a small number of coconut palms whereas Magoodhoo has over half of its area untouched with thick vegetation including several coconut palms. The coconut palms in the areas identified represent a small proportion of the total number of palms on the island. The area also falls in areas that have been designated in the landuse plan for future housing plots and roads. is built on the island of Medhufaru on the southeast rim of Noonu Atoll.

On the northwest of Medhufaru (Soneva Jani), at about 8.5km is Magoodhoo. Soneva Jani resort is located at geographic coordinates 5°42.800'N, 73°24.883'E. The island shares its reef another medium sized, uninhabited island and five small, vegetated sandcays. At about 5.5km north of Medhufaru is the capital of Noonu Atoll, Manadhoo, which is the closest inhabited island. Cheval Blanc Randheli resort is at about 7.5km southwest of Medhufaru (Soneva Jani).

Figure 2-1: Location of parent and host sites (magenta) in Noonu Atoll (Google Earth)

Figure 2-2: Satellite image of Magoodhoo and its reef (Google Earth)

Figure 2-3: Satellite image of Medhufaru and its reef (Google Earth)

The project involves the landscaping of almost all built-up areas of Medhufaru. Coconut palms will be transplanted in all or most of these areas as all areas lack coconut trees.

2.3 The Project

The proposed project involves the uprooting of coconut palms in designated areas in Magoodhoo and transplanting to neighbouring Medhufaru (Soneva Jani) resort. About 500 trees have been proposed to be transplanted from four different areas of the undeveloped vegetated area of the island. The coconut trees would be purchased from their owners for an agreed rate. The total number of palms is not expected to exceed 700.

2.3.1 Areas from which palms will be removed

The palms will be mainly removed by clearing the proposed roads and land areas where future housing would be developed. Planned roads and house plots in the areas that have already been planned by the Island Council for settlement in the near future would be cleared of coconut trees only. These areas are indicated in Figure 2-4.

Table 2-1: Areas from which coconut palms are proposed to be removed

Wooded areas from which coconut trees will be removed	Area (m^2)	No. of palms
Area 01	26,000	195
Area 02	16,000	75
Area 03	9,000	150
Area 04	6,000	100
Total		**520**
Total number of transplantable coconut palms		**450**

The above estimates indicate that a reasonable area from proposed future roads and house plots would be required to provide the required number of coconut trees.

2.3.2 Area in which palms will be replanted

All coconut palms that would be transported from Magoodhoo to Medhufaru will be planted in the existing vegetated areas of Medhufaru to compenstate for the lack of coconut palms on the island. This covers almost the entire built-up area of the island. These areas will have a good mix of tropical plants that will be landscaped to harmonize with the landscape of the original island of Medhufaru.

2.3.3 Work Methods

The following methodology has been drawn as the most practicable method based on discussions with some experienced contractors who have been involved in such works in the recent past.

2.3.3.1 Planning and Mobilisation

Site mobilisation will occur after proper planning and finalizing the sites in further consultation with the Island Council. These discussions will look at the harbour area in which the transplant operation will take place so that disturbances to other people using the harbour will be avoided and the access routes so that public nuisances can be avoided. The access routes would be finalized in consultation with the Island Council. Land for the machinery will also be arranged prior to mobilisation. Site mobilisation will involve mobilising the excavator and crane lorry(ies) with the necessary workforce to site and arranging appropriate land for the machinery and accommodation for the workforce.

2.3.3.2 Uprooting

The plants will be uprooted by digging at about 3 feet away from the trunk and about 6 feet deep removing roots by chain saw. A purpose-built belt will be placed in the center of the palm using which the palm will be gently put down using excavator, then remove remaining bottom roots using chain saw. Then, the leaves will be cut into half except those in the crown. The uprooted palm will then be gently put on to crane lorry with the sand in the roots for delivery to harbour area. When one load of trees has been taken to site, the excavator would be brought to harbour to load the trees to landing craft and return to site for further uprooting.

2.3.3.3 Delivery and replanting at site

Once delivered to site in the landing craft, the coconut palms will be gently taken off the landing craft, taken to site in lorries (preferably crane lorries) and placed in dedicated holes which will be backfilled and watered. It is important to ensure that the holes are ready by the time the trees are transported to site. It is also important to keep the transplanted tree wet by spraying water on it including the tree trunk during the first few days of transplantation. Thereafter, it would be necessary to ensure that the transplanted palm is watered regularly and protected from shakes or other impacts for about four months or until the roots begin to spread out again.

2.3.3.4 Additional planting

The Regulation on the Felling, Uprooting and Transplantation of Mature Trees require that for every tree felled, two new trees have to be planted. Therefore, it would be necessary to plant about 1,000 additional trees in Magoodhoo or Soneva Jani.

2.3.3.5 Holes and green waste management

Holes and green waste would be dealt with appropriately. Since the Regulation on Tree Transplantation requires that the holes shall be backfilled with sand, it is proposed to dredge approximately 2,400m^3 of sand from the harbour basin at the onset of the project, keep them in the harbour front for some time to drain excess salt and use for filling holes created by the uprooting process.

Green waste will be created in large quantities as part of the leaves will be cut off before transplanting and some of the trees falling on to the roads that would be cleared would be cut down. Therefore, it would be necessary to find a way to dispose them appropriately. One or more of the following methods would be adopted, assuming that burying the green waste would be acceptable.

- Compacted and placed under trees in wooded areas
- Burnt onsite and resultant ash buried in holes.
- Mulched on site and the mulch is buried
- Transported to Thilafushi or Vandhoo

2.3.4 Project duration

The project is expected to be completed in two months from the date of approval of this EIA report. The transplantation is expected to be undertaken during early late August or September and completed by the end of October. Mobilisation will occur immediately upon EIA approval and site planning in liaison with the Island Council.

2.4 Project Inputs and Outputs

The project has inputs in terms of human resources and natural resources such as water and fuel. The main output of the project is the economic value of the area in which the coconut trees will be transplanted and the carbon offset that the plants will provide as a result of the natural cooling of the transplanted, especially the guest rooms where the air-conditioning need will be greatly minimized. The improved aesthetics of the transplanted areas is also an important consideration. These inputs and outputs are summarised in Table 2-2 and Table 2-3.

Table 2-2: Main inputs of the proposed project

Input resource(s)	Source/Type	How to obtain resources
Construction workers	Maldivians and expatriates	Mainly the existing work force of the contractor plus some locals.
Water supply	Well water from the household wells and bottled water for workforce	Community household wells and bottled water bought from island shops
Electricity/Energy	Island electricity	Island electricity mains
Machinery	Crane lorry(ies), lorries, excavator(s), barge, landing craft, chain saws and other general construction tools	Already available with the contractor and hiring from local suppliers.
Telecommunications	Mobile phones and internet facilities	Available with contractor
Transport	Landing craft and speed boat	Already available with contractor
Food and Beverage	Food items available in the island	Local purchase
Fuel	Light Diesel, Petrol, Lubricants	Local suppliers
Insecticides, pesticides, etc.	Imported pesticides	Import/local suppliers

Table 2-3: Matrix of major outputs

Products and Waste Materials	Anticipated Quantities	Method of Disposal/Remarks
Additional trees planted	3,000+ trees	About three thousand trees (mostly coconuts) will be planted as per the requirement of Regulation on the Felling, Uprooting and Transplantation of Mature Trees
Green waste	1,000m^3 of green waste	Green waste will be burned after on site, mulched/compacted and placed in holes or under forested areas as natural fertilizer or transported to Thilafushi
Hazardous waste	Approximately 20 litres of waste diesel and oils	Contained and stored at site for final disposal to Thilafushi
Noise	Only localised to the island environment	Insignificant noise pollution will only occur since the sites are located at a distance from the residential areas. Noise pollution will impact the fauna in the area possibly affecting their behavior, nesting and feeding patterns
Air pollution	Limited quantities of dust in direct work areas	Mainly arising as a result of dust emission from machinery movement. Only localised to project boundary.

2.5 Need and Justification

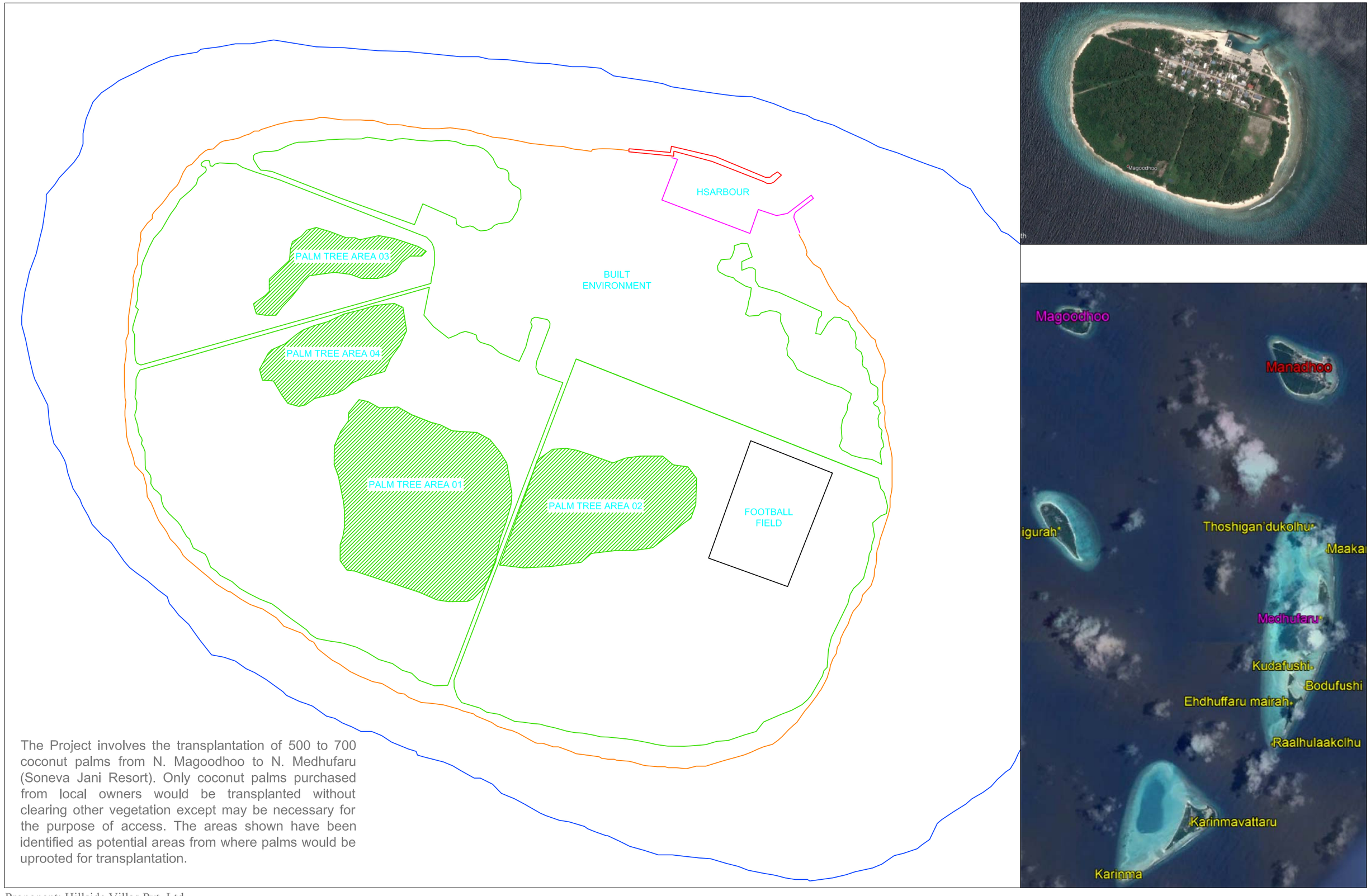
The primary objective of the project is the improved landscape of Medhufaru with coconut palms. Mature, medium-sized palms, with the ease of their transplantation and adaptability to reclaimed areas with highly saline aquifers would be the perfect candidate for transplantation. Tropical island vegetation would never be complete without coconut trees. Coconut trees are not only a fascination but bestow might and tranquillity and usually occur spontaneously in most of the islands of the Maldives. In fact, they are the first (pioneer) species to grow on new islands and Maldives provides the perfect climate for their growth and sustenance.

Furthermore, coconut palms act as wind breakers giving protection to structures in its lee. Also, they provide shade to buildings as they stand high above roofs of single storey buildings. This keeps the building cool, minimizing the cooling demand from air-conditioning. Air-conditioning account for about 40% of the energy needs in tropical resorts. Therefore, natural cooling is necessary to keep cooling costs down. Since energy for cooling comes from the burning of diesel in diesel generators, natural cooling helps to minimize the amount of fuel

burnt, i.e, a reduction in carbon dioxide emissions, which is the main greenhouse gas responsible for global warming and associated climate change.

The coconut trees are being removed primarily for the purpose of clearing roads and future house plots based on existing master plan and the community of Magoodhoo needs to do and some of the land plots that require clearance in the short to medium term. Usually, when roads and house plots or even agricultural land is cleared of vegetation, the trees are cut down or felled and disposed to landfill. Therefore, this project provides the opportunity to salvage several coconut palms that would otherwise be felled and dumped (allowed to decay) or burnt, thereby adding to the global carbon emissions. Instead, in this project, these trees will be replanted in their new home where they would sequester more carbon every year as long as they live.

Figure 2-4: Proposed project components



The Project involves the transplantation of 500 to 700 coconut palms from N. Magoodhoo to N. Medhufaru (Soneva Jani Resort). Only coconut palms purchased from local owners would be transplanted without clearing other vegetation except may be necessary for the purpose of access. The areas shown have been identified as potential areas from where palms would be uprooted for transplantation.

3 Legislative and Regulatory Considerations

This section will 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. The proposed project is expected to conform to all of the policy and regulatory aspects outlined here. This section outlines and summarizes key policies, applicable laws and regulations and regulatory bodies that the Proponent has to comply with and be answerable in terms of implementing the project.

3.1 Applicable Laws and Regulations

There are a number of laws and regulations relating to environment in the country. Only relevant laws and regulations have been outlined in this section.

3.1.1 7th Amendment Law (Law No. 8/15) to the Maldives Tourism Act (Law No. 2/99)

The 7th Amendment Law to the Maldives Tourism Act has been enacted on 27 April 2015, which now stipulates provision for preparing and approving EIAs prepared for activities in tourist resorts in the Maldives, hence, the amended Tourism Act is now the key legal instrument that the proposed project has to comply with.

The 7th Amendment Law (Law No. 8/15) to the Maldives Tourism Act (Law No. 2/99) where it states that the Article 15 of the Tourism Act now provision;

- Written approval from the Ministry of Tourism for any activity deemed to have environmental impacts of tourist resorts (Clause 1);
- Such written approval shall only be granted upon approval of an Environmental Impact Assessment (EIA) Report (Clause 2);
- Ministry of Tourism now has the sole authority to request for preparing and approving EIAs prepared for tourist resorts (Clause 3); and
- Relevant regulations shall only be prepared by Ministry of Tourism (Clause 4).

Some of the regulations discussed in this report may be irrelevant once the Tourism Ministry develops relevant regulations as per clause 4 of the Amendment. However, any such regulations are expected to complement with current environmental regulations.

3.1.2 Environmental Protection and Preservation Act

The Environmental Protection and Preservation Act of the Maldives, EPPA (Law No. 4/93) provides the basic framework for environmental management including Environmental Impact Assessment (EIA) process in the Maldives, which is currently being implemented by EPA on behalf of Ministry of Environment and Energy.

Clause 2 of the EPPA mandates the Ministry of Environment to formulate policies, rules and regulations regarding the environment.

Clause 5 of this Act specifically provides for environmental impact assessment (EIA), a tool implemented to attempt to integrate environmental issues into development decisions. According to the Clause, environmental impact assessments are a mandatory requirement for all economic development projects.

Clause 6 of the EPPA gives the Ministry of Environment the authority to terminate any project that has an undesirable impact on the environment.

Clause 7 of the EPPA refers to the disposal of oil, wastes and poisonous substances in to the Maldivian territory. According to this clause, any type of waste, oil, toxic gas or any substance that may have harmful effects on the environment should not be disposed within the Maldivian territory. If, however, the disposals of such substances become absolutely necessary, the clause states that they should be disposed only within the areas designated for that purpose and if incinerated, appropriate precautions should be taken to avoid harm to the health of the population.

Furthermore, clause 9 sets a fine between five and five hundred Rufiyaa for minor offenses in breach of this law and a fine of not more than one hundred million Rufiyaa for major offenses. The fine shall be levied by the Ministry of Environment or by other government authorities designated by that Ministry in case of minor offenses.

Finally, Clause 10 of EPPA gives the government of the Maldives the right to claim compensation for all damages caused by activities that are detrimental to the environment.

The Environmental Act or Law 4/93 is the most important legal instrument with regards to environmental management and it gives very high prominence towards safeguarding the

environment with regard to all the development activities. Under this Act, the Ministry of Environment has developed regulations and guidelines concerning environmental protection.

3.1.3 Environmental Impact Assessment Regulation

There are 2 EIA Regulations in force in the Maldives – one implemented by the Ministry of Tourism for Tourism Projects and the other implemented by the Environmental Protection Agency for all other projects. EIA Regulation, which came into force in 2007, which has been recently revised as EIA Regulation 2012 is the basis for the EIA Regulation for the tourism sector as well. This EIA is subjected to the EIA Regulations 2012.

The EIA Regulation is currently only in Dhivehi and an official translation is awaited. The Regulation sets out the criteria to determine whether a development proposal is likely to significantly affect the environment and is therefore subject to an EIA. Schedule E of the EIA Regulations defines the type of projects that would be subject to Environmental Impact Assessment. Resort development tops the list.

The main purpose of this Regulation is to provide step-by-step guidance for proponents, consultants, government agencies and general public on how to obtain approval in the form of an Environmental Decision Statement. The structure of the EIA report and EMP report as well as monitoring report are also given in the Regulation.

It is important to note the heavy fines included in the EIA Regulations for the Tourism Sector. These are way above the normal fines levied in any other regulation and has remained a cause for concern.

3.1.4 Regulation on the Protection and Conservation of Environment in the Tourism Industry

This regulation was made pursuant to the Maldives Tourism Act. The regulation mandates the standards for the protection and conservation of environment in the tourism industry of the Maldives, which are relevant, understood and adhered to in the proposed project. The purpose of this regulation is to protect the environment in the tourism industry and to encourage and facilitate sustainable development of tourism.

In this regulation, unless the context otherwise requires, “tourism industry” means any island leased for the development and operation of a tourist resort, tourist hotel, tourist guest house,

yacht marina, and islands leased under the Maldives Uninhabited Islands Act (Law No. 20/98) and all other places and facilities registered under Ministry of Tourism for the provision of service to tourists.

Any of the following activities in an island or place leased for the purpose of tourism shall be carried out after obtaining permission from the Ministry of Tourism:

- Dredging of the lagoon and reclamation of land
- Construction on the beach and lagoon
- Beach enhancement by pumping sand
- Construction of breakwater
- Construction of sea wall, revetment or groyne
- Dredging of lagoon or reef for safe access
- Dredging of reef
- Felling of trees
- Importing and exporting living species
- Conducting research of land, sea and lagoon
- Demolition of a building or facility
- Anything which may adversely affect the vegetation or fresh water lens of the island

In addition to the provisions of clause 2.1 above, any activity that may cause damage or adversely affect the environment shall be carried out after obtaining permission from the Ministry of Tourism.

Trees shall not be felled in order to construct buildings or for other purpose in an island, resort, or other place leased for the purpose of tourism, except with prior written permission from the Ministry of Tourism.

In the event any tree or coconut palm is felled for construction or any other reason in any resort, Picnic Island, or marina or such other place leased for the purpose of tourism, two trees or coconut palms shall be replanted in the same island.

Groundwater shall not be extracted for the purpose of construction in an island or land leased for the development of tourism

Any infrastructure or facility in an island or land leased for the development of tourism shall be built five meters inwards from the vegetation line

In order to preserve and maintain the natural environment of islands or part of it leased for purpose of tourism, at least 80% of the island shall be spared un-built. The area inwards from the vegetation line shall be taken as the area of the island. If the relevant area is a designated part of an island, the area inwards from the vegetation line of that area shall be taken. However, this percentage was later amended to 70%.

It is prohibited to extract coral stones from any part of the lagoon or the reef of an island in the Maldives, for any purpose of an island leased for the development of tourism

In an island or land leased for the development of tourism, all jetties built in all resorts, picnic islands, marinas or other islands shall be built in such a way that allows free movement of water current and sand beneath the jetty.

3.1.5 Regulation on Uprooting, Cutting and Transportation of Palms and Trees

This Regulation was implemented on 1 February 2006 by the then Ministry of Environment, Energy and Water. The primary purpose of the Regulation is to control and regulate large-scale uprooting, removal, cutting and transportation of palms and trees from one island to another. According to the regulation, certain types of trees and plants that have unique attributes are prohibited to be removed from its natural environment. Also, uprooting and removal of 50 or more trees and palms are subject to environmental impact assessment (EIA), which is required to be submitted to the Environmental Protection Agency and written approval is required prior to implementation of the project. For resort projects, this approval would be given by the Ministry of Tourism.

This regulation would be respected in implementing the proposed project. The proposed project would require quite a number of plants to be cleared for building purposes although most of the vegetation will be intact. However, most of the mature trees, especially coconut palms that need removal would be transplanted in areas where there are clearings or where mature trees are lacking (which may be just a few areas in Medhufaru), thereby saving those trees.

3.1.6 Regulation on Environmental Damage Liabilities

Under the Environmental Protection and Preservation Act (No. 4/93), the Ministry of Environment formulated the Environmental Damage Liabilities Regulation in February 2011, which encompasses the basis to avoid environmental deterioration, extinction of biological

resources, environmental degradation and avoid wastage of natural resources. The main purpose of this regulation is to stop unlawful activities on environment and adequately implement a fining procedure for violations as well as implement a compensation mechanism on environmental damages. Its schedules form the basis for levying fines on various environmental components and activities. Hence, the proposed project will be subject to this Regulation for any activity outside of the EIA scope and Environmental Decision Statement including transplantation of trees cleared from Medhufaru to other islands.

3.1.7 Waste management regulation

The Waste Management Regulation (Regulation No. 2013/R-58) came into effect in August 2013. The objective of Waste Management Regulation is to implement the National Waste Management Policy; through which it aims to protect the environment by minimizing the impact of waste on the environment, including the impact of waste on human health, establishing an integrated framework for minimizing and managing waste in a sustainable manner and establishing uniform measures to reduce the amount of waste generated. The regulation also ensures waste is reused, recycled and recovered in an environmentally sound manner before being safely treated and disposed. The regulation covers the management of general, hazardous and special waste. Wastes arising from paints and chemical solvents are considered as special waste.

Clause 7 of the regulation requires the preparation of Waste Management Plans for specific sectors or areas. Clause 7(c) requires that City and Island Councils prepare their own Waste Management Plans for EPA approval. Clause 8 is for hazardous waste management and clause 9 for special waste management. The types of hazardous waste considered under clause 8 are given in Appendix J of the Regulation.

Clause 10 is about extended producer responsibility and Clause 11 requires that waste shall be disposed in approved locations only. Clause 11(b) states the areas where waste should not be disposed at all including roads, parks, beaches, lagoon, reef, and so on. Clause 11 (c) (d) states the situations that exempt the enforcement of the regulation including situations where human life is at risk and natural disasters or national security threats. Clause 11(e) states that waste management at household level would not require any permits under the regulation. Clause 12 states the provisions for managing waste in public places; that appropriate bins be placed in appropriate locations with appropriate labels distinguishing different kinds of waste and that

those bins shall be emptied periodically in an appropriate manner to avoid nuisances of any sort.

Clause 13 is for waste management on sea-going vessels. Clause 14 is for waste management at harbors or ports. Clause 15 is for recycling and recovery of waste.

Clause 16 to 23 deals with waste management permits including the standards to be adhered by licensed parties, renewing licenses, types of licenses, renewal and change of licensee, cancellation of licenses, fees and charges. Clause 24 requires that EPA maintains an inventory of the licensed parties and the details required in the inventory.

Clause 25 to 28 lists the provisions for waste transport. Clause 29 talks about the responsibilities of the licensed parties. Clause 30 requires that administrative records including fines shall be maintained by the EPA. Clause 31 gives the EPA the authority to check/monitor the activities of the licensed parties. Clause 32 and 33 are also about data collection and reporting.

Clause 34 discusses the actions to be taken in case of non-compliance. Clause 35 sets the conditions for cancellation of license. Appendix M of the regulation states the different fines that will be levied upon non-compliance.

This regulation was effective from 6 January 2014 and EPA would be responsible for the implementation this regulation. For resort and other tourism projects, Ministry of Tourism has certain requirements which are already in place in the resort. This regulation is of relevance since this came into effect after the resort's initial EIA was approved.

3.1.8 Land Act 2002 and Landuse Regulation

Law no. 1/2002 (Land Act of the Maldives) and especially the Regulation on Landuse Planning and Implementation are of relevance to this project. Magoodhoo currently falls into Category B of the Regulation on Landuse Planning and Implementation. Clause 3.1 states that category B and C islands will be planned by Regional or Provincial Office while Housing Ministry will plan only Category A islands. At present, the island office prepares the plans and sends to the Ministry of Housing, Transport and Environment for a decision from the Technical Committee as per Clause 4 of the Regulation. Clause 7 states that landuse plan should be based on 20-year population growth, density and household ratios, the landuse plan of Magoodhoo appears to be based on such requirements. The presently available landuse plan prepared by Magoodhoo

Council was shared by the Councillor during the field visit from 27-29 May 2010. This landuse plan is annexed.

3.2 Policy Guidance

The policy guidance on the development of the proposed project is taken from a number of policy documents prepared by the Government of Maldives on sectoral developments. Key documents outlined in this EIA are currently being implemented towards sustainable development of the country.

3.2.1 Fourth Tourism Master Plan

Tourism master plans are for four years, the most recent one being the Fourth Tourism Master Plan (4TMP). The plan is currently in the draft stage. The emphasis of the 4TMP is on six themes.

- Maintaining Maldives position in the world
- Managing environment and conservation issues
- Engaging more Maldivians in tourism careers
- Promoting sensible ways for communities to participate in tourism
- Promoting investment towards sustainable growth and high product quality
- Efficient in marketing and destination management.

The proposed project is in line with the policies and plans outlined in the Fourth Tourism Master Plan.

3.2.2 Third National Environment Action Plan

NEAP 3 sets out the agenda for environmental protection and management in the Maldives for the five-year period 2009-2013. This plan is targeted to achieve measurable environmental results that matter to the people of the Maldives.

The aim of developing NEAP 3 is to protect and preserve country's environment and properly manage natural resources for sustainable development of the country and encompasses ten principles, six strategic results with targeted goals to be achieved under each result.

The key principles of the NEAP 3 are:

Principle 1: Environmental protection is the responsibility of every individual

Principle 2: Achieve results

Principle 3: Promote and practice sustainable development

Principle 4: Ensure local democracy

Principle 5: Inter-sectoral co-ordination and co-operation

Principle 6: Informed decision making

Principle 7: Precaution first

Principle 8: Continuous learning and improvement

Principle 9: Right to information and participation

Principle 10: Environmental protection complements development

The six strategic results of NEAP3 are: resilient islands; rich ecosystems; healthy communities; safe water; environmental stewardship; and a carbon neutral nation with 30 result oriented environmental goals that will be achieved in the span of the NEAP 3.

3.2.3 National Biodiversity Strategy and Action Plan

The goals of the National Biodiversity Strategy and Action Plan are:

- Conserve biological diversity and sustainably utilize biological resources.
- Build capacity for biodiversity conservation through a strong governance framework, and improved knowledge and understanding.
- Foster community participation, ownership and support for biodiversity conservation.

In implementing the proposed project activities due to care has to be given to ensure that the national biodiversity strategies are adhered to including deforestation and transplantation of trees.

3.2.4 Maldives Climate Change Policy Framework

The Maldives Climate Change Policy Framework was published in August 2015. This document takes into consideration eight principles and five specific policy goals, which have been refined into five areas of objectives and strategies: sustainable financing, low emission development, adaptation and opportunities, capacity building and leading advocacy at climate negotiations and fostering sustainable development.

3.3 Regulatory Bodies

3.3.1 Ministry of Environment and Energy

The primary environmental institution in the Maldives is Ministry of Environment and Energy (MEE). It is mandated with formulating policies, strategies, laws and regulations concerning environmental management, protection, conservation and sustainable development. The Minister of Environment or a designate gives the environmental approval or clearance to EIA by an Environmental Decision Statement. However, with recent change in legislation, EIAs and environmental clearance of activities in tourist resorts, including initial development is given by Ministry of Tourism.

Additionally, MEE is responsible for formulating relevant laws and regulations, policies and strategies concerning energy, water and sanitation, waste and infrastructure.

3.3.2 Environmental Protection Agency (EPA)

EPA is the key regulatory body on environment, which is an autonomous body formed under the umbrella of MEE. It is mandated with implementing the EIA process in the Maldives, implementing the Environment Act and subsequent regulations on behalf of MEE, regulating water and sanitation, biodiversity conservation, waste management and coastal zone management. Also, it is responsible for developing environmental standards and guidelines in the country.

However, as mentioned earlier, with the implementation of amendments to Tourism Act 2/99 in April 2015, currently Ministry of Tourism is mandated with issuing environmental clearance to all tourism-related activities in the Maldives. This EIA would be processed and approved by the Environmental Protection Agency.

3.3.3 Ministry of Tourism

For resorts, the Ministry of Tourism is the key government institution dealing with all matters relating to the project including EIA. In April 2015, Amendment to Tourism Act was passed that allows the Ministry of Tourism to administer the EIA process related to tourism developments/projects in the Maldives. With this Amendment to the Tourism Act, the role of EPA with respect to environmental assessment in the tourism sector has been passed on to the Tourism Ministry. All communications including the EIA report shall be submitted to the Ministry of Tourism. The Ministry also has its own regulations and environmental standards for tourist establishments, which shall be strictly adhered to. Therefore, the Ministry would monitor the environmental impacts of the development.

However, for the proposed project involving local island, the EIA would be administered by the Environmental Protection Agency. Yet, it may be relevant to submit a copy of the EIA report to the Ministry of Tourism including a copy of the EIA Decision Statement issued by the EPA to obtain further clearance from the Ministry of Tourism to transplant at Soneva Jani.

3.4 International and Regional Context

3.4.1 Environment Sector

The major global issue facing the Maldives is climate change, global warming and subsequent sea-level rise. The small size of the islands and their low elevation above MSL makes possible impacts of it very seriously. Consequently, the country plays a prominent role in fore-fronting environmental issues faced by many other small islands developing states including the Maldives in the international arena. The Maldives is therefore, a party and signatory to various international conventions and declarations. These include;

- The Paris Agreement
- UN Convention on the Law of the Sea – UNCLOS (1982)
- International Convention for the Prevention of Pollution of the Sea by Oil (1982)
- Vienna Convention for the Protection of the Ozone Layer (1985)
- Montreal Protocol on Substances that Deplete the Ozone Layer (1987)
- Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal (1989)

- The London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1990)
- Agenda 21 and the Rio Declaration of the United Nations Conference on Environment and Development (1992)
- Convention on Biological Diversity (1992)
- United Nations Framework Convention on Climate Change (1992)
- The Copenhagen Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1992)
- The Montreal Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1997)
- The Beijing Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1999)
- Washington Declaration on Protection of the Marine Environment from Land-Based Activities
- Kyoto Protocol to the United Nations Framework Convention on Climate Change (1998)
- Cartagena Protocol on Biosafety (Maldives acceded on 2 September 2002)
- United Nation Convention to Combat Desertification (2002)
- The Paris Agreement (on Climate Change, 2016)

The Maldives is also a key player in formulating and adopting various regional plans and programs to protect the environment by continuously participating in various activities organized by regional bodies such as SACEP, ESCAP and SAARC. As a result, the Maldives is committed to the following;

- SAARC Environment Action Plan adopted in 1997 in Male'
- SAARC Study on Greenhouse Effect and its Impact on the Region
- South Asian Regional Seas Action Plan and Resolutions concerning its implementation (1994)
- SAARC Study on Causes and Consequences of Natural Disasters, and
- South Asian Seas Program initiated by SACEP
- Male' Declaration on Control and Prevention of Air Pollution and its likely Transboundary Effects for South Asia (1998)

Few of these would be applicable in the context of the proposed project components, especially the Paris Agreement signed most recently for combating the impacts of global climate change. The United Nation Convention to Combat Desertification would also be of some relevance.

3.5 Environmental Permits required for the Project

3.5.1 EIA Decision Statement

The most important environmental permit to initiate transplantation work under this project would be a decision regarding this EIA from the Environmental Protection Agency (EPA). This has been clearly stated in the letter provided to the Proponent from the Island Office, which is annexed. The EIA Decision Statement, 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 Statement may only be given to the Proponent after a review of this document following which the EPA 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 EPA may provide the Decision Statement while at the same time requesting for further information.

4 Existing Environment

4.1 Introduction

Conditions of the existing environment of the study area were analyzed by using appropriate scientific methods. Field surveys were not undertaken by the Consultants but field information including photos of sites and groundwater samples were shared with the Consultant and necessary investigations were undertaken. These were carried out in July and August 2017.

The following components of the existing environment were considered, as per the TOR;

- Existing landuse at Magoodhoo
- Terrestrial flora and fauna
- Groundwater quality
- Landscape integrity

In addition, general meteorological conditions of the project area were considered, as required in the approved TOR.

4.2 Climate

4.2.1 General Conditions

The Maldives, in general, has a warm and humid tropical climate with average temperatures ranging between 25ºC to 30ºC and relative humidity ranging from 73 per cent to 85 per cent. The country receives an annual average rainfall of 1,948.4mm. There is some variation of climate between northern and southern atolls. The Table below provides a summary of key meteorological findings for Maldives. General studies on climatic conditions of Maldives were taken into account during study as local level time-series data are limited for longer periods at the nearest meteorological station.

Table 4-1: Key meteorological information (Maldives)

Parameter	Data
Average Rainfall	9.1mm/day in May, November 1.1mm/day in February
Maximum Rainfall	184.5 mm/day in October 1994
Average air temperature	30.0 C in November 1973 31.7 C in April

Parameter	Data
Extreme Air Temperature	34.1 C in April 1973 17.2 C in April 1978
Average wind speed	3.7 m/s in March 5.7 m/s in January, June
Maximum wind speed	W 31.9 m/s in November 1978
Average air pressure	1012 mb in December 1010 mb in April

4.2.2 Monsoons

Maldives is in the Monsoonal Belt in the North Indian Ocean. Therefore, climate in the Maldives is dominated by south-west (*Hulhangu*) and north-east (*Iruvai*) monsoons. The southwest monsoon is the rainy season which lasts from May to September and the north-east monsoon is the dry season that occurs from December to February. The transition period of the south-west monsoon occurs between March and April while that of the northeast monsoon occurs from October to November. These monsoons are relatively mild due to the country's location on the equator and strong winds and gales are infrequent in the Maldives. However, storms and line squalls can occur, typically in the period May to July. The winds usually get stronger in the south west monsoon especially during June and July. During storms the impact is greater on the northern atolls than the southern atolls.

Table 4-2: Summary of Monsoons in Maldives

Season	Months
North East-Monsoon (Iruvai)	December to February
Transition Period - 1 (HulhanguHalha)	March to April
South West Monsoon (Hulhangu)	May to September
Transition Period - 2 (IruvaiHalha)	October to November

There appears to be a change in seasons over the past years with the transition from northwest to southwest occurring late towards January with prolonged windy conditions up to mid-March. The generally harsh southwest monsoon had been a bit mild the last year as well as the previous years.

4.2.3 Temperature

The temperature of Maldives varies little throughout the year with a mean daily maximum temperature of about 32°C and mean low of 26°C and are rarely below 25°C or above 33°C.

4.2.4 Rainfall

Annual average rainfall in the Maldives is about 1900mm. There is a marked variation in rainfall across Maldives with an increasing trend towards south. The annual average rainfall in north is 1977mm and for south is 2470mm. The southwest monsoon is known as the wet season with monthly average rainfall ranging from 125-250mm. The northeast monsoon is known as the dry season with average monthly rainfall of 50-75mm.

4.2.5 Wind

Wind has been shown to be an important indirect process affecting formation development and seasonal dynamics of the islands in the Maldives. Winds often help to regenerate waves that have been weakened by travelling across the reef and they also cause locally generated waves in lagoons. Therefore, winds are important here, as being the dominant influence on the sediment transportation process (waves and currents). Winds are also a cause for concern in coastal settlements. Coastal vegetation, especially palm trees help to break the wind and provide shelter from winds.

With the reversal of winds in the Maldives, NE monsoon period from December to March and a SW monsoon from April to November, over the year, the accompanying wave and current processes respond accordingly too. These aspects have ramification on the seasonal sediment movement pattern on the islands and also the delivery/removal of sediments from the reef platform/island.

The two monsoon seasons have a dominant influence on winds experienced across the Maldives. These monsoons are relatively mild due to the country's location close to the equator and strong winds and gales are infrequent. However, storms and line squalls can occur, usually in the period May to July; gusts of up to 60 knots have been recorded at Male' during such storms.

Wind was 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 the Maldives during both monsoons, with a maximum wind speed recorded at 18 m/s for the period 1975 to 2001. Maximum wind speed recorded in the south was 17.5 m/s during the period 1978 to 2001. Mean wind speed was highest during the months January and June in the central region, while wind speed was in general lower and more uniform throughout the year in the southern region.

Wind analysis indicated that the monsoon was considerably weaker in the south (Naseer, 2003). During the peak months of the SW monsoon, southern regions have a weak wind blowing from the south and south-eastern sectors.

Table 4-3 summarizes the annual wind conditions in the central region, more applicable to the proposed location and Figure 4-1 provides the wind-rose diagram (adapted from windfinder.com). This analysis represents wind data from Malé Velana International Airport taken between 07/2002 - 01/2018 daily from 7am to 7pm local time.

Table 4-3: Summary of general wind conditions in the central Maldives

Month of year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
	01	02	03	04	05	06	07	08	09	10	11	12	1-12
Dominant wind direction													
Wind probability >= 4 Beaufort (%)	53	40	15	16	49	45	34	35	35	41	23	39	35
Average Wind speed (kts)	11	10	8	7	11	10	10	9	10	10	8	10	9
Average air temp. (°C)	30	30	31	31	31	30	30	30	30	30	29	29	30

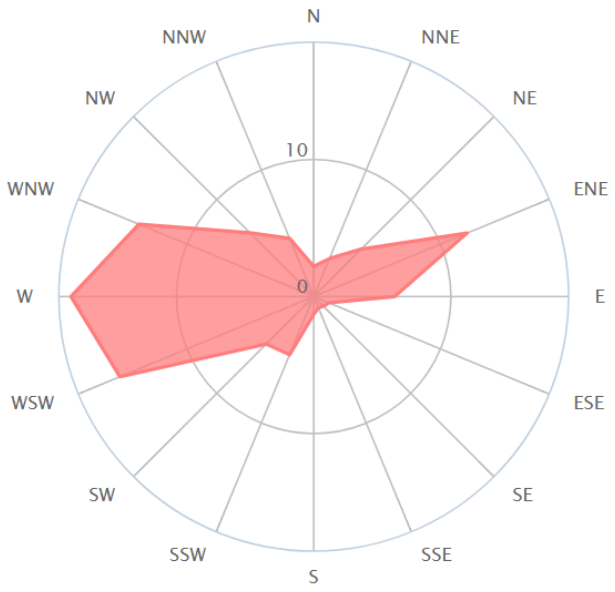


Figure 4-1: Windrose diagram based on data from Malé International Airport

4.3 Existing Landuse

Existing landuse patterns of Magoodhoo was assessed from existing landuse plans as well as from findings of the field trip to Magoodhoo in July 2018. During the field mission, handheld

field computers with differential GPS and drone was used to record landuse patterns and information relating to different sites. Photographic records were made of the land use patterns observed.

Magoodhoo is an average island with a large proportion of its woods untouched or without any form of development.

4.4 Hazard Vulnerability

The risk of hurricanes and storm surges are considered here, as per the requirements of the approved Terms of Reference.

Medhufaru is located on the eastern rim of Noonu Atoll with the island formed closer to the eastern rim. The island is formed closer to the eastern rim with a large span of shallow lagoon on the west. The shallow reef flat on the eastern rim provides a large degree of protection from oceanic swells on the east while the long stretch of shallow lagoon on the western side provides protection to the western side. The wide deep lagoon on the western side also provides a dampening effect on the incoming wind waves during the southwest monsoon. Therefore, the western beaches are generally stable with the large shallow and deep lagoon areas providing adequate sand for beach enhancement. The current flow around the island is generally in the westerly direction due to constant oceanic swells on the eastern rim. Therefore, the eastern shoreline is deprived of sandy beach with the sediment moving and collecting on either ends of the island forming sand spits at the north and south ends.

Magoodhoo is located inside the atoll closer to the eastern rim and the east side facing two channels on either side of Manadhoo. Therefore, the eastern side is heavily eroded with beach rock while the western side is also eroded with beach on the south and northern sides. Magoodhoo has a recently built harbour although its population is small.

The height of the two islands is at an average of 1.4m above MSL, which is the average height of islands in the Maldives. Therefore, the existing height is sufficient to render the island safe from tidal inundation under normal tidal surge conditions except for the wetland areas in Medhufaru. Apart from that there are no natural hazard concerns.

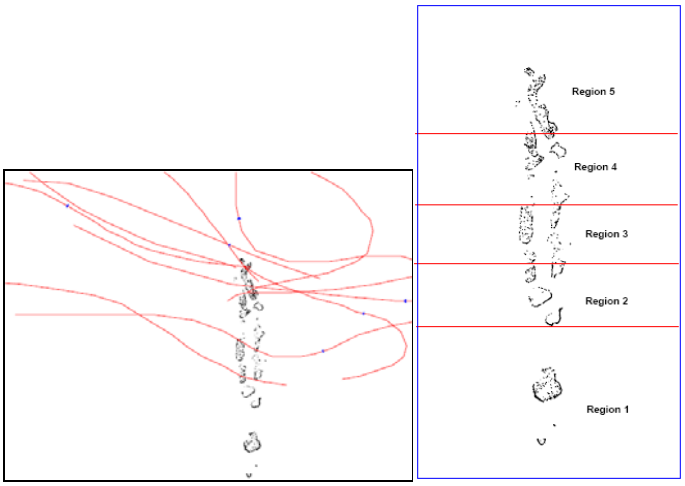
Following the tsunami event of December 2004, UNDP carried out a detailed assessment of the natural vulnerability of the islands and atolls of the Maldives to potential hazards using

appropriate models to understand the risk factors of the country. Based on these assessments and based on past data and vulnerability of the island, Magoodhoo and Medhufar are considered to have low to moderate risks associated with hurricanes and cyclones while some degree of high risk due to potential tsunamis, which have not been heard of until the December 2004 tsunami. The islands of Maldives are most vulnerable to tidal waves associated with cyclones and other severe weather patterns in the Bay of Bengal area and high astronomical tides combined.

Besides heavy rains and strong winds during monsoons, hazardous weather events which regularly affect Maldives are tropical storms or 'tropical cyclones', and severe local storms. At times, tropical cyclones hitting Maldives are destructive due to associated strong winds that exceed a speed of 150 kilometres per hour, rainfall of above 30 to 40cm in 24 hours and storm tides that often exceed four to five meters (UNDP 2006).

Cyclonic winds sometimes can cause a sudden rise in sea-level along the coast, leading to a storm surge. The combined effect of surge and tide is known as 'storm tide'. Storm tides can cause catastrophe in low-lying areas, flat coasts and islands such as Maldives.

Referring to Suffir-Simpson Scale given in Figure 4-2, Magoodhoo and Medhufaru are considered to be in a vulnerable zone when cyclonic winds and storm surges over the Maldives are concerned and also moderately low risk when tsunamis and earthquakes are concerned. The island falls under hazard zone 5 at Suffir-Simpson Scale 0, with some risk of hurricanes and cyclones.



Hazard Zone	Probable Maximum Wind Speed (knots)	Saffir-Simpson Scale
1	0.0	0
2	55.9	0
3	69.6	1
4	84.2	2
5	96.8	3

Figure 4-2: Cyclonic wind hazard zones (adapted from RMSI/UNDP 2006)

Figure 4-3 show that Maldives faces tsunami threat largely from the east and relatively low threat from the north and south. So, islands along the eastern fringe are more prone to tsunami hazard than those along the northern and southern fringes. Islands along the western fringe experience a relatively low tsunami hazard. This map is produced based on the experience of the tsunami in 2004 and also occurrence of historic tsunami events in the greater region where most of the events have identified to have occurred from the Sumatra Region (UNDP 2006).

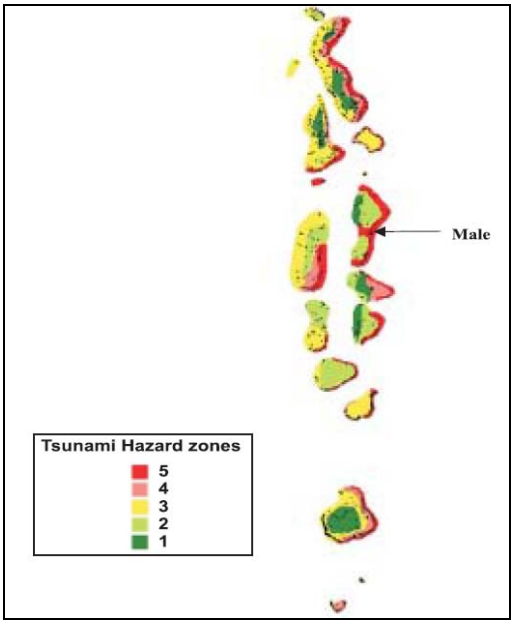


Figure 4-3: Tsunami hazard zones

Maldives is also affected by severe local storms-thunder storms/thunder squalls. Hazards associated with thunder storms are strong winds, often exceeding a speed of 100 kilometres per hour, heavy rainfall, lightning and hail; they also give rise to tornadoes in some regions. In general, thunderstorms are more frequent in the equatorial region than elsewhere, and land areas are more frequently hit by thunderstorms as compared to open oceans. However, thunder storms close to the equator are less violent when compared with those in the tropical regions and beyond. Maldives being close to the equator; thunder storms are quite frequent but less violent here. Strong winds generated by severe local storms generate large wind-driven waves which are hazardous for Maldives (UNDP 2006).

Vulnerability of the islands of the Maldives to flooding and storm surges and possibly complete inundation is considered to be high due to increasing vulnerability to the effects of global warming such as melting of polar ice caps. As a result, sea level rise due to climate change has uniform hazard throughout the country (RMSI/UNDP 2006). However, there are theories that

support that high rates of evaporation in the tropical Indian Ocean may cause water levels to go down although pan evaporation studies may indicate of only evaporation due to sunlight falling on the pan excluding other meteorological factors.

There are no concerns related to storm water flooding as Magoodhoo is small and so is Medhufaru and does not cup towards the middle of the island.

4.5 Hydrography

4.5.1 Groundwater

The groundwater is in a good state and local community has no issues with groundwater at present. Groundwater testing was not done but the quantity available for abstraction (sustainable yield) was calculated from available data. The present net safe yield is estimated to vary from 250 to 600litres per person per day. Figure below shows the sustainable yield under a worst-case scenario. The estimate is based on the available freshwater quantity, rate of abstraction and net recharge. Recharge is affected by the shallow groundwater table and the thick growth of vegetation which is responsible for high evapo-transpiration rates.

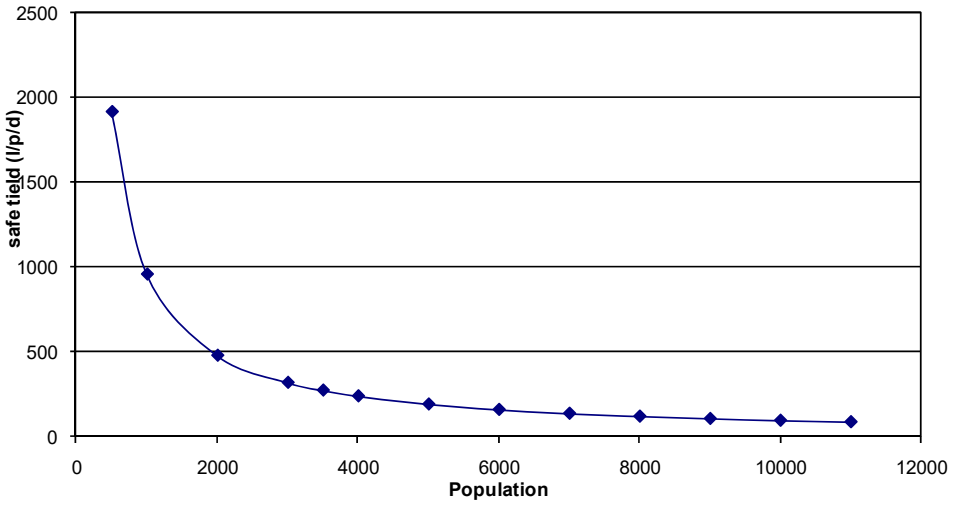


Figure 4-4: Daily safe yield estimate for Magoodhoo under worst case scenario

Based on per capita total (potable, grey and black) water demand of 95L/c/d (Falkland, 2000), for the current population of Magoodhoo, the estimated sustainable yield is 500 to 1000m^3/day, which means that the island has a surplus of groundwater for the current population. In fact, the above figure indicates that the island's groundwater lens would be able to cater for the needs of

at least 5,000 people, if the groundwater were to be drawn at sustainable rates. It should also be mentioned that with increasing population, the vegetation cover will dramatically decrease, which increases the chance of groundwater recharge due to reduced evapotranspiration.

Jayasekara and Jayasekara (1993) cited in Gomes and Prado (2007) estimated a daily transpiration between 30 and 120 L by an adult coconut with 35 leaves in the crown (150 m^2 of leaf area), depending on soil water content and evaporative demand of the atmosphere. Yusuf and Varadan (1993) cited in Gomes and Prado (2007) estimated the water consumption by tall coconut in India as 115l/day in summer and 55l/day in winter. However, this evapo-transpiration is not directly from the groundwater lens but the soil moisture content.

Groundwater quality was not tested as the groundwater was not expected to be affected by the project. Groundwater testing at host site (Medhufaru) has been included in the previous EIAs and part of the ongoing resort monitoring programme.

4.6 Ecology

4.6.1 Floral Landscape

Magoodhoo is an average-sized, overall-shaped island while Medhufaru is a long yet quite wide island with flourishing tropical vegetation.

The floral landscape of Magoodhoo is dominated by mature coconut palms. The coastal vegetation is dominated by Scaevola (magoo). Other mature trees such as sea hibiscus is commonly found in the island. Breadfruit trees and banyans have also been observed.

At Medhufaru, the most common vegetation type is bush vegetation which consists of Ginaveli, Boakashikeyo and Magoo. Iron wood (Kuredhi) dominates the coastline of Medhufaru and further inland, Magoo with few Boakashikeyo is the main constituent. Overall, the floral landscape of Medhufaru is dominated by Magoo and Ginaveli, especially the centre of the island in addition to part of the eastern coastline. Less than 15 mature coconut palms are also seen in the middle of the island. Another distinct characteristic of Medhufaru vegetation is presence of wild grass beds on the beach just outside larger shrubs and almost up to high tide line on the western side of the island. These are also seen on the southwest side of the island near the channel between mainland and the small islet. A distinct lack of larger woody trees such as dhiggaa (sea hibiscus), kaani, nika and funa which are common in Maldivian islands

was noted for Medhufaru. According to the widely discussed vegetation succession theory, colonization of land by plants happen in small successions where fast growing shrubs populate the area at first and later slow growing woody trees dominate the area. Taking this into account, it can be assumed Medhufaru is fairly young and still in the early stages of vegetation.

Due to the lack of mature vegetation, especially coconut palms in Medhufaru (Soneva Jani), it is proposed to bring in or transplant coconut palms from neighbouring Magoodhoo. Four areas of Magoodhoo that have coconut plantations have been identified and the results of the number of palms in each area is given below.

Table 4-4: Count of coconut trees in project areas using aerial photography

Wooded areas from which coconut trees will be removed	Area (m^2)	No. of palms
Area 01	26,000	195
Area 02	16,000	75
Area 03	9,000	150
Area 04	6,000	100
Total		**520**
Estimated no. of transplantable coconut palms		**450**

The table below indicates the main vegetation types found in five of the project areas where vegetation transects have been undertaken in Medhufaru.

Table 4-5: Results of vegetation transects in project areas of Soneva Jani

Dhivehi name	Common name	Scientific name	T1	T2	T3	T4	T5
Dhiggaa	Sea hibiscus	*Hibiscus tiliaceus*					
Magoo	Sea lettuce tree	*Scaevola taccada*	18	14			>35
Boakashikeyo	Wild screw pine	*Pandanus leucanthus*	11	23	>30	12	
Kuredhi	Iron wood	*Lythraceae*		3	>20	>30	
Midhili	Indian almond	Terminalia catappa			3		
Ruh	Coconut palm	*Cocos nucifera*					37

The terrestrial environment of Magoodhoo is the primary focus of this study. The terrestrial environment has the following significant components.

1. The residential area occupying about a fourth of the island is located on the northeast corner of the island
2. Farmland on the south and southwest side
3. Thickets of mature trees with mainly coconut palms
4. Shrub areas with very few mature trees on the coastal belt

4.6.2 Vegetation

The project areas have predominantly coconut palms (cocos nucifera) as the mature vegetation and grassy shrubs as the undergrowth. There are a few mature midihili (*terminalia catappa*) and dhiggaa (*hibiscus tiliaceous*). Some large banyan trees locally known as nika (*ficus benghalensis*) can be found.

4.6.3 Farming or Agriculture

Magoodhoo has a lot of green space with natural, untouched vegetation. There are a few plots of land that have been cleared for agriculture on the southern side, where mainly water melons and other such species have been grown. At some plots of agricultural land rearing of goats is undertaken. Banana, chilly, cucumber, water melon, papaya, bell pepper and pumpkin are grown on quite a wide scale with mangoes and breadfruit grown at household level. The island community has been extensively involved in agriculture with several training programmes and especially field visits to other islands.

4.6.4 Terrestrial Fauna

Terrestrial fauna in both islands are similar. Few avian species and some terrestrial animals have been observed in both islands. Some of these include Maldivian water hen (*Dhivehi kambili*), grey heron (*maakanaa*), Maldivian little heron (*raabondhi*), Asian Koel (*koveli*) and cattle egret (*iruvaihudhu*). Furthermore, various species of crabs and common garden ants were observed on the islands. Flying fox have been observed in the large trees in Magoodhoo but not so in Mudhufaru as there are no mature trees such as banyan in Medhufaru.

4.7 Socio-economic environment

Noonu Atoll is approximately 43 kilometers in length and 37 kilometers in width. The atoll consists of 68 natural islands of which 13 are inhabited. Most of the islands of the atoll are on the western, eastern rim and inside of the atoll and there are just a few on the north rim of the atoll. A population of 14,042 inhabits just thirteen of the islands. Most of the inhabited islands are on the western, eastern and centre of the atoll.

Noonu Atoll is one of the popular atolls in the country. From the total population of 14,042 people, 50.93% are males and 49.07% are females. The population is scattered throughout the islands. The most populated island is Velidhoo with 2,161 people, and the least populated

island is Magoodhoo with a registered population of only 354 people. The numbers of males in the atoll are higher than females, with men making 50.93% of the total population.

It is noted the atoll has un-employment rate of 13%. The labor force participation is estimated to be 63.8%. The atoll has 3,396 persons who are dependent or economically inactive.

The reproduction rate is declining, but the population of the atoll has increased 18% in five years. Nearly fifteen (15.38%) of the total population of the atoll lives in Velidhoo which is highest populated Island in Noonu atoll.

The main economic activity in atolls is fishing. Agriculture, construction, general trading, carpentry and employment in tourist resorts also include in the economy. Though tourism exists in the atoll, most people's livelihood provider still is fishing. Tourism participation in the economy is relatively low. There is enough economic opportunities exist in the atoll. However, due to increase in population productivity and increase in working age group in the atoll requires more livelihood opportunities in near future. Services such as health, education, housing and transport needs to be established to cater the increasing population.

A number of educational institutions exist in the atoll as a whole. The average level of education available in islands of this atoll is up to 10^{th} grade except Ken'dhikulhudhoo. This ranges from 1^{st} grade in all islands and up to 10^{th} grade in the all islands. Education up to 10^{th} grade is available at 13 islands in the atoll. A total of 3633 students are enrolled in educational institutions throughout the atolls, which amounts to 26.8% of the population. Statistics indicate that 8-10% of the population is presently studying away from home. At present, 383 students are studying in Male', and 10 people from the atoll are studying abroad. The number of students per trained teacher in the atoll is 11.

When we consider school enrolment by gender, the statistics within the institutions of this atoll show a very balanced enrolment. Female enrolment for primary and middle school remains at 49% of overall enrolment, and for secondary enrolment, this figure is 51%. But when compare this with the overall population under sixteen, female accounts 48% and males accounts 52% of the population. When we consider overall school enrolment with the total population under sixteen, it indicates that 74% of males and females are enrolled in schools in the atoll. When we consider the students from the atoll who are enrolled in institutions in Male' and abroad, the percentage of females is 49%. Therefore, we can infer from this that male attain higher levels education in this atoll than females.

The literacy rate for this atoll is 99.89%. There is not much difference in adult literacy and student enrolment between Male' and Atolls. But there are striking differences in life expectancy and incomes. Life expectancy in Male' is, on average 8 years higher than in the Atolls. And income in Male' is 75 percent higher than in the Atolls. As a result of HDI value for Male' is 8 percent higher than that of the national average where the HDI value for the Atolls is 3 percent lower than that of the national average'. (HDI Report 2000). The HDI of Male' 0.823 is in the high end of HDI category where as the average for the atolls 0.738 is in the medium range.

The atoll has a category one regional hospital located in Manadhoo. In other islands health services were provided through health centre. So of the centers provides the service of doctors or community health worker. The centers are equipped with to carry out some very basic laboratory tests to help the health worker to determine the nature of cause of the health problems. Access to a basic pharmaceutical facility is limited in most of the islands.

There are six operational resorts in Noonu Atoll with some new resorts under construction. The existing total bed capacity stands at 1,032 beds.

Table 4-6: Operational resorts in Noonu Atoll

Name of the Resort	Island	Year of initial operation	Initial bed capacity	Bed capacity 2016
Ayada Maldives	Magudhdhuva	2011	200	200
Cheval Blanc Randheli	Randheli	2013	120	120
Hilton Maldives Irufushi Resort and Spa	Medhafushi	2008	200	442
Noku Maldives Resort	Kudafunafaru	2008	100	100
Soneva Jani	Medhufaru	2016	36	36
Velaa Private Island	Fushivelavaru	2013	100	134

This atoll is considered as an agricultural atoll with some islands such as Landhoo, Manafaru, and Manadhoo who is well known for their agricultural products. Also, the Hanimaadhoo Agricultural Center being located at Hanimaadhoo gives an encouragement and boost to the agriculture industry in the region.

The island has 24-hour electricity with a powerhouse managed by FENAKA with a capacity of about 100kVA operated by 3 staff.

Figure 4-5: Survey locations

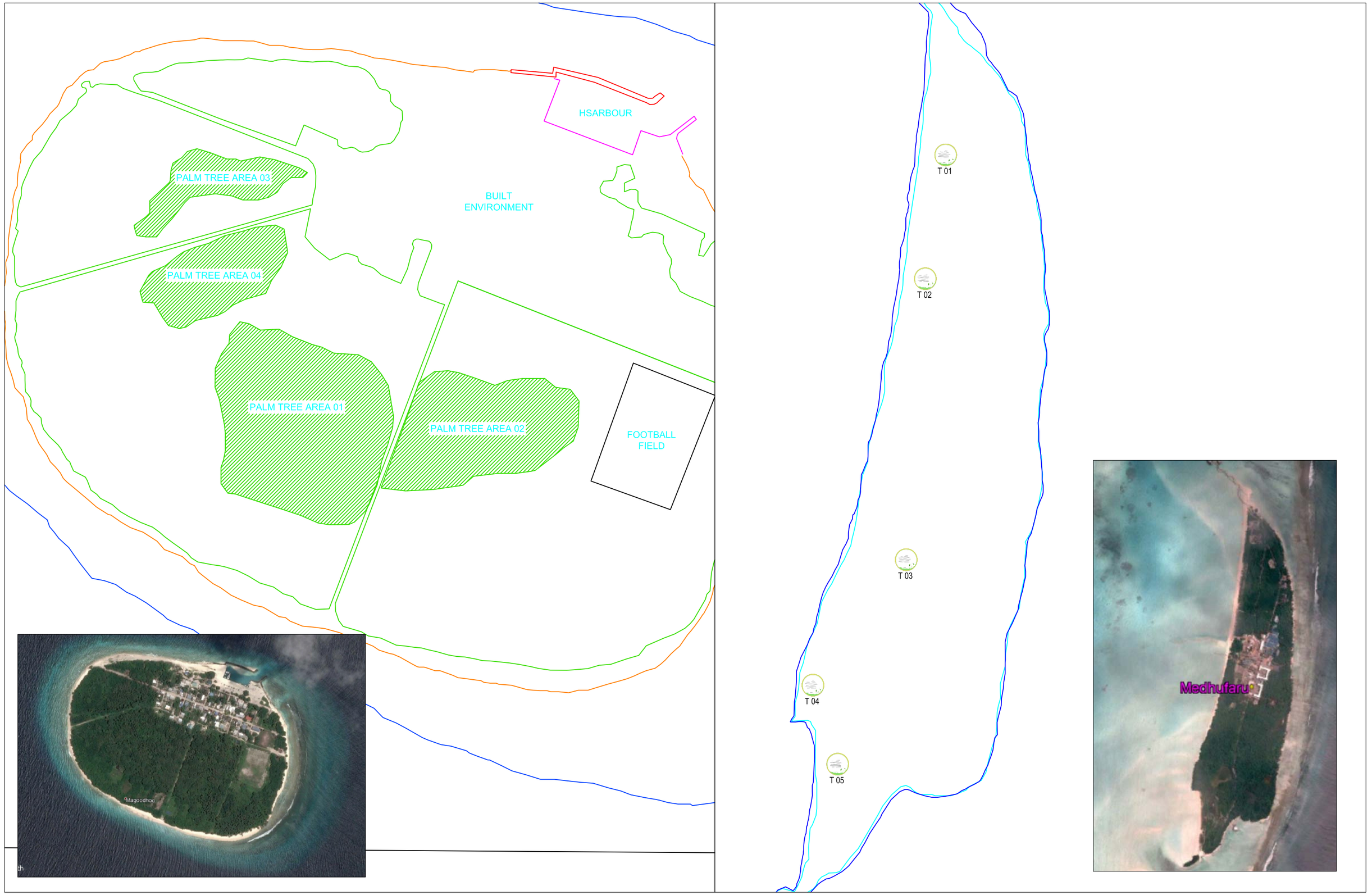
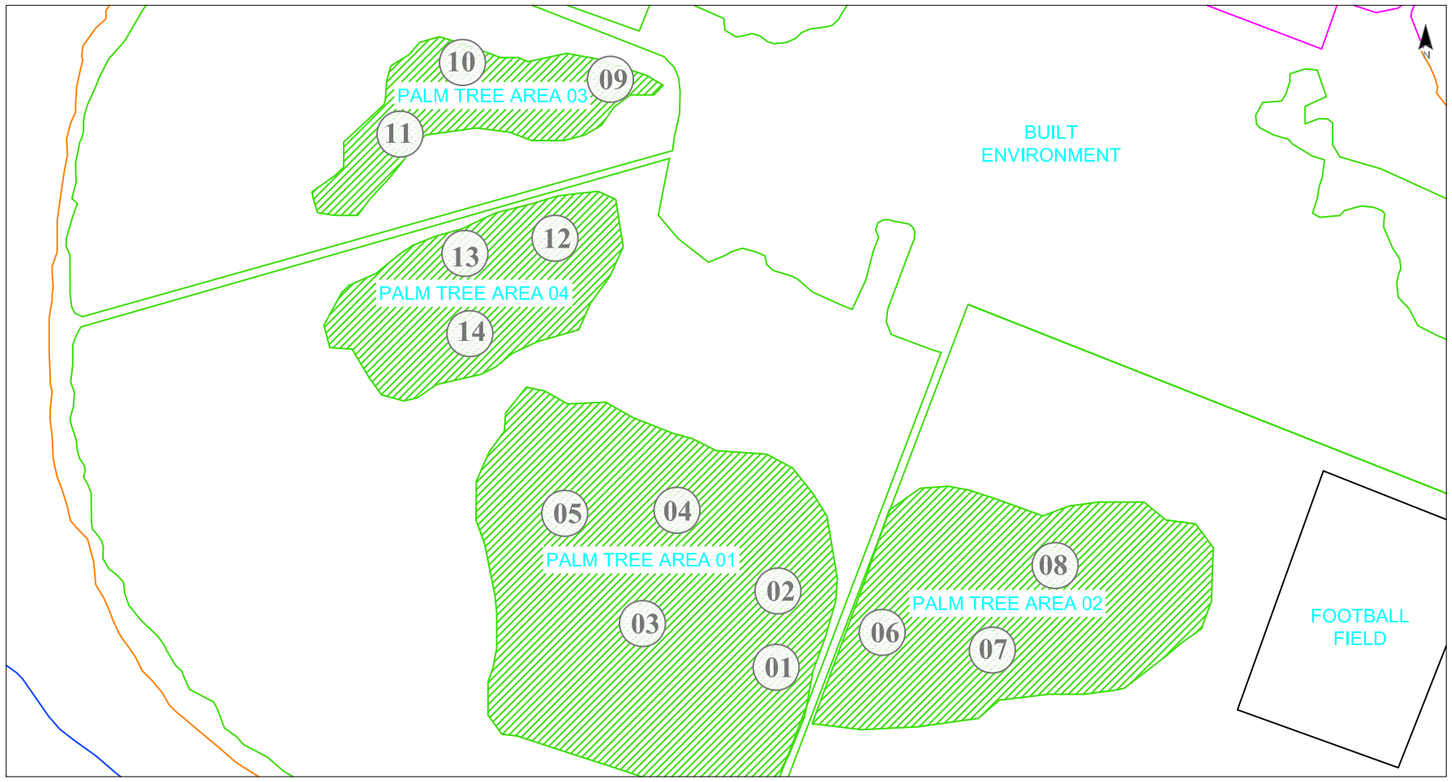


Figure 4-6: Photographic summary of site conditions
















5 Environmental Impacts and Mitigation Measures

5.1 Introduction

Development projects on the fragile environment of the Maldives may be believed to generate a series of environmental impacts, of which some can be felt immediately on the surrounding environment while others can be felt continually and can be far reaching. By far and large the most significant environmental impacts are those that are felt on the immediate environment. Also, coral reef environments are sensitive and highly susceptible to immediate changes that will be incurred from coastal developments, especially those involving dredging and reclamation or shore protection activities. Therefore, all the development activities must take into consideration the understanding of the environment and changes as well as implications that it will bring about to the environment and surrounding.

The following account describes potential environmental impacts that will be associated with the proposed upgrading or additional structures development works.

5.2 Methods and Limitations

The methods used to predict and evaluate the environmental impacts that may be associated with the proposed resort development may not be the most comprehensive methods as they are quite simple prescriptive methods. The main shortcoming of these methods is that only assumptions have been made to predict the impacts which may or may not be accurate. Also, the degrees at which these impacts are either accurate or inaccurate as well as uncertainties and natural variability are the key factors that affect the accuracy of these methods. Nonetheless, the methods used are concise and provide a general overview as well as the range of impacts that can affect the environment. Also, the EIA report has taken into consideration similar studies undertaken in the Maldives as well as expert judgment in identifying the main environmental impacts that may be associated with the proposed new structures.

5.3 Impact Identification

Impacts on the environment from various activities of the proposed development have been identified through:

- A consultative process within the EIA team and the Proponent

- Purpose-built checklist
- Existing literature and reports on similar developments in small island environments and other research data specific to the context of the Maldives
- Baseline environmental conditions described in Chapter 4.
- Consultant's experience of projects of similar nature and similar settings

A purpose-built matrix has been used to evaluate the overall impacts of the proposed project. The impacts of the project have been evaluated according to the following criteria:

- Magnitude (or severity): the amount or scale of change that will result from the impact
- Significance: importance of the impact. Reversibility is considered part of its significance
- Duration: the time over which the impact would be felt
- Extent/spatial distribution: the spatial extent over which the impact would be felt
- The scales associated with the above criteria are given in the table below.

Table 5-1: Impact evaluation scale

Criteria	Scale	Attribute
Magnitude Change caused by impact	-3	Major adverse
	-2	Moderate adverse
	-1	Minor adverse
	0	Negligible
	1	Minor positive
	2	Moderate positive
	3	Major positive
Significance/Reversibility Impact implications / Reversibility of impact's effects	0	Insignificant
	1	Limited implications / easily reversible
	2	Broad implications / reversible with costly intervention
	3	Nationwide or global implications / irreversible
Duration Duration / Frequency of Impact	0	Immediate
	1	Short term/construction period only
	2	Medium term (five years of operation)
	3	Longterm/continuous
Extent/Spatial Distribution Distribution of impact	0	None/within 1m from point of discharge/no affected party
	1	Immediate vicinity/household level/developer/consumer
	2	Specific areas within the island/atoll/specific parties
	3	Entire island/atoll/nation/all stakeholders

Based on the above scale, an impact matrix was developed for the proposed development to determine the overall impact of the proposed project. This matrix is given in Table 5-2.

An impact potential index was then developed from Table 5-2. The impact potential index table represents a product of the magnitude (M), significance (S), duration (D) and extent/spatial distribution (E) given in the above table. The sum of all key component specific indexes for

one activity (i.e. sum by rows) provides the Activity Potential Impact Index (API) and the sum of all activity specific indexes for one key component (i.e. sum by column) provides the Component Potential Vulnerability Index (CPVI) which gives an indication of the vulnerability of each key component to activity related impacts. Table 5-3 represent the impact potential indices for the proposed project.

5.4 Overall Impacts of the Proposed Project

The environmental impacts that are associated with the proposed project to transplant coconut trees from Magoodhoo to Medhufaru would be the loss of vegetation from parent site (direct, moderate negative), improved landscape and additional vegetation in host site (major positive) and increased demand for water during initial plant growth and energy for transport of trees (cumulative, minor negative) and the impact of the use of machinery during the works at the parent site including noise and movements (minor negative), continuation of carbon sequestration after replanting (positive), holes created at parent site after removal (minor negative) and sedimentation due to dredging from the harbour basin to cover holes created (minor negative).

There will be no major impacts on the groundwater lens due to the removal of trees. The impact of removal of trees and clearing vegetation at parent site would be increased heat generation from open ground surface (minor negative) while providing space and other benefits including financial benefits due to purchase of the palms to local community (positive). Other socio-economic benefits associated with the project include employment and contracting opportunities, revenue to palm owners and job opportunities from the project.

Table 5-2: Impact matrix for the proposed project

PROJECT ACTIVITIES	KEY COMPONENTS									
	Environment					Socio-Economic				
	Terrestrial flora and fauna	Soil and groundwater	Lagoon/seawater	Land/seascape	Air/Noise	Services and Infrastructure	Health and Safety	Employment	Property Value	Costs to consumer/tax payer
Construction										
Tree removal and green waste	-1 1 1 1	-1 0 1 1	0	-1 0 3 1	-1 0 1 1	1 1 1 1	-1 1 1 1	1 1 1 1	0	-1 1 1 1
Creation of holes from uprooting of trees	-1 0 1 1	-1 0 1 1	-1 0 1 1	-1 0 3 1	-1 0 1 1	2 2 3 1	-1 1 1 1	1 1 1 3	0	-1 1 1 1
Transport of palms between the islands	-1 0 1 1	-1 0 1 1	-1 0 1 1	0	0	1 1 1 1	-1 0 1 1	1 1 1 3	0	-1 1 1 1
Operation										
Transplanted palms at host site	0	-1 0 3 1	-1 0 3 1	2 1 3 1	0	1 0 3 1	1 1 3 2	1 0 1 1	1 1 3 1	0
Cleared areas at parent site	0	1 1 3 1	-1 0 3 1	0	-1 0 3 1	1 1 3 1	1 1 3 1	1 1 3 1	0	0

KEY: M S Magnitude Significance
D E Duration Extent (spatial)

Table 5-3: Impact potential indices for the proposed project

	KEY COMPONENTS										
	Environment					Socio-economic					
PROJECT ACTIVITIES	Reefs incl. live bait	Soil and groundwater	Lagoon/seawater	Land/seascape	Air/Noise	Services and Infrastructure	Health and Safety	Employment	Property Value	Costs to consumer/tax payer	TOTAL API
Construction											
Tree removal and green waste	-0.01	0	0	0	0	0.01	-0.01	0.01	0	-0.01	-0.01
Creation of holes from uprooting of trees	0	0	0	0	0	0.15	-0.01	0.04	0	-0.01	0.17
Transport of palms between the islands	0	0	0	0	0	0.01	0	0.04	0	-0.01	0.04
Operation											
Transplanted palms at host site	0	0	0	0.07	0	0	0.07	0	0.04	0	0.18
Cleared areas at parent site	0	0.04	0	0	0	0.04	0.04	0.04	0	0	0.16
TOTAL CPVI	-0.01	0.04	0	0.07	0	0.21	0.09	0.13	0.04	-0.03	0.54

API = Activity Potential Impact Index
CPVI = Component Potential Vulnerability Index

The table above indicates that the project has some negative environmental impacts during the construction phase as well as operational phase, which are minor negative but the general outcome of the project is mostly positive due, as a result of which the total potential impact index for the project is slightly positive. Therefore, the project can be allowed to proceed as proposed.

5.5 Construction Phase Environmental Impacts

The following section outlines key environmental impacts that may be associated during the construction period of the proposed new structures.

5.5.1 Carbon emissions

The project involves carbon emissions related to the use of machinery and transport. The main emission component is from the burning of diesel for the landing craft operations. These emissions can be offset by the planting of new trees in addition to the transplantation of existing trees, which will help in the sequestration of atmospheric carbon in the longterm. Lowered air temperature and wind speeds from increased tree cover result in reduced cooling needs. The transplanted trees in Medhufaru would reduce carbon emissions by helping to

conserve energy required for cooling or air-conditioning due to shade from the coconut palms. Coconut palms provide natural cooling quite effectively due to their height. They also filter wind through their fronds adding to the cooling effect better than most other trees. In addition to carbon sequestration by trees, changes in farming practices can also help in the reduction of carbon in the atmosphere. The details of sequestration and soil carbon decomposition are discussed below.

5.5.2 Transport of trees

The main adverse impact from the proposed project would be the emissions related to movement of the landing craft or dhoni between Magoodhoo and Medhufaru. It is estimated that to transport the 500 coconut trees, about 12 trips would have to be made by a landing craft. For an average sized landing craft, it is estimated that this would be equivalent to 18tonnes of CO_2 emissions. This is not so significant and represents a fraction of the CO_2 sequestration that can be obtained by the proper implementation of the project. In fact, it is estimated that this would be 40% of the CO_2 sequestration obtained in the first year.

The direct mitigation measure that can be proposed would be to minimize the number of trips by appropriate supervision and planning. The indirect mitigation measure would be the sequestration achieved from the planting of new trees as a regulatory requirement under the proposed project.

5.5.3 Machinery

Emissions from machinery would be the second most adverse impact from the project. Given that little machinery would be used over a longer period of time, the magnitude of this impact is considered to be low to moderate. The total CO_2 emissions from the operation of machinery are estimated to be a maximum of 5 to 10 tonnes per month. These emissions can be further reduced by minimizing the operational hours of the excavator by appropriate planning and supervision.

The other possible major impact from machineries would be oil leak or accidental oil spill. The other impact would be the hardening of land surface on which the excavator moves, the significance of which is low. Other than these impacts, the impact from machineries is minimal and insignificant such as noise generation and emission of exhaust gas during the operation.

One of the most important impacts of the proposed project could be nuisance to local communities from the movement of machinery and work hours. Damage to property is also an unlikely cause for concern. Since designated roads and specific locations would be cleared of vegetation, it is important for the island office to demarcate these areas and closely supervise the works.

Other measures that can be adopted to mitigate impacts due to machineries include bringing machineries on site in a clean, washed condition and are to be maintained free of oil leaks, wash/refuel and service machineries and store fuels and other materials for the machinery away from water to prevent any deleterious substance from entering water and soil, keep an emergency spill kit on site in case of fluid leaks or spills from machinery.

5.5.4 Carbon Sequestration

Carbon sequestration or the process by which trees, oceans or other natural reservoirs or carbon sinks remove carbon dioxide from the atmosphere, is the primary process that helps to maintain the natural balance and minimize the effects of global warming and climate change. Carbon sequestration is the process by which CO_2 is transformed into above- and below ground biomass and stored as carbon.

Trees play an important role and the Kyoto Protocol promotes the use of trees for offsetting carbon emissions. As one of the first countries to ratify the Kyoto Protocol and as the first country to initiate the difficult goal of achieving carbon neutrality by 2020, the Maldives would have every reason to protect and preserve its wooded areas.

Once trees die or are cut down, they begin to decompose and return stored carbon to the atmosphere. The rate of decomposition differs greatly based on the fate of the wood. Wood from coconut trees can be salvaged for use in wood products which can survive for over 100 years before gradually decomposing. This is one of the few reasons why new plantings with coconut trees under this project would have a profound positive impact and this is considered as one of the most important mitigation measures while it is also a legal requirement under the Regulation on Felling, Uprooting and Transplantation of Mature Trees.

Based on fuel use data from some high end five-star resorts operating in the Maldives, it is estimated that Soneva Jani resort would emit about 700tonnes of CO_2 annually, which would require around 7800 trees (preferably a good mix of local species). Therefore, the proposed 500

coconut trees would sequester about 50tonnes of CO_2 annually, which represents about 10% of the total CO_2 emissions estimated for the resort. However, there will be some emissions related to transplanting (mainly transport) and regular maintenance, which involve energy from burning fuel. It is estimated that this would amount to about 40% of annual CO_2 reductions obtained through sequestration in the first year with a dramatic decrease in the subsequent years to less than 2% of annual CO2 reductions achieved through sequestration when maintenance would be an absolute minimal. In fact, for coconut palms there will be hardly any maintenance apart from removal of coconuts on a regular basis. Considering that the transplanted trees do not necessarily provide additional carbon sequestration, it is important to consider the annual carbon sequestration from the new trees that will be planted on site in Magoodhoo. It is estimated that about 1000 new trees would be planted in Magoodhoo. These are expected to offset at least 50tonnes of carbon dioxide annually.

5.5.5 Holes from uprooting

Holes that are left after the uprooting process, as Mohamed Zahir (Meemu Zaviyani) had pointed out during a previous project, is a major issue related to transplantation projects. This has to be appropriately dealt with. It is estimated that about 500 to 700 coconut trees would be uprooted. This would result in several dug holes or pits. There are several impacts related to the holes if they are left untreated. These include mosquito breeding in these holes following rain and public safety as people may fall into these holes after rain and even under low light conditions. Vehicular movements and safety would also be affected. For this reason the Regulation on the Felling and Transplantation of Mature Trees require that such holes be backfilled and compacted.

Since the Regulation on Tree Transplantation requires that the holes shall be backfilled with sand, it is proposed to dredge approximately 4,000m^3 of sand from the harbour basin. The harbour of Magoodhoo is in need of maintenance dredging on the far north side close to the breakwater as it has been filled over the years. The impacts of this are considered to be minor adverse and cumulative. These impacts are briefly discussed here.

The main environmental impacts of the proposed excavation from the harbour area would be sedimentation. This is a short-term impact which only affects the lagoon environment as there is no reef in the vicinity. The direct effects of dredging would be removal or burial of benthic habitats and turbidity or sedimentation. This is considered to be a small scale excavation given

the size of the harbour and the island lagoon or reef extent on this side of the island. Since the excavated matter contains high salt levels, it should not be immediately used to fill the holes created from tree uprooting. Instead, it is important to do the excavation at the onset of the project and to keep them on the side of the harbour. This will help to drain excess salt before use for filling holes created by the uprooting process.

5.5.6 Transplantation of trees

The removal of trees from their habitat and replanting in the new site would have some degree of impacts. The most significant impacts would be deforestation at the affected site of a small currently vegetated area, which would be a significant negative impact while reforestation at the new site would be a significant positive impact. These two impacts offset each other given that there would be zero mortality of the trees in their new environment. This is ensured by taking the measures discussed below.

5.5.7 Uprooting

Successful re-establishment of transplanted palms depends on rapid regeneration of roots, avoiding injury and dessication of the trees during transport and handling and maintaining sufficient soil moisture around root balls after transplanting. Broschat (1994), Reuveni et al (1972) and Hodel et al (2003) cited in Pittenger et al (2005) found that for most palms would survive if the rootballs and backfill are kept moist, and that little or nothing is gained from practices such as leaf removal (or leaf cutting) and leaf tie-up to protect the crown. Pittenger et al (2005) also concluded that a rootball of 12-inch radius is adequate for the survival of any palm. Therefore, as has been discussed earlier, the trees should be dug from around two or three feet from the trunk. It is also important to make sure that prior to digging, the soil around the root system is thoroughly wetted to help keep the root ball together (pinknursery.com; Meerow and Broschat 1997). The rootball shall be kept wet at all times during transport and replanting at the new site.

5.5.8 Replanting at new site

Once delivered to site in the landing craft, the coconut palms shall be gently taken off the landing craft, taken to site in lorries (preferably crane lorries) and placed in dedicated holes which will be backfilled and watered. It is important to ensure that the holes are ready by the time the trees are transported to site. When planting, it is necessary to carefully set root ball

into hole and back fill with original soil and not add any organic matter to backfill, so the new transplant can adapt more quickly to its surrounding native soil. It is also important to keep the transplanted tree wet by spraying water on it including the tree trunk during the first few days of transplantation. Thereafter, it would be necessary to ensure that the transplanted palm is watered regularly and protected from shakes or other impacts (by wooden bracing, for instance) for about four months or until the roots begin to spread out again.

5.5.9 Compensation at deforested site

Since the island community wishes to clear and make a few roads, some mature trees that would not be taken to the transplant site may be cut down. It may, therefore, be important to replant senile palms at appropriate location in Magoodhoo. This may not be as practical as planting juvenile palms or new coconuts in a designated nursery. Therefore, it is recommended to plant new trees in a designated nursery or at different potential locations in Magoodhoo to meet the regulatory requirement. This process could start soon after mobilisation to site by buying coconuts and raising them in a small nursery. This process can be undertaken by empowering the community and providing them with the necessary funds to manage the nursery. This is more than a recommended mitigation measure and shall be undertaken. The Regulation on the Felling, Uprooting and Transplantation of Mature Trees require that for every tree felled, two new trees have to be planted. Therefore, it would be necessary to plant more than 1,000 additional trees in Magoodhoo.

As suggested earlier, there could be other compensation measures such as helping to create living hedges and fences around house and farm plots with nitrogen-fixing trees. However, the most practicable measure would be the planting of two new trees (coconut trees in this case) for each tree uprooted as per the Regulation on the Felling, Uprooting and Transplantation of Mature Trees.

5.5.10 Export of pests

There are two types of pests affecting or thriving on coconut palms in the Maldives: rhino beetle (ruku madi) and coconut hispid beetle. Rhino beetle is quite common in the Maldives, however, the coconut hispid beetle (brontispa longissima) was recently introduced and controlled with assistance from FAO. According to Shafia (2006), brontispa longissima came with some ornamental palms (the importation of which is prohibited by law) imported to Sun Island Resort and Spa in South Ari Atoll and was controlled before it reached northern Ari

Atoll. Release of parasitoid wasps namely *Asecodes hispinarum* (a biological control agent) on the recommendation of the FAO consultant, who had the experience of the use of this wasp in controlling hispid beetle outbreak in Western Samoa in the 1980s, was highly effective. Before identification of the biological control agent a chemical DIAZINON 10 percent granules, trade name DIAPHOS was used. Such control was not effective in controlling the spread to nearby islands and chemical control also involved continuous and heavy application causing great financial losses. According to Shafia (2006), information provided by Sun Island resort management indicated direct economic losses between June 2000 and February 2003 at US$237,350.

Coconut hispid beetle was considered one of the most serious pests introduced to the Maldives but it has been reported to have been controlled and there had not been any reported infestation in any islands north of Malé. Therefore, introduction of pests that infest coconut palms due to the proposed project is unlikely.

5.5.11 Protection of important species and places

There are no important species or habitats that require protection due to possible impacts from the project.

5.6 Socio-economic Impacts

The socio-economic impacts of the project are predominantly beneficial. The most important impact of the project would be the creation of the long road running along the length of the island towards the middle of the island and that of the road on the west of the football ground as well as some other roads in the area that has been demarcated for new housing plots behind the Atoll School. Most of the coconut trees in these areas belong to individual people who would benefit from selling the trees. It would be necessary for the Island Council and the Proponent to further discuss about the senile coconut trees that would be cleared from the area. While it is recommended to transplant these, it may be necessary for the Island Council, the Proponent and the owners to discuss how these trees can be dealt with, especially in terms of compensation.

Socio-economic impacts as well as some of the environmental impacts can be mitigated by following important steps, as below.

- Setout the areas to be cleared in consultation with the Island Council, environmental consultant and the Proponent as well as any other relevant Government or community group.
- Ensure that only coconut palms that require removal is removed and all other trees are left intact unless absolutely necessary to make way.
- Identify the harbour area to be excavated for backfill material
- Determine the palm tree owners whose trees will be uprooted or felled and discuss with them their demands and grievances, if any.
- Mobilize to site only after signing appropriate plans and documents and after ensuring that the opinions and views of all concerned are taken into consideration.
- Assign an official from the Island Council to supervise the works.

5.7 Commitment and costs of mitigation

The Proponent is committed to undertake all mitigation measures stated in this EIA report and carryout the works according to the Regulation on the Felling, Uprooting and Transplantation of Mature Trees. The Proponent has provided a letter of their commitment, which is given in Appendix 4 of this report. Most of the mitigation measures stated have been incorporated into the cost of the project. The cost of the additional planting of trees as per regulatory requirements and management of the nursery would be decided in consultation with the Island Council. This is estimated to cost around USD10,800.00 in the first year and USD9,500.00 in the following year.

5.8 Limitations of Impact Prediction

The methods used to predict and evaluate the environmental impacts that may be associated with the proposed additional components may not be the most comprehensive methods as they are quite simple prescriptive methods. The main shortcoming of these methods is that only assumptions have been made to predict the impacts which may or may not be accurate. Also, the degrees at which these impacts are either accurate or inaccurate as well as uncertainties and natural variability are the key factors that affect the accuracy of these methods. Nonetheless, the methods used are concise and provide a general overview as well as the range of impacts that can affect the environment. Also, the method is considered among one of the best methods used in impact assessments in the Maldives so far.

Environmental impact assessment 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. The level of uncertainty, in the case of the proposed development, may be expected to be low due to the experience of similar projects in similar settings in the Maldives. Furthermore, the several resort development projects that are undertaken in the islands have greater negative environmental impacts, yet the socio-economic benefits are seen to be overwhelming resulting in low impact potential. Nevertheless, it is important to consider that there will be uncertainties and to undertake voluntary environmental monitoring as indicated in this report and mitigated impacts as and when they arise.

It is important to note that if any activity not covered in this EIA report is found to have an impact on the environment during the project development or post development stage, the Proponent shall obtain clearance from Ministry of Tourism before any remedial work is carried out to mitigate the impact.

5.9 Likely accidents and hazard scenarios

Accidents and hazards in the workplace will arise mainly during the construction phase. Workers would be susceptible to injuries due to workplace hazards arising from improper management of work place and unavailability of safety gear. For the proposed project, the likely incidents/accidents and hazard scenarios include possible use of inappropriate or poor handling of tools and chemicals and injuries due to fallen objects in the work areas or untidy work areas. These can be during the construction phase mainly. During the operational phase, poor handling of pool chemicals would be the only hazard scenario that may have to be taken into consideration other than the safe use and appropriate water quality of the pool.

Table 5-4: Summary of negative impacts

Activity	Negative Impacts	Geographic Extent	Type of impact	Duration	Reversibility	Significance
Removal of trees	• Loss of wooded area	7% of the island area or 11% of the currently wooded area	Direct	Medium to long term	Reversible	Moderate
	• Loss of habitat for some fauna in the area	<5% of wooded area with no significant habitats	Direct	Short to Medium term	Irreversible	Minor
Excavation for borrow material	• Sedimentation • Poor water quality	Small area of existing harbour	Direct	Short term	Reversible	Minor
	• Altered bathymetry		Direct	Long term	Reversible	Minor
	• Smothering of bottom biota		Indirect	Short term	Irreversible	Minor
Site mobilization	• Impacts of workforce	Specific areas of island	Direct	Short term	Reversible	Minor
	• Impacts of machinery (noise, etc)	Worksites and harbour	Direct	Short term	Reversible	Moderate
Fuel use and handling (mainly landing craft, excavator and crane lorry)	• Global warming and climate change	Global	Indirect	Long term	Irreversible	Moderate
	• Spillage into environment	Magoodhoo harbour and Medhufaru lagoon	Direct	Long term	Irreversible	Minor

Table 5-5: Summary of positive impacts

Activity	Positive Impacts	Beneficiaries/Geographic Extent	Type of impact
Removal of trees	• Clearing of roads at no cost to the community/public	Local community	Cumulative
	• New house plots get to be cleared to some extent	Local community	Cumulative
Transplant at new site	• Resort landscaping needs fulfilled • Shade and reduced cooling needs, therefore minimized carbon emissions	Resort/global tourist community	Direct
Civil works	• Some employment during project related works and additional opportunities following it (nursery, etc.)	Local community and others	Direct
	• Indirect employment due to economic expansion	Locals and others	Indirect
New planting	• Contribution to carbon sequestration	Global	Direct
	• Contribution to national goal of carbon neutrality by 2020	National/Worldwide	Direct
	• Increased economic opportunities	Island community	Direct and Indirect

Table 5-6: Mitigation measures for negative impacts and impact significance after mitigation measures

Activity	Negative Impacts	Mitigation Measures	Impact Significance before mitigation	Impact Significance after mitigation
Removal of trees	• Loss of wooded area	• Clear areas according to landuse plan/community needs • At least 90% of mature trees removed are transplanted • Legally required compensation of two new trees for every mature tree transplanted or felled	Major	Minor
	• Loss of habitat for some fauna in the area • Large mature trees may be affected • Tharaagandu may be affected	• Protect and preserve important habitats, large mature trees and cultural heritage	Moderate	Minor
Excavation for borrow material	• Sedimentation • Poor water quality • Altered bathymetry • Smothering of bottom biota	• Dredge from existing harbour area for maintenance dredging due to shoaling of a large area of harbour	Minor	Negligible
Site mobilization	• Impacts of workforce	• Workforce is supervised adequately • Workers are given appropriate information on environmental protection prior to start of works on site	Minor	Negligible
	• Impacts of machinery (noise, etc)	• Machinery kept in clean and good condition • Movement of vehicles are minimized to the greatest possible extent by proper planning and management	Moderate	Minor
Fuel use and handling (mainly landing craft, excavator and crane lorry)	• Global warming and climate change	• Minimize landing craft movement and that of other vehicles used in the project • Use large sized landing crafts	Moderate	Minor
	• Spillage into environment	• Keep machines clean and take care in fuelling operations	Moderate	Minor

6 Environmental Monitoring

6.1 Introduction

Environmental monitoring is essential to ensure that potential impacts are minimized and to mitigate unanticipated impacts. The parameters that are most relevant for monitoring the impacts that may arise from the proposed project are included in the monitoring plan. Monitoring would ensure that the proposed activities are undertaken with caution and appropriative care so as to protect and preserve the built environment of the areas in proximity to the site or those areas and environmental aspects affected by the development.

The purpose of the monitoring is to provide information that will aid impact management, and secondarily to achieve a better understanding of cause-effect relationship and to improve impact prediction and mitigation methods. This will help to minimize environmental impacts of projects in future.

6.2 Recommended Monitoring Programme

Outlined here are minimum project specific monitoring requirements that can be considered. This monitoring programme for the proposed project includes daily logs, site photos by the site supervisor and weekly monitoring during construction and three to six monthly monitoring after the completion of the project up to three years from the completion of the project activities.

Stage 1: During coconut palm transplantation

Stage 2: Post transplant phase

The monitoring needs of each stage are discussed in detail below:

Stage 1 (during transplantation process)

- Daily fuel use data or number of hours of operation of the different vehicles (Proponent/Contractor)
- Document public grievances (Island Council)
- Daily log of number of palms and other trees removed, felled and transplanted (Proponent/Contractor and Island Council)

- Document constraints at site (Proponent/Contractor)
- No. of plants transplanted to the new site (Proponent/Contractor)
- No. of new coconut trees grown with location (Proponent/Contractor and Island Office)
- No. of holes backfilled and levelled at the end of the works prior to demobilisation (Island Council).

Stage 3 (post transplantation)

- No. of trees that survived in the new environment after three or six months of transplantation (Env Consultant/Proponent)
- Public concerns/grievance after three months (Env Consultant/Island Council)
- Growth of the new trees in the nursery and/or elsewhere in Magoodhoo after six months (Env Consultant/Island Council)

6.3 Monitoring Cost and Commitment

The monitoring programme given involves very little cost. The total estimated cost of the monitoring programme during the project and up to or after six months of project completion is about USD2000. The Proponent commits to the proposed monitoring programme and its costs.

6.4 Monitoring Report

A detailed environmental monitoring report is required to be compiled and submitted to the Environmental Protection Agency and the Ministry of Tourism at the end of the construction phase as well as the operational phase. This will help to demonstrate compliance of the Proponent during construction. There are no specific monitoring requirements for the operational phase, therefore, no reporting requirements too.

The monitoring report shall be submitted in accordance with the requirements of the EIA Regulations. As per Jadhuvalu Laamu of the regulations, summary reports need to be submitted every two months during construction phase and detailed report or reports after project completion as per the schedule identified in the EIA report. In this regard for this project, it is recommended to continue to monitor as per schedule and submit only one detailed monitoring report at the end of the construction phase and one year after the transplantation.

7 Conclusions

The proposed project involves the transplantation of about 500 to 700 coconut palms from Magoodhoo to Medhufaru in Noonu Atoll. The project has several socio-economic benefits. The primary benefits from the project is the direct and indirect employment opportunities from the project, the revenue generated due to the project to the small community and the clearance of land while preserving the trees removed by enhancing the landscape integrity of the host site.

The economic benefits to the coconut tree owners from the sale of the coconut palms could also be considered as a direct positive impact although when compared with the long term revenue that the tree would generate, the long term benefits of keeping the tree may outweigh the short term benefits of selling the tree. Since the trees that would be transplanted have a zero mortality rate, the carbon sequestration from the trees would not be affected. Therefore, carbon sequestration is not affected. In addition, the Proponent would also plant 1000 or more coconut trees in a nursery in Magoodhoo or Medhufaru. Since this is a regulatory requirement, the Proponent is bound to do this. These trees would provide further carbon sequestration benefitting the environment in a special way by absorbing atmospheric carbon and contributing to the national goal of carbon neutrality.

The main negative impacts of the project would be the atmospheric emissions from the use of machinery for the transport and transplanting process. Also, the holes that would be left after the digging would remain a public nuisance and health problem if they are not backfilled and levelled. Therefore, as an important mitigation measure, the holes would be filled with sand dredged from the existing harbour. This is not expected to have adverse impacts and the backfilling will further enhance the quality of the roads. The sedimentation during the dredging of the harbour and stockpiling on the side of the harbour is not expected to cause damage to the housereef of the island as the area is mainly contained within the harbour basin protected by the breakwater.

Provisions are also made for supervision and monitoring of environmental effects due to the project. These will help in understanding the overall benefits and impacts of the project over the long term. The monitoring is proposed to be undertaken for a period of about one year in which the new plants would be matured to survive on their own and the transplanted trees would be thriving in their new environment.

In conclusion, the socio-economic as well as environmental benefits of the project are greater than the negative impacts of deforestation and impacts on fauna from deforestation. In fact, the impact on fauna in the affected areas would be negligible. Yet, there may be uncertainties and it is recommended to watch out for environmental impacts at all times during the implementation of the project.

8 Acknowledgements

The author wishes to acknowledge the work of several people who have contributed to this report. The author is thankful for the contributions to the report made by Ahmed Zahid, who is one of the senior-most EIA consultants in the Maldives. Thanks are also due to those who participated in the different meetings.

The survey team comprising of Mohamed Shifaf and Nisanthan has been very helpful in assessing the site conditions and providing relevant maps and data following the field visit.

The Consultant wishes to acknowledge the contributions from the relevant staff of Soneva Jani, especially Ibrahim Asif, who had checked the report and his efforts throughout the process are much appreciated.

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10 Appendices

Appendix 1: Approved Terms of Reference

Appendix 2: Commitment letter from Proponent

Appendix 3: LUP of Magoodhoo with initial palm area identification

Appendix 4: Council letter

Appendix 5: Proponent letter informing availability of funds

بسم الله الرحمن الرحيم

Environmental Protection Agency

No: 203-EIARES/PRIV/2018/482

Terms of Reference for Environmental Impact Assessment for the Proposed Transplanting Coconut Trees from N. Magoodhoo to N. Medhufaru (Soneva Jani Resort).

The following is the Terms of Reference (ToR) following the scoping meeting held on ***16/07/2018*** for undertaking the **EIA of the Proposed Transplanting Coconut Trees from N. Magoodhoo to N. Medhufaru (Soneva Jani Resort).** The proponent of the project is **Hillside Pvt Ltd.**

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 of matters deemed to be significant but not incorporated in them, or matters currently unforeseen, that emerge as important or significant from environmental studies, or otherwise, during the course of preparation of the EIA report.

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

2. **Study area** – Submit a minimum A3-size scaled plan indicating the proposed project components. Specify the agreed boundaries of the study area for the environmental impact assessment highlighting the proposed development location and size. The study area should include adjacent or remote areas, such as relevant developments and nearby environmentally sensitive sites, if any.

3. **Scope of work**

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 project activities will be considered.

- Areas from where coconut trees would be transplanted;
- Description of activities at the parent site from where trees are uprooted;
- Work method and machineries for uprooting and transportation of trees;
- Description of activities at the transplanted site;
- Environmental monitoring during construction activities;
- Measures to protect environmental values during construction and operation phase;

- Project management (include scheduling and duration of the project; target dates, construction/operation/closure of labour camps, access to site, safety, equipment and material storage)

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.

Specific emphasis should be placed on the following activities of the project or related to the project:

- Movement of excavators, crane lorries or other vehicles in Magoodhoo project site(s)
- Uprooting of coconut palms including cutting off extended roots
- Backfilling of holes created from the uprooting
- Loading onto barge at Magoodhoo and transport to Medhufaru
- Workforce management

As such the following field investigations must be considered for baseline data collection:

- Representative assessment of vegetation clusters in project site(s)
- Assess the prevalence of coconut hispid beetle or other pests in Magoodhoo
- Potential disruptions to local communities and any people that may be dismayed
- Outline of the built environment and proposed housing and agricultural plots in the island
- Socio-economic conditions of the island community, especially with reference to income and other social benefits from coconut palms
- Housing and land use patterns including potential/planned land use of the project area(s)

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. Include permits and approvals in the EIA document.

Task 4. Potential impacts of proposed project – The EIA report should identify all the impacts, direct and indirect, during and after construction, and evaluate the magnitude and significance of each. Provide an assessment of the impacts including the impacts of transplantation, backfilling, pest control, movement of vehicles within or close to inhabited areas, demolition waste (if any), transportation and carbon emissions from vehicles, etc. needs to be considered. The socio-economic impacts of the project including any benefits to the local community, benefits to the project proponent and end users, as well as any costs to local community, proponent and end users including the costs of potential pest control

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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 outline all positive and negative/short and long-term impacts. Identify impacts that are cumulative and unavoidable.

Task 5. Mitigation and management of negative impacts – Identify possible measures to prevent or reduce significant negative impacts to acceptable levels with particular attention paid to minimising the number of trips to transport the trees, pest control and work methods such as the use of appropriate equipment, machinery and tools. Measures for both construction and operation phase shall be identified. 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.

Task 6. Development of monitoring plan – Identify the critical issues requiring monitoring to ensure compliance to mitigation measures and present a monitoring plan, if relevant or necessary. Environmental monitoring shall focus on the transplantation process as well as the performance of the transplanted coconut palms in their new environment. The number of coconut trees removed, the areas from which trees were removed, number and type of machinery used, number of trips made by the barge and any grievances of the public shall be documented during the project implementation. Once transplanted, monitoring shall assess the health of the transplanted trees, their survival rate and the pest control and watering needs of the trees shall be assessed for a period of one year from the day the trees were transplanted. Detail of the monitoring programme including the physical and biological parameters for monitoring, cost commitment from responsible person to conduct monitoring in the form of a commitment letter, reporting schedule, costs and methods of undertaking the monitoring programme must be provided.

Task 7. Stakeholder Consultation – Stakeholder consultations may be limited to consultations with representatives from the Island Council and parties selling the coconut palms or consents from Island Council. Additional information or approvals sought from line agencies shall be documented or discussed.

Presentation- The EIA report shall be concise and focus on significant environmental issues. It shall 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 and relevant amendments.

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.

17th July 2018

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Tel: (960) 301 7201 Fax No: (960) 332 4660

Our ref No: HILL/LET/095/2018,
26 August 2018,

Director General,
Environmental Protection Agency,
Male'
Maldives

Dear Sir

This is in reference to the Environmental Impact Assessment (EIA) report for the Proposed Project to Transplant Coconut Palms from Magoodhoo to Medhufaru, Noonu Atoll.

As the Proponent of the project, we assure you our commitment to undertake the proposed mitigation measures and monitoring programme given in the EIA Report.

Sincerely,

Thank you.

Yours faithfully,
For **Hillside Villa Pvt Ltd**

HILLSIDE VILLA PRIVATE LIMITED
REP. OF MALDIVES
C-0391/2011

Asif Ibrahim
Manager, Male' Office
Authorized Signatory.

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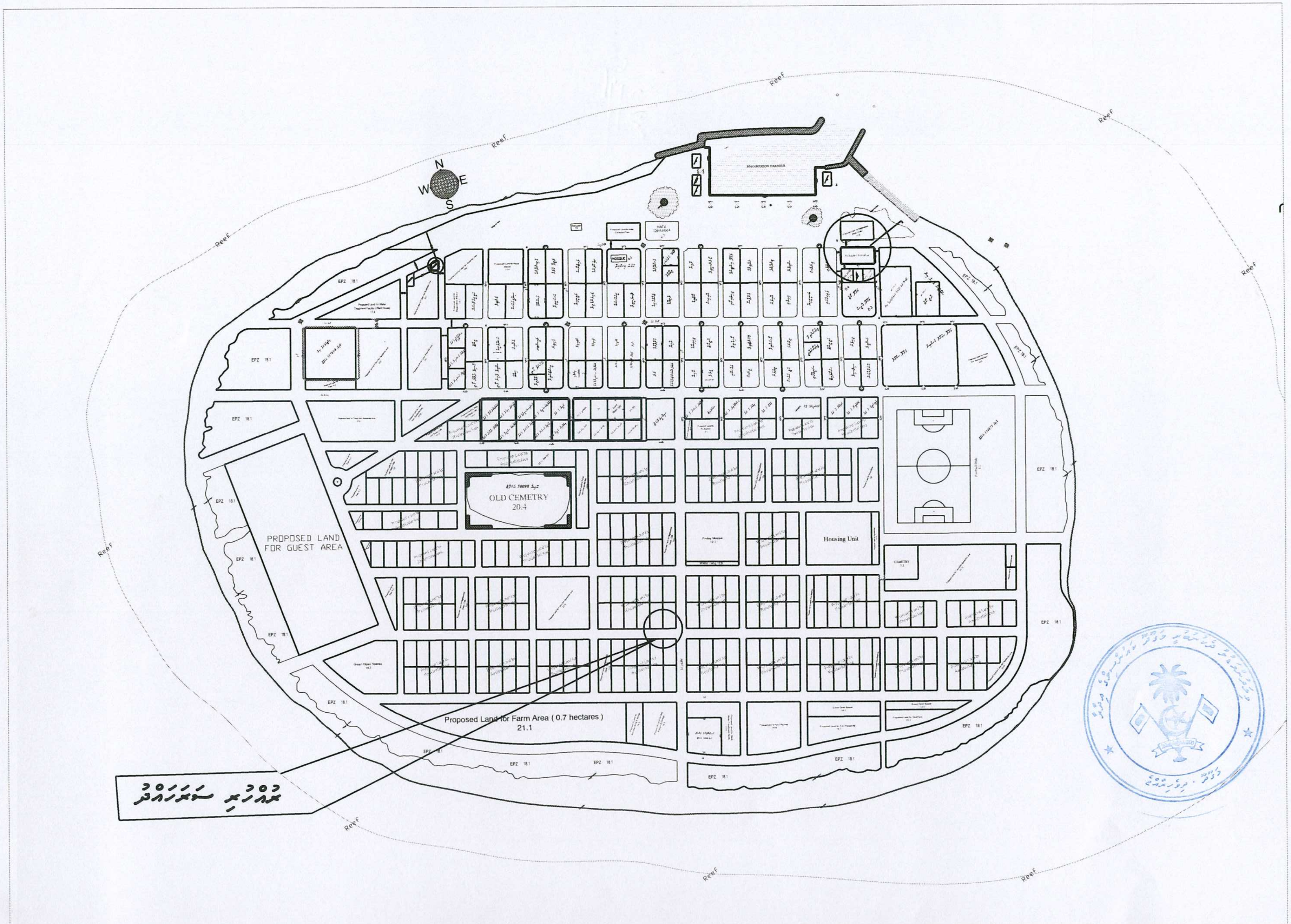

بسم الله الرحمن الرحيم

Secretariat of the Magoodhoo Council
South Miladhunmadulu Republic of Maldives

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HILLSIDE VILLA PRIVATE LIMITED
REP OF MALDIVES
C-0391/2011

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Reply Forward Delete

EIA for Transplantation of Coconut Palms from N.Magoodho to N.Medhufaru (soneva Jani)

Date: Today, 03:01:26 AM CDT
From: hassan@sandcays.com
To: admin@noon.gov.mv

Attachments: EIA for tree transplantation from Magoodhoo to Medhufaru_rev03-signed.pdf (6.0 MB)

Text (2 KB)

Dear Sir
Please find the attached EIA for Transplantation of Coconut Palms from N.Magoodho to N.Medhufaru (soneva Jani) for Your perusal.

Kind regards

Hasan

EIA for tree transplantation from Magoodhoo to Medhufaru_rev03-signed.pdf (6.0 MB)