ECO-TECH
CONSULTANCY

April 2023

Environmental Impact Assessment for the Proposed Refurbishment of Water Villas Project at Angaga Island Resort and Spa, South Ari Atoll

Proponent;

Angiri Resorts Management & Operation Pvt Ltd

Consultants;

Mahfooz Abdul Wahhab (Lead Consultant)

Ibrahim Rashihu Adam

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We hereby declare that the statements made in this EIA report are true, complete and correct to the best of our knowledge and available information at the time of writing the report.

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Date: 18th April 2023

Sign:

Name: Ibrahim Rashihu Adam (Co-Consultant)

Date: 18th April 2023

Sign:

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ހުރިހާ ކަމެއްވެސް ރަނގަޅަށް މޮނިޓަރ ކުރުން ވަރަށް މުހިއްމުވެއެވެ. އެއީ ވެއްޓަށް ލިބޭނެ ގެއްލުން ކުޑަކުރުމަށްޓަކައި ބަޔާންކޮށްފައިވާ ފިޔަވަޅުތަކުން ނަތީޖާ ހާސިލުކުރެވޭތޯ މިންވަރު ދެނެގަނެވޭނީ އޭރުންނެވެ. އަދި ރަގަޅުކުރަން ޖެހޭ ކަންކަންވެސް އެގޭނީ މޮނިޓަރ ކުރުމުންނެވެ. އެގޮތުން ފެންގެ ކުއަލިޓީ މޮނިޓަރ ކުރުމާއި ފަރުގެ ދިރުމާއި މަޝްރޫޢުގެ މަސައްކަތް ކުރިއަށް ގެންދާ ސަރަހައްދު މަސްވަރާއްސަރު އަސްސަ ބަދަލުތަކާއި އަދި މީގެ އިތުރުންވެސް މަޝްރޫޢުގެ އަމަލީ މަސައްކަތުގެ ކުރާ މަރުހަލާގައި ހިންގާ ބަލަހައްޓާ މަރުހަލާގައި ކުނި އުކާ މިންވަރާއި ކުނި މެނޭޖުކުރާ ގޮތާއި މޮނިޓަރިން ޝާމިލު ވާ އެއްގޮތަށް މޮނިޓަރ ކުރުމަކީ ވަރަށް މުހިއްމުކަމުގައި ފާހަގަ ކުރެވެއެވެ.

މި ރިޕޯޓުގައި ބަޔާންކޮށްފައިވާ ގެއްލުން ކުޑަކުރުމަށް އަޅަންޖެހޭ ފިޔަވަޅުތަކާއި އެއްގޮތަށް މަޝްރޫޢުގެ މަސައްކަތް ކުރިއަށް ގެންދެވިނަމަ، މަޝްރޫޢުގެ ސަރަހައްދުން ލިބިދާނެ ގެއްލުމުން ވުރެ ލިބޭނެ ފަރާއި ބޮޑު ކަމަށް ފެންނަނީ، މަޝްރޫޢުގެ މަސައްކަތް ކުރިއަށް ގެންދިއުން އެންމެ ރަނގަޅުކަމުގައިފެނެއެވެ.

VII. EXECUTIVE SUMMARY

The purpose of this EIA is to critically analyse and assess the potential environmental impacts associated with the proposed refurbishment of existing water villas, construction of additional water villa, construction of service hut and associate works and propose the solutions and preferred alternatives as well as mitigation measures to minimize any negative impacts whilst trying to derive the maximum positive impacts from the project.

Angaga Resort is looking to improve their services by upgrading its existing facilities by refurbishment and expansion of current infrastructure. The current water villas are damaged and are overdue for replacement as continuing to using them as per the current situation might be prone to an incident of infrastructure failure. Furthermore, the upgrade is required in order to diversify the current facilities looking forward to meet the growing demand for exotic tourism ventures.

The major impacts of the proposed project during the construction phase are the impacts to the marine environment, majorly resulting from the construction works in the over water villas resulting from turbidity and sedimentation. Other impacts include impacts to air quality (increase of GHG emissions) and impacts to landscape integrity and scenery during the period of construction. The major negative impacts during operational phase are air pollution, impacts on the marine environment and risk of hazard from storm surges and fire induced hazards. The positive impacts during the operational phase are the socio-economic impact from service diversification and the increased health and safety of the staff and guests due to refurbishment works.

Major mitigation measures include, undertaking proper sedimentation controls and restricting the movement of barges and excavators to a narrow area. Care should also be given to ensure that the workforce will abide by the health and other regulatory measures to minimize the risk of the Covid-19 episode within the workforce.

Main alternatives that were studied were the no-project option, alternative mobilisation route and integrating green building concepts to the proposed project. On further observation, it

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was noted that it would be more beneficial to incorporate the aforementioned alternatives than the proposed project.

In terms of environmental monitoring, it is recommended to monitor the water quality, benthic substrate, fish census and waste generation during the construction phase of the project. Furthermore, continuation of monitoring the marine environment is recommended in the operational phase with monitoring the waste generation, water quality, benthic substrate, fish census and occurrence of accidents.

The socioeconomic benefits during the operations far outweigh the negative impacts of the construction phase of the proposed project. Hence, with the mitigation measures outlined in the report, it is recommended to proceed with the project as planned.

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1. INTRODUCTION

1.1 Structure of the EIA

This Environmental Impact Assessment (EIA) addresses the potential impacts of the proposed development on the physical, biological, environmental and socio-economic aspects of the development area in addition to providing safeguards to reduce any environmental effects.

In addition to forming a basis for the assessment and approval of the proposed project, this EIA provides the community and government authorities with information on all aspects of the proposal. The EIA has been divided into following sections;

- **Section I - III**: CONTENTS- Provides hyperlinks to various sections, figure and table of the EIA report.
- **Section IV - V**: DECLARATIONS- Provides the Proponent and Consultant's declaration for the EIA report.
- **Section VI - VII**: EXECUTIVE SUMMARY- Provide a brief non-technical summary of key finding of the EIA report.
- **Section 1**: INTRODUCTION- Provides an outline of the structure and purpose of the EIA as well as objectives of the proposed development.
- **Section 2**: METHODOLOGY- Describes the detailed methods used for data collection on the existing environment and baseline conditions.
- **Section 3**: STATUTORY REQUIREMENTS- Outlines the relevant legislative requirements pertaining to the proposed project.
- **Section 4**: PROJECT DESCRIPTION- Describes the proposed development in detail.
- **Section 5**: EXISITING ENVIRONMENT- Describes the present conditions of the physical components of the study area and sets baseline conditions.
- **Section 6**: STAKEHOLDER CONSULTATION- Provides details on the consultation process and parties consulted for this study.

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- **Section 7**: POTENTIAL IMPACT ANALYSIS- Describes the prevailing environmental characteristics and constraints of the site and locality being investigated and an assessment of the potential environmental impacts associated with the proposed development.
- **Section 8:** OPTIONS ASSESSMENT- Discusses all the available alternatives for the project and justifies the preferred option.
- **Section 9:** MITIGATION MEASURES- Outlines the mitigation measures that would be implemented to reduce any potentially adverse impacts.
- **Section 10**: ENVIRONMENTAL MONITORING- Outlines the environmental management monitoring parameters that would be used to monitor the changes.
- **Section 11**: JUSTIFICATION AND CONCLUSION- The conclusions drawn from the proposed project and impact analysis with the justification of the preferred options.
- **Section 12**: ACKNOWLEDGEMENTS- Highlights the parties which had contributed to the preparation of this EIA report.
- **Section 13**: APPENDICES- Supporting documents and information are provided as appendices to this EIA.

1.2 Project Objectives

The primary objective of the proposed project is to demolish existing 20 water villas and establish 24 water villas, restaurant and 1 housekeeping hut at the same location of the existing water villas.

1.3 Need for the Project

Angaga Island Resort and Spa is looking to upgrade its facilities with some additional structures along with some modifications over the current building scheme. Essentially the upgrade is required as the water villas has reached its end-of-life cycle as per the developers and the wood footings of the water villas are damaged. As such the resort wishes to completely demolish the

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existing water villas and construct new water villas at the same footprint with the addition of 4 new villas with some changes to the villa designs and a housekeeping hut.

1.4 Summary of Impact Assessment Methodology

Upon submission of the EIA application the ToR was issued on the 05th April 2023 (the approved ToR is attached in appendix section Appendix C) without a scoping meeting. Based on the approved ToR the proponent and the consultants have conducted a risk-based environmental review as part of the planning process. Data has been drawn from a wide range of sources, including existing similar project EIA reports, baseline data, consultations with stakeholders, existing legislations, professional judgement and expertise of the consultants. Impacts were identified based on the locations of the project components as well as type of service to be provided. The detailed impact assessment methodology is described under chapter 7.

1.5 List of similar project EIAs reviewed

As part of relevant literature review for impact prediction as mentioned in the above section the following project EIAs were reviewed;

- EIA for additional water villa, expanding existing water villas and associated works in Lhaviyani Kanuhura
- EIA for proposed refurbishment, beach nourishment and seagrass removal at Lhaviyani Kanuhura
- EIA for seaplane arrival pavilion and refurbishment of beach villas in Lhaviyani Kanuhura
- EIA for upgrade works for Dive Center, Boat yard and workshop in Gili Lanlanfushi
- EIA for Partial Renovation and Upgrade works in Four Seasons Landaa Giraavaru
- EIA for additional spa pavilion and coastal protection measures of B.Voavah
- EIA for partial renovation and upgrade works of Six Senses Laamu
- EIA for the partial renovation and upgrade works of Four Seasons Kuda Hura
- EIA for the development of B.Vovah as a Luxury Resort

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1.6 Purpose of this EIA

The purpose of this EIA is to critically analyze the environmental and socio-economic impacts which may arise due to the construction and operation of the proposed project. After analyzing the impacts, it would be then possible to suggest proper mitigation measures to prevent/reduce any negative impacts and to enhance any positive impacts. The study involves evaluation of baseline conditions, prediction of the likely impacts, stakeholder consultation and design mitigation measures.

1.7 The EIA Process

The EIA process in the Maldives is coordinated by the Environmental Protection Agency (EPA) of the Maldives in order to ensure that environmental considerations are included in decisions regarding projects which may have an adverse impact on the environment.

The first step in the process involves screening (for the projects that may have significant impacts on the environment which are listed as projects requiring an EIA under appendix D of the EIA regulation 2012, an EIA application shall be provided to EPA and upon review EPA will call for the scoping meeting) of the project to determine whether a particular project warrants preparation of an EIA. Based on this decision, the EPA then decides the scope of the EIA which is conferred to the project proponents, the consultants as well as any relevant stakeholders to the project at a scoping meeting. A document ideally encompassing the issues and impacts that have been identified during the scoping meeting will then be issued known as the Terms of Reference (ToR). The consultant then prepares the EIA in accordance with the ToR and/or the range of issues identified during the scoping process. Once the findings of the EIA has been reported to the EPA, it gets reviewed following which an EIA Decision Statement (DS) is issued to the proponent who is responsible for implementing the project according to the DS and undertake appropriate environmental monitoring if required and report to the EPA.

Note; due to the covid19 situation scoping meeting are held online.

1.8 The Consultant

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The EIA was prepared by Eco-Tech Consultancy, which is an environmental and information technology consultancy firm registered in the Maldives on 2021. The company specializes in providing environmental solutions to clients. However, the company's services are not just limited to Environmental Impact Assessment, Environmental Monitoring Reports and Environment Management Systems, with their partners they provide land surveying and IT solutions as well. Within the short period Eco-Tech Consultancy has completed a total of 30 assignments that includes Environmental Impact Assessment reports, Environmental Monitoring Reports and RO Plant registrations.

The following registered EIA Consultants of Eco-Tech Consultancy were involved in the preparation of this EIA report;

- Mahfooz Abdul Wahhab, Consultant registration no: P22/2016 (Lead Consultant)
- Ibrahim Rashihu Adam, Consultant registration no: P06/2017

1.9 The Proponent

The proponent is Angiri Resorts Management & Operation Pvt Ltd. Established in the year 2001, Angiri Resorts Management holds a number of resorts operated in the Maldives. The proponent desires to create new hospitality ventures that are unique for our visitors and loyal travelers. Moreover, they also strive to create memorable stays for their guests through excellent customer care and premium facilities, whilst progressing through the empowerment of their employees. Furthermore, they intend to provide an environmentally conscious ambience and incorporate the rich Maldivian culture and the world-renowned Maldivian hospitality and friendliness to each aspect of their operations (Angiri Resorts Management & Operations, 2023).

1.9.1 Contact details of Focal Point of the Proponent

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Designation: Technical Advisor of MD

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2. METHODOLOGY

This chapter describes the EIA report formulation method and the methods used to collect and analyze site-specific baseline data along with the potential limitations and uncertainty in data collection methods.

2.1 EIA report formulation

The three main guiding principles that was utilized in the formulation of this EIA report was the Environment Impact Assessment Regulation 2012, the approved Terms of Reference, and the EIA writing guideline 2012. Supporting principles were adopted from the UNEP EIA Training Resource Manual 2002 and AS/NZS ISO 3100:2009 Risk management principles and guidelines. Lastly project information was used in determining the locations for baseline studies.

The contents in the chapters of this EIA report were as per the appendix E of the EIA regulations 2012 and the approved ToR. The EIA layout and structure is as per the EIA writing guideline. The baseline data which was collected in accordance with the ToR and EPA data collection guidelines as much as possible. The detailed methodology employed for baseline data collection is described in the following section 2.2.

All the legislation pertaining to the proposed development was studied through the published legislations under the Maldivian governments gazette.

Stakeholder consultation were done via public hearing for the EIAs that require public consultations and through face-to-face meeting or online meetings or via email communications.

The potential impacts were identified and analysed as per the method described in chapter 7.

Alternative were analysed based on its technical viability, economic feasibility, legal compliance, environmental practicability and social acceptability.

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Preferred mitigation measures were determined based on the most significant impacts, where the mitigation measures would mitigate the adverse impacts or amplify the positive impacts further.

Similarly monitoring parameters were also determined based on the most significant impacts that could have adverse impacts to the environment.

Conclusion was justified by comparing the project need and the envisaged environmental impacts associated with the project.

2.2 Site-specific baseline data collection methods

All site-specific data was collected on 14th December 2022. The climatic conditions at the sampling times were light air to gentle breeze winds from WSW at speeds between 2.61 to 11.3 Knots.

2.2.1 Water quality

4 marine water samples were collected (Refer to Table 3 and Figure 2 for sampling locations and respective GPS coordinates). Samples were collected in 500 mL Plastic bottles by first rinsing the bottle with the sampling water three times. Marine water samples were collected just below the surface. Marine water samples were collected on 2nd April 2021 between 09:30 to 10:45 hours.

Samples were then sent to Maldives Water and Sewerage Company's (MWSC) water quality assurance laboratory in a chilled ice box for testing.

2.2.2 Noise

Noise level was measured using a smart phone via the sound meter application. Sound was measured for 1 minute at the desired location and the maximum, minimum and average was recorded (Refer to Table 3 and Figure 2 for sampling locations and respective GPS coordinates).

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2.2.3 Structural Environment

The structural environment of the proposed project site was visually inspected and qualitative notes were taken on the type, number and quality of existing infrastructure.

2.2.4 Terrestrial Megafauna

Any terrestrial species encountered during the survey was recorded to give an indication of the terrestrial fauna on the island. For birds even if the species was not visually found, hearing of calls were noted as the species being present.

2.2.5 Current measurement

A drogue constructed from plastic plates joined together by bolts to make four fins (Figure 1) to catch the currents, were used to measure currents. The drogue was deployed for a few minutes, the start and end location of the drogue was geo-referenced using a hand-held GPS (Figure 1). The distance travelled was later calculated and the speed of currents determined. Drogue runs were done at 4 different locations (the locations of current measurement are shown on Figure 2 and respective GPS coordinates on Table 3). However due to a malfunction in the GPS data was only available for only 2 sites.

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Figure 1. Drogue deployed at sea for current measurement (left) and hand-held GPS used to geo-reference sampling locations

2.2.6 Benthic Substrate Analysis

CPCe software was used to assess the benthic substrate, which is one of the most widely used tools for marine assessments (Kohler & Gill, 2006). 15 pictures were taken at each respective site from which 10 photos are chosen for analysis (Refer to Table 3 and Figure 2 for sampling locations and respective GPS coordinates). CPCe used 25 points on each photograph to point out the substrate found at each point. The software calculates the percentage of each substrate for the 10 photographs. The method is repeated to take 4 transects at different locations.

Percentage live coral cover was used as an indicator to categorize the condition of the reef (Table 1). The categories were used from (Rizmaadi, et al., 2018), with an additional category of very poor.

Table 1: Reef condition categories based on % live coral cover.

Category	% Live coral cover
Very poor	0%-10.9%
Poor	11%-24.9%
Moderate	25%-49.9%
Good	50%-74.9%
Exceptional	75%-100%

2.2.7 Fish Census

The number of fish encountered while swimming for 5 minutes in a straight line on the reef were all counted to get the total abundance. Fish census were carried out at the 4 locations where benthic substrate analysis were undertaken (Refer to Table 3 and Figure 2 for sampling locations and respective GPS coordinates). The fishes were identified using the (Fishes of the Maldives, 2003), (FishBase, 2023), (Kuiter, 2014), and (Coleman, Godfrey, Bridge, & Moritz, 2019). After identification of the fishes, the abundance of each species for all sites was calculated along with the relative abundance for each family.

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2.2.8 Seabed Sediment

The seabed sediments of the proposed project site were visually inspected and qualitative notes were taken on the type and quality of sediments found. Seabed sediments were inspected at 4 different locations. Refer to Table 3 and Figure 2 for sampling locations and respective GPS coordinates.

2.2.9 Hazard Vulnerability

The vulnerability of the proposed project site to storms, cyclonic winds, storm surge, seismic activity and tsunami were determined based on the disaster risk profile for Maldives 2006 and multi-hazard risk atlas of Maldives 2020. Risk of flooding was determined by analysing available rainfall data from the nearest meteorological station.

2.3 Limitations in data collection methods

There are several sources of uncertainty and limitations in any data collection method, some of which we aren't even aware of it. Nonetheless, the possible sources of uncertainty and limitations for the methods used to collect data for this EIA is described below.

Firstly, the water quality tests were not done on-site, therefore the results may not reflect the actual physical parameters of water for example temperature.

Noise measurements were taken for a short period of time and during daytime only. The noise levels may be very different at night time.

Current measurements were taken only at one time. While currents may change depending on the time and the season.

During benthic substrate analysis, the category of the substrate is very subjective and hence different analyzers may perceive a substrate category differently. To avoid this human bias, one analyzer has analyzed all the transects for this EIA.

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Fish census were taken only at one time, while the abundance of fish may differ with tide, day and night and with season. Furthermore, since the fish census was done via snorkeling only the fish mostly living at 0-5m depth would be recorded. Finally, the abundance of fish was calculated based on the numbers only without factoring in the size or mass of the fish which could lead to misinterpretation of the total biomass of the different groups of fishes.

2.4 Data gaps

The most contrasting data gap is the lack of long-term site-specific data and the data that was taken under this EIA was also a snapshot of the full environmental setting as can be seen evidently from the above section. Namely, these data gaps include; lack of site-specific hazard risk analysis, climatic conditions, currents in both seasons, seasonal erosion patterns, fish census data for different tides and seasons.

2.5 Uncertainty in data

The first and foremost uncertainty in any data arises from the data collection method as it is impossible to devise a sampling method that is devoid of error. Hence any physical, chemical or biological parameter that is measured will have an error or uncertainty from the data collection method itself as no method by nature is 100% accurate. Additional uncertainties to the sampling method arises from the instrument used, these include the instruments resolution, accuracy and precision errors. Thirdly the human error that will be imposed when a person measures a parameter using a specific sampling method by using a particular instrument. Other factors include the time and environment.

Some of the results presented in this report are given with a confidence interval. The confidence interval is calculated at 95%, which means that we are 95% confident that the true value lies within the range given. Uncertainty could be calculated like this for certain parameters as some of the results provided are from third party data which does not have information of accuracy and precision. And in other cases it is not possible to calculate as the measurements are only discreet data describing a varying parameter. In these types of cases the initial value obtained

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is given. Caution must be taken when using this type of data, as it is this type of data that usually warrants long-term studies.

2.6 Management of Uncertainties and Data Gaps

Due to the abovementioned limitations, data gaps and uncertainties, the following assumptions were made;

Table 2: uncertainties and data gaps in collected data and how it was managed

Data	Sources of Uncertainty	Data Gap	Assumption (how it was managed)
Hazard risk	Modelling errors due to imperfect understanding of the natural setting and lack of long-term data	No site-specific data	The available broadscale hazard risk analysis of the Maldives was used to determine the site-specific hazard risk at the proposed project site
Temperature, rainfall, wind	Equipment precision errors Human error	No site-specific data	Regional climatic conditions from the meteorological centre for wind, rain, temperature was assumed true for the proposed project location
Water quality parameters	Off-site testing Equipment precision errors Human error	Data lacking for both seasons	The tested water quality parameters (except for temperature) in the laboratory was assumed to be the onsite conditions.

2.7 Geographic Coordinates for all sampling locations

All the sampling locations were geo-referenced using a hand-held GPS. The coordinates for all sampling locations are shown in Table 3 and Figure 2 below.

Table 3: Geographic coordinates for all sampling location at Island name

Code	Type	Location	GPS Coordinates	
			Easting	Northing
D1	Refers to location D1 of water sample, fish census and benthic transect	(Project Construction site) Water villa West side	257796.06	404039.84

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D2	Refers to location D2 of water sample, drogue run, fish census and benthic transect	(Project Construction site) Water villa walkway	257494.71	404034.18
D3	Refers to location D3 of water sample, drogue run, fish census and benthic transect	Northern reef	258070.00	404169.00
C	Refers to location C of water sample, fish census and benthic transect	(Control site) South Western reef, near the existing entrance channel	257712.21	403734.86
S1	Refers to location S1 of seabed sediments	Water villa north walkway	257794.73	404033.12
S2	Refers to location S2 of seabed sediments	North of the water villas	257791.00	404057.00
S3	Refers to location S3 of seabed sediments	Between water villa walkways	257790.06	404013.26
S4	Refers to location S4 of seabed sediments	Water villa South walkway	257797.14	403997.22
N1	Refers to location N1 of noise recordings	Near the first Water villa	257828.00	404018.00
N2	Refers to location N1 of noise recordings	First Beach villa near the walkway	257962.00	404027.00

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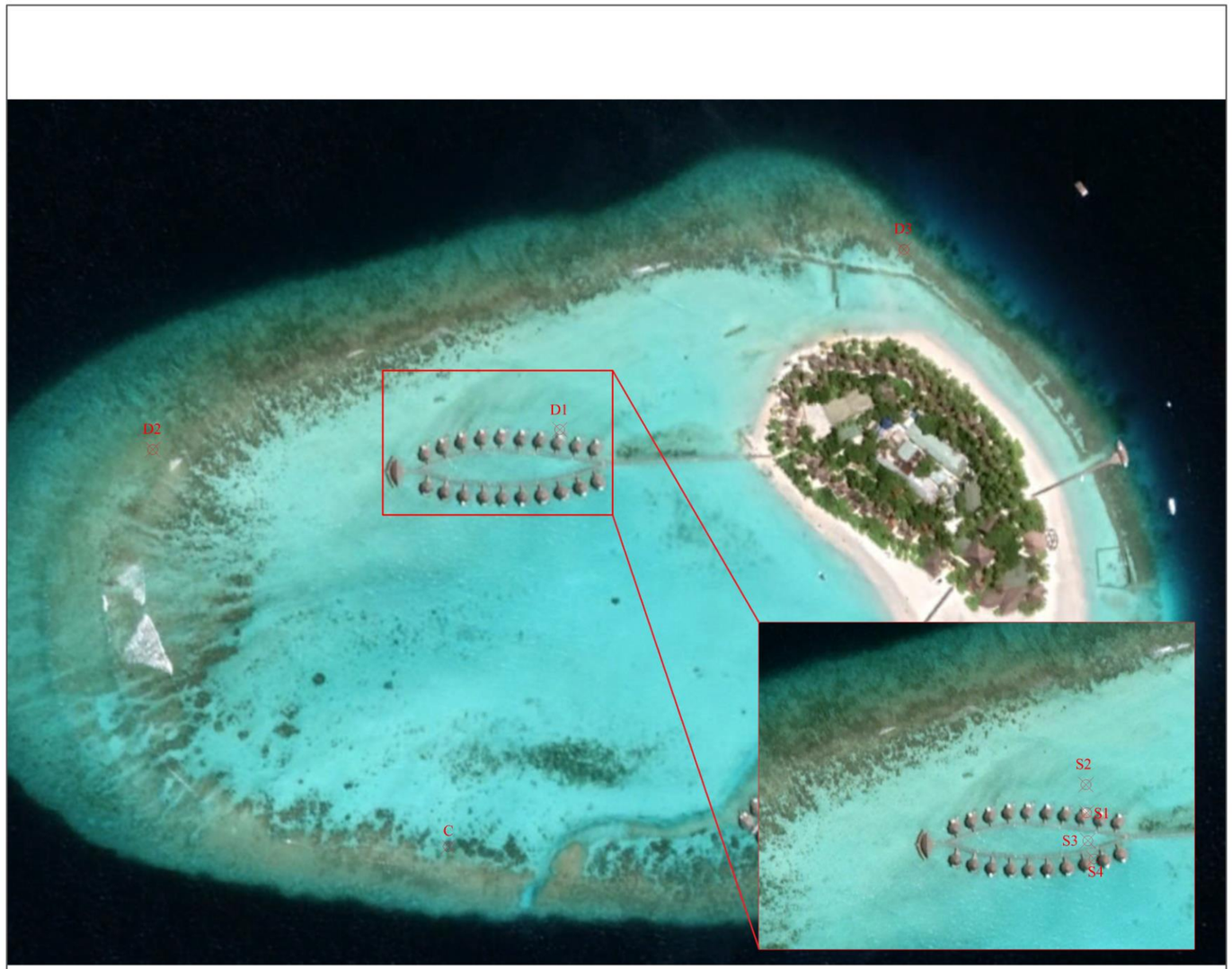

LEGEND

Surveyed Locations

MAP INFORMATION

Units: Meters
Coordinate System: WGS 84 UTM Zone 43N

N

PROJECT

Title: EIA for Proposed Refurbishment of Water Villas Project
Proponent: Angiri Resorts Management & Operation Pvt Ltd
Proponent's Address: M. New plot, Ameenee Magu, Male', Rep. of Maldives

Surveyed by: Rashihu
Surveyed date: 02 April 2023

Map Title: All surveyed Locations
Location: Angaga Island Resort and Spa
Map Description: This map shows all surveyed locations at the Angaga Island Resort and Spa

DRAWN BY

Name: Eco-Tech Consultancy
Date: 13 April 2023
Drawing No: All Surveyed Locations V1
Sheet No: 01

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Figure 2: sampling locations at Angaga

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3. STATUTORY REQUIREMENTS

This section describes the statutory requirements relevant to the proposed proposal. Section 3.1 describes all the relevant laws, policies and strategic action plans that must be complied to for this proposal. Section 3.2 describes all the pertinent regulations, section 3.3 all the guidelines and section 3.4 describe all the international conventions that the Maldives are a party to.

3.1 Laws, Policies and Strategic Action Plans

This section describes the applicable laws, policies and strategic action plans pertaining to the proposed development.

3.1.1 Environmental Protection and Preservation Act (4/93)

The Environmental protection and Preservation Act of the Maldives was enacted to protect the environment and its resources for the current and future generations. Relevant articles under this law pertaining to the proposed project are:-

- Article 2 states that the instructions for environmental protection will be given from the competent authority and everyone must respectfully follow these instructions;
- Article 3 states that all matters relating to environmental protection and preservation must be handled by the Ministry of Planning, Human Resource and Environment (MPHRE);
- Article 4 states that MPHRE must declare protected sites and species and formulate the regulations to manage them. If any other party wants to declare a protected site or species they must be registered in the MPHRE and managed according to regulations made by the Ministry;
- Article 5 states that any projects which pose significant impacts to the environment, an EIA report has to be made and submitted to the MPHRE. The projects which require an EIA and the regulation must be made by MPHRE;

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- Article 6 states that if any project is found to cause significant adverse impacts, MPHRE have the right to stop the project;
- Article 7 states that any waste, oil or hazardous gas must not be dumped into any part of the Maldives, however, if strictly needs to be disposed it should be disposed of in an area designated by the Government. If such hazardous gas, waste or oil is to be disposed by combustion, it should be done in a way it does not impact human health and environment;
- Article 8 states that any hazardous waste must not be disposed into any part of the Maldives. Before trans-boundary transfer of such waste, approval must be taken from the Ministry of Transport and Communication by writing to the Ministry at least 3 months beforehand.
- Article 9 states that any party who violates this law or any regulation under this law is punishable to no more than MVR 100 million according to the offence. The fine will be applied by the MPHRE.
- Article 10 states that any offence to this law or any regulation under this law or any action resulting in environment damage, the compensation for such damages can be taken through judicial processes.

3.1.1.1 1st addendum to Environmental Protection and Preservation Act (4/93) law no 12/2014

Article 3 and 11 of the Environmental Protection and Preservation Act (4/93) of Maldives is amended as follows:-

Under article 3, all matters relating to environmental protection and preservation must be handled by the Ministry charged with implementation of environmental policy.

3.1.2 Maldives Tourism Act (2/99)

This act encompasses the issues related to the development of tourism in the Maldives. It came into effect on the November, 1999, repealing the Law on Tourism in the Maldives (Act No.

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15/79) and the Law on Leasing of Uninhabited Islands for the Development of Tourist Resorts (Act No. 3/94). Act No. 15/79 was the primary legislation that was passed by the Citizen's Majlis in November 1979 and the main aim was to provide for the collection of a bed tax from the visiting tourists and to control their movement in the Maldives. While this Act only dealt with tourist resorts, hotels and guest houses, the amended act (Act No. 2/99) incorporates the determination of zones where tourism development can occur, as well as the development and management of marinas and the operation of tourist vessels, diving centers and travel agencies. This is evidence that the tourism industry has expanded since the enactment of the initial laws, both in magnitude and in the diversity of facilities that are provided for the visiting tourists.

The environmental legislation that directly applies to the development is outlined under article 15 (a) and (b). Article 15 (a) provides for the felling of Ruh's and trees, dredging of lagoons, reclamation of land or any other activity that may cause permanent change to the natural environment of an island leased as a tourist resort. It states that the activities mentioned above can only be carried out after obtaining written permission from the Ministry of Tourism and in accordance with the relevant regulations.

Under Article 15 (b), a justification has to be provided for such an activity, as well as an environmental impact assessment, which has to be submitted to and approved by the Ministry of Housing and Environment.

There are several regulations under the Maldives Tourism Act (Law No. 2/99) and those pertaining to the environment are presented below.

3.1.3 Maldives Third Tourism Master Plan

The Maldives Third Tourism Master Plan (TTMP) was launched in August 2007. The planning horizon is from 2006 to 2010. The strategies recommended will integrate with the policies and strategies for tourism, air and sea transport proposed in the 7th National Development Plan which is also being developed.

The TTMP will focus on the following areas:

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- Identification of potential product expansion and diversification and Maldives tourism product review.
- Increasing the share of Maldivians working in the tourism industry.
- Greater community involvement in the tourism sector.
- Improvements in the retention of economic benefits of tourism within the Maldives economy.
- Improvements to the tourism related infrastructure and support services.
- Protecting, preserving and promoting the natural resource base, heritage and culture in relation to tourism development.
- Strengthening the institutional capacity of Ministry of Tourism
- Developing domestic tourism.

Improving the legislative framework in relation to the tourism industry

3.1.4 Waste management policy

With the implementation of waste management policy 2015, the 2011 and 2007 policy is void. The waste management policy which came into effect on 2015 is to ensure that the Maldivians are well aware of the waste management techniques and maintains cleanliness as well as the natural aesthetics and clean air quality of the country is well maintained. Under this policy, all the inhabited islands need to implement a waste management plan and manage all the wastes generated from that island in accordance with that policy.

3.1.5 Waste management act (24/2022)

The waste management act came into force in 18th December 2022 with the main objectives of implementing sustainable waste management, establish waste management standards, minimize negative impacts from waste to the environment and human health. The act outlines the principles for waste management, roles and responsibilities of the relevant institutions.

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3.1.6 Maldives Energy Act (18/2021)

The Maldives Energy Act was published on 11th October 2021 with the aims to regulating power production, power usage, electricity services, protecting the rights of customers, detailing the rights and responsibilities of service providers, upkeeping the quality of services, regulating power tariff rates, promoting renewable energy, facilitate sustainable development of the energy industry in a manner that is environmentally friendly, resilient to the impacts of climate change, facilitate reduction in GHG emissions, economically feasibility. Relevant notable articles under this law pertaining to the proposed project are:-

- Chapter 1 – Introduction. the following are some aspects highlighted under the chapter.
    - Energy sector policy:
        - Shall be formulated and gazetted.
        - All involved in electricity service provision shall adhere to it.
        - Policy shall be reviewed and revised in every 5 years.
    - Energy sector plan:
        - 10-year plan on the energy sector development shall be formulated.
        - All licensees for electricity service provision shall provide a plan on service provision to the Ministry.
- Chapter 2 relates to the Roles and Responsibilities of the institutions, under which the following are highlighted:
    - Responsibility of the Ministry:
        - Facilitation of electricity services at an affordable rate in all inhibited islands, facilitating the investments for the sector,
        - Provision of technical assistance to island councils,
        - Implementing the international commitments relative to the sector,
        - Formulation of regulations and ensuring sustainable levels of electricity services are received to all inhibited islands.
    - The Authority and Responsibility of the Regulator:
        - Enforcement of regulations,
        - Licensing,

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  - Tarrif setting,
  - Monitoring and revision,
  - Regulating of service providers,
  - Formulating of standards relevant to the sector etc.
- Roles and responsibilities of island councils.
- Responsibility of other entities to provided assistance for the enforcement of the act.

- Chapter 3 is regarding the renewable energy. The following are discussed in the chapter
  - Ownership
  - Development
  - Target setting
  - utilising the space required for renewable energy
  - providing preference to renewable energy.
- Chapter 4 deals with petroleum and petroleum products. It details the following aspects regarding petroleum and petroleum products
  - Licensing and its relevant details
  - Quality Assurance
  - Stock Management
  - Environmental protection and general public health safety
  - Regulatory aspects for vessels carrying petroleum and petroleum product
- Chapter 5 deals with production of power and provision of its services, the following are some aspects highlighted under the chapter
  - Service provider and customer rights
  - Provision of services
  - Licensing
  - Responsibilities of service providers
  - Provision of services for personals with financial vulnerabilities
  - Monitoring
  - Inspections
  - Tariff settings

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- Application of services
- Quality assurance
- Termination of services
- Emergency power cut
- Vandalism and disruption of services
- Ownership

- Chapter 6 deals with economising electricity and its efficient use, the following are some aspects highlighted under the chapter
  - Energy saving and its efficiency
  - Information collection
  - Formulation of regulation and guidelines
  - Energy efficiency certifications
  - Energy auditing
  - Annual energy report
  - Ill practices in electricity usage
- Chapter 7 highlights regarding the transition from previous legal framework of the energy sector.

3.1.7 Maldives Energy Policy and Strategy 2016

Maldives Energy Policy and Strategy 2016 consists of revised policies derived from Maldives Energy Policy and Strategy 2010. The 9 policies are reduced to 5 key policy statements.

- Strengthen the institutional and regulatory framework of the energy sector
- Promote energy conservation and efficiency
- Developing and enforcing standards for exhaust emissions for power plants, vehicles and vessels that use fossil fuel in order to improve air quality
- Increase the share of renewable energy in the national energy mix

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- Improve the reliability and sustainability of electrical services and maintain universal access to electricity
- Devising means to reliably meet energy demands in a consistent manner assuring security and reliability of supply
- Improve the operational performance of service providers to manage the electrical power infrastructure
- Increase efficiency of the energy systems and quality of energy services provided
- Review and regularly implement electricity tariff adjustments
- Develop and update an integrated system management and expansion plan for utilities
- Increase national energy security
- Ensure environmentally safe and adequate storage, supply and distribution of fuel to meet the demand.

3.1.8 Water and sewerage Act (8/2020)

The water and sewerage Act was published on 05th August 2020 with the aims to provide safe water and sanitation services to the general public by implementing guidelines for providing water and sanitation service, operation and maintenance of water and sewer facilities, and other related guidelines. Relevant articles under this law pertaining to the proposed project are:-

- Article 5 states that, to provide the water and sanitation services entitled for every citizen of Maldives, it is the duty of the government to implement the following;
    - establishing facilities required to provide water and sanitation services sustainably
    - ensuring that safe water and adequate sanitation services are provided
    - overcoming any hindrance to provide water and sanitation service
    - establishing standards for water and sanitation service
    - ensuring that the water and sanitation service providers follow the set standards

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- researching and developing the water and sanitation sector

- Article 6 states that the water and sanitation policies shall be declared by the Minister as advised by the President. These policies shall be made available to the general public. All parties involved in the water and sanitation sector must fully comply with these policies.
- Article 7 states that Utility Regulatory Authority shall be responsible to implement this law.
- Article 8 states the duties of the Ministry in detail. These include drafting the polices, laws and regulations required to implement this law, establishing water and sanitation facilities in all inhabited Islands of the Maldives within 05 years of implementation of this law, ensuring that proper sewerage facilities are established on tourist and other industrial islands, and all the works to develop the water and sanitation sector.
- Article 9 states that the Council has the authority to declare the fees that could be taken from the water and sanitation service in accordance with the Utility Regulatory Authority and Governments policies and regulations. Additional responsibilities of the Council include; monitoring the third party water and sanitation service provider, monitoring environmental impacts due to water and sewer systems, providing information about water and sanitation service on the Island to the Competent Authorities, ensuring that enough water is available to the living population of the Island, and providing water and sanitation service via a licensed third party.
- Article 10 states the points that must be included in the third party agreement mentioned in article 9.
- Article 11 states the duties of Utility Regulatory Authority, which is to give licenses to all water and sewerage facilities in the Maldives and monitoring them.
- Article 15 states that the licensed all water and sanitation service providers must submit a plan to provider water and sanitation service annually with an implementation report which specifies; (1) water quality, (2) lost water, (3) service interruption, (4) costs, (5) revenue generated, and (6) CSR activities.

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- Article 18 states that the groundwater presents in Tourism, Industrial and Reclaimed Islands are protected.
- Article 19 states that the groundwater presents in Tourism, Industrial and Reclaimed Islands cannot be used for commercial purposes. For existing agricultural Island a period of 2 years must be given for them to install RO plants and for inhabited islands, RO plants must be installed for agricultural field larger than 10,000 m^2.
- Article 20 states that any activity that contaminates the ground water is prohibited. Exclusive of this clause is using fertilizer for agricultural purpose and installing septic tanks in households. The article further states that fuel and other chemicals must be handled properly such that spills do not occur and if a spill occurs, the proponent must be responsible for clean-up. Finally, it is prohibited to dispose water which contains fuel and chemicals from Engine maintenance to the sea.
- Article 21 states that dewatering must be done in accordance with the regulations made under this law.
- Article 22 states that it is prohibited to dispose brine into ground or wetlands. Further, mixing of permeate water and rain water must be done according to set guidelines of the Utility Regulatory Authority.
- Article 24 states that there must be 05 days of water stored in case of emergency by all the service providers. Emergency water storage must be allocated in reference to the living population on the island, available water, and land availability for water storage.
- Article 25 states that operating license for water and sanitation service must be issued after the EIA process.
- Article 27 states that power required for the operation of RO plants must be from renewable energy sources. However, a period of 05 years shall be given to existing RO plants for transition. Nonetheless during an emergency situation due to a disaster on in case of renewable energy system failure, power from Diesel generators could be used.
- Article 28 states that rain water must be included as much as possible in the provision of Desalinated water.

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- Article 29 states that it is the duty of the water and sanitation service provider to do all works required to provide the service in the assigned region for them. Additional responsibilities include; providing reports to Utility Regulatory Authority, upgrading water and sewerage facilities according to new technology, providing the first house connection free of charge, and water testing to ensure quality of water.
- Article 30 states that the water and sanitation service provider reserved the right to prohibit certain substances being disposed into the sewer system, installing meters, and entering households and commercial places.
- Article 31 states that the water facilities on inhabited islands of the Maldives must be established in accordance with MFDA's regulations. Additional points under this article include; the established water systems must have the capacity to test for water quality and disinfect, and it is the responsibility of the building's owner to establish measure to manage pressure in tall buildings, if a license for providing water has already been issued to an inhabited Island a second RO plant by another party could be installed with the approval of the Utility Regulatory Authority.
- Article 32 states that the Ministry shall declare publicly the Islands which require an STP and duration for establishing STP's on these Islands. On the islands where the Ministry has declared that an STP is required, on these islands sewerage services must only be provided with an STP. However, during an emergency situation due to flooding, disposal of this storm water is allowed without the involvement of an STP. Additional points include; Disposing of water from dewatering to the sewerage network is prohibited and technical specification for sewerage facilities must be made by the Utility Regulatory Authority.
- Article 34 states that an agreement must be made prior to giving approval to any water and sanitation service provider and this agreement must be registered in the Utility Regulatory Authority.
- Article 35 states that all water and sewer systems in the Maldives must be operated after registering in the Utility Regulatory Authority.

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- Article 36 states that water and sewer services in inhabited Islands of the Maldives must be given after taking the operating license from the Utility Regulatory Authority.
- Article 37 states that an exclusive operating license could only be given after getting the written approval from the president as advised by the Parliament if it is needed for the betterment of the country.
- Article 38 states the requirements of the operating license, these include; operation and maintenance of water and sewer systems in accordance with the regulations set by the Utility Regulatory Authority, implementing the business plan mentioned in article 41(a-2), reporting, and fulfilling other requirements set by the Utility Regulatory Authority.
- Article 41 states that the procedures for obtaining the operating license must be publicly made available. The article further details the information the service provider must submit while applying for the operating license.
- Article 42 states that the fees for water and sewer for inhabited Islands will be declared by the Utility Regulatory Authority.
- Article 43 states that the service provider must submit a performance report to the Utility Regulatory Authority, Council, and Ministry annually
- Article 44 states that customers have the right to report any complaints regarding the service provider to the Utility Regulatory Authority.
- Article 45 states that the Utility Regulatory Authority has the right to investigate the service provider of any misconduct or even if the Utility Regulatory Authority deems necessary.
- Article 60 states that if there are any overlaps with other laws regarding water and sanitation, this law shall take precedence.
- Article 61 states that with the implementation of this law, the articles pertaining to water and sanitation services under the law on general public services (4/96) is void.

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3.1.9 Utility Regulatory Authority Law (26/2020)

This Utility Regulatory Authority Law was drafted to establish an Authority that will oversee the general public services given in the Maldives. The specific objectives of this law include;

- Ensure that the general public services given in the Maldives are provided sustainably
- Ensure that general public services are given efficiently and with minimal damage to the environment
- Ensure that general public services are given at adequate standards
- Create a competitive environment to develop general public services in the Maldives
- Draft and implement regulations on general public services
- Regulate the general public service providers
- Create awareness on the rights of the customers and the service providers

This law has 16 chapters. Chapter 1 states the objectives of the law, Chapter 2 states the responsibilities of the Utility Regulatory Authority, Chapter 3 states how the board of directors are to be established and their responsibilities, Chapter 4 states the organizational structure of the Utility Regulatory Authority, Chapter 5 states the responsibilities of the Minister, Chapter 6 states details about operating licenses, Chapter 7 states how tariffs are to be implemented, chapter 8, 9 and 12, 13, 14 sates the rights of the Utility Regulatory Authority in relation to monitoring service providers, Chapter 10 states the discipline that the Utility Regulatory Authority must have, Chapter 11 states guides on conflict resolution, Chapter 15 states the budget and reporting by the Utility Regulatory Authority, Chapter 16 states the changes in existing institutional framework such as the transfer of Maldives Energy Authority and EPA Water, Sanitation and Waste section to the Utility Regulatory Authority. Relevant articles under this law pertaining to the proposed project are:-

- Article 4 states all the responsibilities of the Utility Regulatory Authority. The most important responsibilities include; giving operating license to service providers, implementing all laws and regulations pertaining to general public services and ensuring

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that the service providers abide by them, implementing tariff, drafting and implementing regulation and guidelines for providing general public services.

- Article 23 states that a license must be obtained in order to provide any general public service in the Maldives.
- Article 24 states that the license for general public services will be given by the Utility Regulatory Authority.
- Article 25 states that an exclusive operating license will only be given after getting the written approval from the president as advised by the Parliament if it is needed for the betterment of the country.
- Article 29 states that the fees taken for general public services must be as per the approved tariffs from the Utility Regulatory Authority.
- The Service providers must strictly follow the directions of the Utility Regulatory Authority as mentioned in chapters 8, 9, 12, 13, and 14.

3.1.10 The National Water and Sewerage Strategic Plan (The NWSSP 2020-2025)

The NWSSP 2020-2025 is an action plan made under the article 14(a) of Water and Sewerage Act (8/2020). The strategies and targets included in the action plan is derived from the National Strategic Action Plan 2019-2023 endorsed by the Government in 2019. The vision of this action plan is to ensure equitable access to safe water and improved sewerage serviced for all. The mission is to provide efficient, effective and reliable water supply and sewerage services, promote conservation and management of the water resources, and to develop sector capacity for sustainable management of resources and services. The action plan has 6 policy goals with its associated target in order to reach the vision. These are;

- Policy 1: Ensure access to safe water supply and adequate sewerage services
    - Target 1.1: By 2020, Water and Sewerage Act is ratified

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- Target 1.2: By 2020, Utility Regulatoryy Authority (URA) for integrated utility services is functional
- Target 1.3: By 2021, Water and Sanitation coordination committee is functional
- Target 1.4: By 2023, all water and sewerage utility providers have an operating license

- Policy 2: Adopt cost-effective and environment-friendly water and sewerage infrastructure
  - Target 2.1: By 2020, a standard mechanism to foster private sector investment in the water and sanitation sector will be in effect
  - Target 2.2: By 2023, all inhabited islands, will have access to safe water supply and sewerage facilities
  - Target 2.3: By 2023, 30% of energy consumption for water and sewerage facilities across the Maldives will be met with renewable energy
- Policy 3: Build sector capacity in water resources, water supply and sewerage services
  - Target 3.1: By 2023, at least 60% of technical staff in utility service providers are licensed (/ By 2023, all technical staff operating and maintaining the water and sewerage facilities will have at least certificate level 3 qualification and will be licensed)
  - Target 3.2: By 2023, at least 40 engineers will be trained in water and sanitation related field
  - Target 3.3: By 2023, at least 30% of all employees working in water and sewerage facilities in each island shall be women
  - Target 3.4: By 2022, collaborative partnership arrangements will be made with at least 3 local/international educational institutes for capacity building of water and sewerage sector programmes and services
  - Target 3.5: By 2024, two (2) staff at each island or city council will be trained for overall utility operational services, governance and best practices
- Policy 4: Strengthen advocacy and awareness programs on water resources, water supply and sewerage
  - Target 4.1: By 2022, public perceptions on safe water and sanitation practices improved by 33% compared to 2018 levels

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- Target 4.2: By 2023, at least 40% of households phased out single-use bottled water use
- Target 4.3: By 2023, WASH awareness programs targeting to island functionaries, front line workers, CBOs and NGOs that are active in all island communities are carried out

- Policy 5: Protect and conserve natural water resources
  - Target 5.1: By 2023, water resource conservation and management plans are implemented in all inhabited islands.
- Policy 6: Build flood resilient island communities
  - Target 6.1: By 2021, identify and map flood prone islands
  - Target 6.2: By 2022, develop and enforce design criteria's and guidelines for flood mitigation

3.1.11 Public Health Protection Act (7/2012)

The purpose of this act is to establish policies for protection of public health, identify persons responsible for protection of public health, define how public health protection policies will be implemented and establish policies to limit basic rights ensured under the Maldives Constitution to Maldivians and people living in Maldives to necessary extents to protect public health. Chapter 5 of the act outlines health hazards, eliminating risk, reporting health hazards, and order of things that can be done and not done in relation to a building. Chapter 6 of the act outlines the procedures for declaring state of emergency.

3.1.12 Immigration Act (1/2007)

This act lays down the rules for the departure and entry of Maldivian Nationals and foreign Nationals. Relevant articles under this regulation pertaining to the proposed project are:-

- Article 3; all persons shall enter the Maldives from an authorised port, unless a person is compelled to do otherwise, due to sudden natural causes, or an emergency which is

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beyond the control of the person. Persons departing from the Maldives shall also depart from an authorised port unless in cases of emergency as stated above.

- Article 7; (a) A foreign national may enter the Maldives if he/she can produce a valid passport and a valid permit of entry. (b) A foreign national may leave the Maldives provided that he/she has a valid passport. (c) Pursuant to subsection (a), a foreign national may enter the Maldives, unless as stated otherwise in the Regulations made under this Act, by filling a disembarkation form as specified in the Regulations and by submitting it with the passport to an immigration officer, and upon the leave to grant a permit of entry for the Maldives. (d) A foreign national may depart from the Maldives, unless as stated otherwise in the Regulations made under this Act, by filling an embarkation form as specified in the Regulations, and submitting it with the passport to an immigration officer and upon the leave to grant departure.
- Article 8; (a) For the purposes of this Act, permits to remain in the Maldives shall be divided into the following eight types;

  (1) Tourist Visa

  (2) Diplomatic Visa

  (3) Student Visa

  (4) Business Visa

  (5) Dependant Visa

  (6) Work Visa

  (7) Resident Visa

  (8) Special Visa

  (b) The permits specified in subsection (a) are subject to the Regulations made under this Act.

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3.1.13 Anti-Human Trafficking Act (12/2013)

This act was enacted to combat human trafficking in the Maldives in order to protect human rights and human dignity. As per international best practices this act includes three main components of criminalization, prevention and rehabilitation of victims, making human trafficking a criminal offense in the Maldives. The law also strictly prohibits forced labor and fraudulent recruitment. The main objective of this act include;

- Preventing human trafficking in the Maldives
- Establish crimes of human trafficking and prescribe the punishments
- Provide for prosecution of perpetrators under this act
- Providing protection and assistance to victims of human trafficking
- Promote and protect the human rights of trafficked victims
- Engage in cooperation with local and international NGOs working against human trafficking to combat human trafficking

3.1.14 National Biodiversity Strategy and Action Plan

The National Biodiversity Strategy and Action Plan 2016-2025 (NBSAP 2016-2025) seeks to ensure that threats to biodiversity are addressed, biodiversity is conserved, sustainably used and benefits arising from them are shared equitably. It also encompasses ways of addressing gaps, challenges and constraints highlighted in earlier sections. It is a living document that will have the capacity to adapt to changes in national conditions, capacities and to the changes in the in-trinational arena.

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3.1.15 Climate Emergency Act (9/2021)

Climate Emergency Act was enacted in the Maldives in order to tackle the dangers that Maldives and its citizens face due to climate change. This act aims to bring forth regulations and mitigation measures to face the impacts of climate change, and to make Maldives a leading nation in advocating for action on climate change. It also aims to make the country carbon neutral while reaching its sustainable development goals.

- Article 2 states that Maldives should be a carbon neutral country by the year 2030, offsetting the same amount of carbon as those emitted. Any changes to the regulations can only be brought in consideration of new scientific findings and changes in international climate mitigation policies.
- Article 5 states that an action plan must be created to analyse the current situation and strategies to reach the climate goas in the country. The action plan must include regulations to make the country carbon neutral and resilient to climate change, adaptation and mitigation measures to respond to climate impacts, implementation of climate adaptation and mitigation in developmental plans, methods of monitoring of greenhouse gas emissions, development and implementation of renewable energy and its storage, and the roles of the government and other related bodies in strategizing and reaching climate mitigation goals.
- Article 7 states that any emissions from flights and ships travelling through Maldives under circumstances not stated in the law will not be considered when calculating total national emissions.

3.1.16 Heritage Act (12/2019)

This law aims at safeguarding the perpetuation of items and sites of historical significance to future generations and ensures the documentation, preservation, and protection of cultural heritage.

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- Article 2 states that portable heritage items, historic constructions or buildings, historic sites, and any cultural skills or talent all fall under heritage to be protected under this law. It also defines each category and states that they will be valued by the importance of their inheritance to future generations.

  Article 3 states that all policies regarding heritage protection will be made under the guidance of the president. Under this law, 'Department of Heritage' was renamed 'National Center for Cultural Heritage'.

- Article 5 states that a catalogue of all heritage artefacts and sites must be published and reviewed to update once every 2 years.
- Article 6 states that a written permit must be obtained from the NCCH if any artefacts are to be moved from its place of origin. If any artefacts are found being moved without necessary permits, they must be detained immediately, and NCCH must be informed. It also states that any historical buildings or heritage sites must have a boundary marked and disclosed at protected. If any work needs to be carried out that encroaches this boundary, a permit must be acquired from the NCCH
- Article 6 also states that NCCH will determine the ownership of heritage artefacts and sites and their guardians.
- Article 7 states that the following heritage items and sites legally belong to the government:
  - All artefacts and sites under the legal custody of the government at the time of passing of this legislature;
  - All artefacts and sites legally renounced by their owners which meets the requirements outlined in this legislature;
  - Any artefacts or sites historically important which have not yet been found within the maritime boundary of Maldives, be it in water or on land.
- Article 7 also states that in order to claim ownership of an artefact or site, one must inform the local council. If any items or sites are not claimed, they will be considered government property until someone claims ownership. If a historical item is found on a

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land leased by the government, all works must be halted on site until the items are assessed by NCCH.

- Article 8 states that all names historically given to islands, lagoons, reefs, and other places must be documented by NCCH without any changes. Paperwork for developmental plans carried out in such places must include these names.
- Article 10 states that any damages caused to heritage artefacts or sites can be fined, depending on its value, an amount between MVR10,000 and MVR1,000,000.

3.2 Regulations

This section describes the applicable regulations pertaining to the proposed development.

3.2.1 Environmental Impact Assessment Regulation 2012 (2012/R-27)

The EIA Regulation, which came into force in 2007, has been revised and this revised EIA Regulation is currently in force since May 2012. 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 D of the EIA Regulation defines the type of projects that would be subject to EIA. 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 DS. Relevant articles under this regulation pertaining to the proposed project are:-

- Article 6 states that when government agencies propose a project, while finalizing the location for the project, they should reflect on the criteria's mentioned in Schedule B of this regulation. Furthermore, they should reflect on all the laws and regulations pertaining to environmental protection in the Maldives as well as international conventions, plans and programs to which Maldives is a party to.
- Article 7 states that the proponent must apply for an Environmental DS prior to commencement of any developmental project in accordance with article 8 of this regulation.

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- Article 8 states that the proponent must apply for a screening if the developmental project is not listed in the inclusive list for EIAs (Schedule D of this regulation). If the proposed developmental project is listed under Schedule D of this regulation, then the proponent must submit an EIA application form.
- Article 11 states that a scoping meeting must be conducted and a ToR must be agreed upon by the proponent and the competent authority.
- Article 12 states that the EIA report must be written as per the approved ToR and the report must be a technical report with scientifically proven alternatives, impacts, and mitigations.
- Article 13 states that the competent authority must assign two independent reviewers to review the submitted EIA report and within 28 working days the competent authority must issue an Environmental DS or for additional information.
- Article 14 states that the Environmental DS must be; (1) Approval with the condition that the proponent follows the proposed mitigation measures (2) EIA report rejection due to poor quality of the report (3) Rejection of the proposal by the competent authority due to potential irreversible negative impacts. The approval has a validity of 1 year. If the proponent could not start the works within one year of the approval due to force major, then the competent authority could give an extension.
- Article 15 states that if the proponent is not contented with the DS, then the proponent may apply to review the DS.

Since the enactment of the EIA regulation in 2012 there have been five amendments to the regulation. These five amendments are discussed below;

3.2.1.1 1st amendment to the Environmental Impact Assessment Regulation 2012 (2013/R-18)

The first amendment to the EIA regulation 2012 involved the establishment of a guideline for fining environmental offences under article 20. According to the guideline fines are as follows; (1) MVR 20,000 for first offence (2) MVR 60,000 for second offence (3) MVR 120,000 for 3rd offence (4) MVR 200,000 for repeated offences after the 3rd time.

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3.2.1.2 2nd amendment to the Environmental Impact Assessment Regulation 2012 (2015/R-174)

With the 2nd amendment to the environmental impact assessment regulation 2012, there were some procedural changes made to the EIA process. The most important was the shifting of tourism related development projects EIAs to the Ministry of Tourism (article 4). The detailed amendments made to the relevant articles are discussed below;

- Article 7 was amended to have three categories of review period as follows; (1) MVR 5000 for a 15 day review period, (2) MVR 5000 for a 10 day review period, (3) MVR 5000 for a 05 day review period
- Article 8 was amended to have 5 categories of Environmental DS for screening as follows; (1) Environment Management Plan, (2) Initial Environmental Examination, (3) Environmental Impact Assessment, (4) Approval to go forth with the screened project, and (5) Approval to go forth with the project according to the mitigation measures proposed by EPA.
- Article 9 was amended to have 3 categories of Environmental DS for an IEE as follows; (1) Environmental Impact Assessment report if the project is anticipated to have major environmental impacts, (2) Environment Management Plan, (3) Approval to go forth with the project if the project is not anticipated to have major environmental impacts.
- Article 14 was amended to have a guideline for extending the Environmental DS as follows; (1) Extension for Environmental DS must be applied by the proponent with the justification for the delay, (2) If extension was applied before the deadline for Environmental DS, an extension shall be granted without a fine, (3) If extension was applied within one month of the deadline for Environmental DS, a fine of MVR 5000 will be charged, (4) If extension was applied within 2 month of the deadline for Environmental DS, a fine of MVR 10,000 will be charged, (5) an extension shall not be granted if applied after 2 months of the deadline for Environmental DS, (6) extension for environmental DS shall be granted for a maximum of 1 year and only once. Further points were added to article 14 to set out the guideline for applying, review and issuing Environment DS for addendums. In this regard a proponent can apply for an addendum

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for an approved EIA report if; (1) it has not been 5 years since the Environmental DS was issued, (2) scope change, (3) works within 500 m of the proposed project.

- Schedule D of the regulation was amended to exclude all tourism related projects and some further changes to the list of project were also made.
- Schedule U was added to the regulation. For the projects under this schedule, approval to go ahead with the project will be granted once the proponent submits a commitment to implement the mitigation measures prescribed by EPA. There project are; (1) maintenance dredging without any changes to the initial footprint, (2) removing vegetation by local plot owners, (3) clearing roads for new housing plots after getting approval from island Council, (4) drilling borehole on land for extracting water.

3.2.1.3 3rd amendment to the Environmental Impact Regulation 2012 (2016/R-66)

One of the major amendments to the EIA regulation with this amendment is that the EIA consultants are classified into 2 categories (article 16). To be eligible for a category A consultant, the applicant should hold a minimum of level 7 qualification in an environment related field recognized by the Maldives National Qualification Framework. Likewise, to be eligible for a category B consultant, the applicant should hold a minimum of level 7 qualification in specific fields relevant for the nature of the project recognized by the Maldives National Qualification Framework. Additional detailed amendments made to the relevant articles are discussed below;

- Article 5 was amended to mention the implementing agency to be EPA on behalf of the Ministry.
- Article 6 was amended such that except for EMP and Environmental monitoring reports, all other reports under this regulation shall be made by a registered EIA Consultant. Further points were added to the article which mentions to submit data which could be used for environmental monitoring and the proponent must inform the Ministry in writing prior to commencement of the project once the approval has been granted for a project.

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- Article 11 was amended such that while applying for EIA, the ToR must be submitted in an editable format along with the application form and project brief. Furthermore, it is now mentioned that that the ToR must be agreed upon during the scoping meeting and that only another registered EIA Consultant could replace the projects EIA Consultant if he cannot attend the scoping meeting, and the proponent could apply for an extension on the validity of the ToR during a 1-year period from the scoping meeting date.
- Article 13 was amended to include more guidelines on how to manage the EIA review process. An additional point was also added which gives the authority to EPA to conduct a review meeting with the Consultant and Proponent if they deem necessary.
- Article 14 was amended to include 2 more points which states that the Environmental DS must have the parameters for the environmental monitoring report and the schedule. The Ministry could ask the proponent to submit environmental monitoring reports up to 5 years or more if the Ministry deems necessary. Additionally, the proponent must share the Environmental DS with the Contractor ad a copy of this Environmental DS and a copy of the approved EIA report must be made available at the project site.
- Article 20 was amended to include the guideline on how to penalize offences under this regulation.

3.2.1.4 4th amendment to the Environmental Impact Regulation 2012 (2017/R-7)

Under this amendment the Schedule U which was added under the 2nd amendment to the EIA regulation (2015/R-174) was amended to include two more type of projects; (5) all projects except for the projects mentioned in point N of this schedule for newly reclaimed areas on natural islands until three years from the reclaimed date, (6) all projects except for the projects mentioned in point N of this schedule for newly reclaimed islands until three years from the reclamation date. The projects mentioned in point N of this schedule are any project that involves dangerous chemicals, oil storage, incinerators, release of toxic chemicals to atmosphere, and fiber works.

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However, if the reclaimed lands were to be populated then any major developmental project shall be subjected to EIA.

3.2.1.5 5th amendment to the Environmental Impact Regulation 2012 (2018/R-131)

With this 5th amendment, Tourism related developments are again included under this regulation. Additionally, the Schedule D was amended to include tourist resort development and tourist hotel developments in the inclusive list for EIAs.

3.2.2 Carrying Capacity for Islands to be developed as Tourist Resorts

A set of standards has been imposed under this regulation to ensure preservation of the natural beauty and the environment of the islands as well as the consumer's image of the islands. As such, the following guidelines are provided:

- The felling of trees has to be carried out evenly throughout the island with the intention of conserving the natural façade and the beauty of the island.
- Sufficient trees have to be left untouched when clearing trees for construction in order that they block the view of the buildings. All buildings, including two storey buildings are to be constructed below the highest canopy level so that they are not visible above the treetops.
- The maximum number of buildings to be constructed on the island should be dependent on how much space can be cleared of vegetation, with consideration of the above factors.
- The maximum area utilized for the construction of buildings should not exceed 20% of the total land area.
- All buildings should be located at least 5 m landwards from the vegetation line of the island. In the event that over water bungalows are built on the reef flat or lagoon, an equal area has to be left free on the island.
- To provide the visiting guests with sufficient beach area, the guest rooms should face the beach with a minimum of 5 m of beach allocated for each room

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3.2.3 Disposal of Garbage from Tourist Resorts

- Garbage from the resorts should be disposed of appropriately to avoid impacts on the environment. Waste disposed of at sea should be thrown away far out to sea, ensuring that it does not get washed back on the beach of any islands.
- All resorts are required to have incinerators and compactors to be utilized for burning all flammable material and compact the cans respectively. Glass is to be broken into small pieces and plastic and polythene bags burnt.
- A fine between Rf100 and Rf2000 is to be charged if the regulation is breached, and the sum doubled for those who violate it a second time.
- In addition to the Maldives Tourism Act and the relevant Regulations, there are Circulars issued by the Ministry of Tourism, advising the Tourism industry of their new policies or strengthening the existing ones.
- Circular no. 21/90 (21.04.1990) advices all resorts having filled jetties to be modified so that they allow free flow of currents through them or new jetties composed of reinforced concerted stilts to be built in their place by the end of June 1991.
- Circular no. CIR-ES/98/07 issued on the 27th of January 1998 states that all resorts have to obtain permission from the Ministry of Tourism before commencing any coastal modifications. Hard engineering solutions are discouraged while environmentally friendly structures are supported.
- Circular no. 88-ES/CIR/2002/12 (05.05.2002) deals with the proper disposal of garbage from the resorts in response to concerns that floating garbage from resort islands were washing up on beaches of nearby islands

3.2.4 Waste Management Regulation (2013/R-58)

The waste management regulation dictates the principles needed to follow when handling waste. The aim is to minimize adverse impacts to the environment and human health from waste. Under this regulation, island councils are required to make a waste management plan and submit

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it to the competent authority. This plan must be reviewed at least every five years. Relevant articles under this regulation pertaining to the proposed project are:-

- Article 8 states that hazardous waste are specified in Schedule J and under no circumstance should it be burned or disposed off in any area of the Maldives. While transporting hazardous waste, it must be in a closed container without any leaks. Further a sign must be on the container, specifying that it is hazardous waste. The import of any hazardous waste mentioned in Schedule J to Maldives is an offense.
- Article 11 states that waste generated at islands must be disposed off in areas specified for the purpose or areas approved by competent authority. Disposal of waste to following areas is prohibited under this regulation and is an offense;
    - Mangroves
    - Island Lagoon
    - Reef
    - Lagoon(falhu)
    - Finolhu
    - Beach
    - Vegetation line
    - Harbor
    - Park
    - Road

Approval to dispose waste to areas not approved by competent authority will be given under following circumstances;

1. Waste is disposed as a measure to protect human health
2. Situation created by natural disaster or a state of emergency

Approval to manage waste at household level is not required for the following actions;

1. Waste segregation at household
2. Composting at household

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- Article 12 states that anybody responsible for public sites must place and manage a dustbin. The waste in these dustbins must be managed according to this regulation. Disposal of waste to public sites (besides the dustbin) is an offense.
- Article 16 states that approval must be taken from the competent authority for the following waste management works
    1. Waste collection
    2. Transportation of waste by land and sea
    3. Waste treatment
    4. Storage of waste
    5. Management of waste disposal sites
    6. Landfill
    7. Handling of hazardous waste

The number of waste management approvals for a particular area or areas will be decided by the competent authority based on the following;

1. Waste generation
2. Economic gains from waste management actions
3. Environmental protection requirements for the area

- Article 25 states that waste must be transported from one place to another in accordance with the standards set in schedule A of this regulation. If waste is to be removed from an Island, it should be taken to a regional waste management facility.

3.2.4.1 1st amendment to waste management regulation (2014/R-10)

This amendment only included the amendment of dates to start implementing articles of this regulation (article 4).

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3.2.4.2 2nd amendment to waste management regulation (2014/R-10)

This amendment also only included the amendment of dates to start implementing articles of this regulation (article 4). The date to implement the articles 13, 14, and 16 were amended to 05th October 2014.

3.2.4.3 3rd amendment to waste management regulation (2017/R-90)

This amendment included amendments to the schedule A and K of this regulation. Further article 25 was amended to include that action will be taken against parties which does not transport waste according to the standards set under this regulation.

3.2.4.4 4th amendment to waste management regulation (2018/R-63)

With this amendment the most notable, was the establishment of a system for fining offences under this regulation under Schedule N. Further article 25 was amended such that waste that needs to be removed from an Island must be taken to the nearest waste management center.

3.2.4.5 5th amendment to waste management regulation (2021/R-109)

With this amendment the most notable, was that waste management responsibility can be assigned to Councils and waste management plans need to be made at Island level.

3.2.5 Regulation on Environmental Liabilities (2011/R-9)

This regulation was made in order to emphasize on sustainable development according to Article 22 of the Constitution of the Republic of Maldives 2008 and penalize environmental

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offences to the regulations made under Environmental Protection and Preservation Act (4/93) in the intention to prevent such offences. Relevant articles under this regulation pertaining to the proposed project are:-

- Article 5 states that this regulation will be implemented by the EPA on behalf of the Ministry of Environment, Climate change and Technology.
- Article 7 states that, if there is a potential environmental damage or if there was an environmental damage due to a project, then the proponent must report to the Competent Authority and take measures to prevent such damages. The Competent Authority must assert to the proponent to implement mitigation measures.
- Article 8 states that, instead of the proponent under following circumstances the Competent Authority reserves the right to implement measures to prevent or mitigate environmental damages;
    - In an emergency
    - The proponent did not implement the mitigation measures prescribed by the Competent Authority under article 7
    - The proponent must bear the cost of implementing the mitigation measures mentioned in article 7 and for inspection visits from the Competent Authority
- Article 9 states that, for potential environmental damages imposed for works done by getting written approval from a government institution or advice, the cost of mitigation measures implemented maybe reclaimed from the government institution that gave the approval.
- Article 10 and 11 states that, if the Competent Authority found that there were environmental damages due to the actions of anybody, the Competent Authority could ask them to submit the mitigation measures that could be implement along with the information mentioned in Schedule 6 of this regulation.
- Article 12 states that the proponent has the right to review the decisions of the Competent Authority to the Minister if;
    - The environmental damages were not due to the actions of the proponent

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- If the decisions of the Competent Authority regarding the environmental damages were questionable by the proponent
- If the environmental damage was imposed due to the proponent following a regulation
- If the environmental damage was imposed due to a third party while the proponent was diligently following all the mitigation measures

- Article 13 states that the Competent Authority has the right to visit and inspect the project sites, take copies of the documents photographs, and samples.
- Article 14 states that when inquired by the Competent Authority about information regarding any investigations under this regulation, correct information must be provided by the inquired entity or person.
- Article 15, 16 and 17 states the procedures for fining offences for environmental liabilities.

3.2.6 Regulation on Safety Standards for Construction Work (2019/R-156)

This regulation was made under the Building Act (4/2017) with the aims to improve working conditions for laborers and to protect the general public from potential health hazards due to construction activities. Relevant articles under this regulation pertaining to the proposed project are:-

- Article 5 states that the following are Contractors responsibilities;
  - If the contractor's work exceeds MVR 1,500,000 a health and safety plan has to be prepared and followed for the safety of employees as well as the public.
  - While handling construction materials, must ensure the safety of the workers and the general public
  - Informing the workers of any potential health hazards during construction works
  - Have an emergency response plan
  - Ensure that works are proceeding in accordance with the health and safety plan
  - Providing personal protective equipment for workers and they must be trained to use the equipment

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- Ensure construction site is safe for the workers and general public
- Ensure that there is no disturbance to the general public from the construction site
- Ensure waste is managed properly at the worksite
- Ensure that the construction materials are properly stored
- Ensure that safety boards and signs are installed around the construction site

- Article 6 states that if the contractor's work exceeds MVR 1,500,000 an emergency response plan must be made and the following must be fulfilled accordingly;
  - Emergency response plan must be made available at the constructions site
  - Inform the workers on the emergency response plan and its protocols
  - Have at least 2 emergency response drills every year
  - Ensure that a first aid personnel is always available at all times at the construction site
  - First aid kit must be readily available at the construction site
  - Ensure that the equipment's in the first aid kit is in proper condition
  - Installing safety boards at the construction site
  - Contacts for Emergencies must be available on a notice board at the construction site
- Article 7 states that the contractor must appoint a safety supervisor with more than five years of experience for the project.
- Article 8 states that the responsibilities of the site safety supervisor is to carrying out daily site inspections to ensure the proper measures are being taken to ensure safety and to report to the contractor/Competent Authority if the measures are not being implemented.
- Article 9 states that if the contractor's work exceeds MVR 5,000,000, the contractor must have an insurance policy taken to compensate for any damages to the workers and the surrounding people.
- Article 10 states that all contractor's must ensure that the general public is protected from the construction site by doing the following;
  - Installing pedestrian detour boards

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- Ensure construction materials and equipment's are stored in a way that does not pose any difficulties to the general public
- Installing safety boards, fences, tapes, sheets to protect the general public

- Article 11 states that the contractor should ensure that workers are always using personal protective equipment when on site. These include safety helmets, safety boots, safety goggles, noise cancellation headphones, gloves, masks, safety belt, and other safety equipment's necessary as per the type of work.
- Article 12 states that all construction sites must be fenced off. The article also explains in details how the fence must be erected.
- Article 13 states that the contractor must ensure the required safety equipment's are provided to the works if they are handling hazardous substances.
- Article 14 explains in detail the safety procedures that must be followed while working at higher than 3 m.
- Article 15, 16, and 17 explains in detail the safety measures that must be taken while working on an overhead platform, roofs, and ladders.
- Article 18, 19 explains how scaffolding are to be used.
- Article 20, 21, 22, 23 states the safety measures that must be followed for using electrical equipment's,
- Article 24 states that the contractor must implement a chemical handling procedure for handling chemicals. The article also explains in details what is to be included in the chemical handling procedure.
- Article 25, 26, 27, 28 states the safety measures that must be followed while working with asbestos, gas cutters, and compressed gas welding.
- Article 29 states that, if there are flammable materials at the construction site, fire prevention equipment must be made available.
- Article 30, 31, and 32 states the safety measures that must be followed for using equipment's powered by mechanical power and electricity, cranes,
- Article 33 states the safety measures that must be followed for while working in closed spaces.

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- Article 34 states the measures that must be followed while decommissioning a building.
- Article 35 states the construction materials must be stored within a close area. Approval must be taken from the Competent Authority to store at the designated area and the approval must be shown on a board.
- Article 36 states the measures that must be followed while loading and unloading materials to a construction site.
- Article 37 and 38 explains the requirements for the safety board and other signs that must be installed at construction sites.
- Article 39 states that, when an accident occurs at a construction site, it must be immediately reported to the police. The record of accidents must be maintained by the contractor.
- Article 49 states that, if there is no entity responsible for implementing the measures mentioned under this regulation, then the proponent shall be responsible for implementing the measures. The proponent must report any offences against this regulation to the Ministry.
- Article 50 states that with the enforcement of this regulation the Male' Planning Regulation Chapter 3 is void.

3.2.7 Regulation on uprooting, cutting and transportation of palms and trees

This regulation was implemented on 1 February 2006 by the Ministry of Environment, Climate change and Technology, 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 a vast number of trees and palms are subjected to an EIA, which is required to be submitted to the EPA and written approval is required prior to implementation of the project. Relevant articles under this regulation pertaining to the proposed project are:-

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- Article 3 states that the following types of vegetation is prohibited to be removed;
    - Vegetation found from 15 m inland of the vegetation line
    - Vegetation found on and around 15 m of wetlands and mangroves
    - Vegetation found on any protected areas of the Maldives
    - Any protected trees
    - Vegetation which has environmentally unique characteristics
- Article 5 (a) states that, to clear large number of trees for any purpose, an EIA must first be done and approval from the competent authority must be obtained. Article 5 (b) states that, if trees are to be transported with soil, the allowable limit is an 8-inch x 10-inch black bag. Article 5 (e) states that, trees larger than what is mentioned in article 8 (a) of this regulation, must be transported with only the soil in their root balls. Article 5 (f) states that, if machinery is to be used for uprooting trees, no damages must be done to any trees besides the trees concerned for uprooting.
- Article 6 states that, if the total number of a particular species of tree is less than 05 on an island, then this species of tree can only be transported with a special permit from the Ministry of Environment, Climate change and Technology. Furthermore, this applies to trees on which birds roost or live in inhabited and uninhabited islands.
- Article 7 states that, the maximum number of trees which could be removed from an island shall be declared by the Ministry of Environment, Climate change and Technology, based on the existing numbers of trees on the Island.
- Article 8 states that, coconut trees taller than 15 feet and other trees taller than 8 feet, their limit for removal is 10 trees, to uproot greater than 10 trees require an approval from Ministry of Environment, Climate change and Technology. Smaller trees could be removed by taking an approval from Island Council and the limit for uprooting is less than 1/3rd of the trees present in the area. For any purpose uprooting and transport of trees must be done under the supervision of the Island Council on inhabited Island; personnel responsible to manage the island in case of uninhabited Island.
- Article 9 states that, after uprooting trees, the holes must be backfilled with soil. It is prohibited to put in any waste into the holes.

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- Article 10 states that, any offences against this regulation will be punishable under Act 4/93 accordingly.

3.2.7.1 1st amendment to regulation on uprooting, cutting and transportation of palms and trees (2014/R-7)

The amendment to this regulation has specified a set of categories and any tree falling under these categories is not allowed to be removed unless it is a project of the government, approved by the parliament. Relevant articles under this law pertaining to the proposed project are:-

- Article 3 was amended such that the prohibited trees for removal could be removed for a project approved by the parliament with the condition that the proponent must plant 6 trees for each tree removed instead of 2. Furthermore, a monitoring plan must be made and the proponent must implement it.
- Article 11 was amended to mention that this regulation will be enforced by the EPA on behalf of the Ministry of Environment, Climate change and Technology.

3.2.8 Regulation on management and conservation of water resources (2021/R-22)

This regulation has been formulated under the Article 17,18,19,20 and 23 of the Water and Sewerage Act (08/2020). The main purpose of the regulation is to ensure sustainable use, conservation, protection, improvement, and beneficial use of the water resources. Relevant articles under this regulation pertaining to the proposed project is:

Article 6:

- None shall do any harm or damage to the water resources.
- Groundwater and other naturally occurring water resources on the islands, shall not be utilised for any economic or business use.

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- Dewatering for building construction shall be carried out as per the relevant regulation.

Article 10: All activities shall be carried out in a manner that would not contaminate the water resources in accordance to the clause 20 of the water and sewerage act (08/2020)

Article 12: Spillage of any oil and chemical to the ground is prohibited. Oil and chemical shall be store in shaded, appropriately bunded areas and in a manner that even if the total volume of the dedicated storage is leaked, the leaked volume is able to be recovered without contamination of the soil or the groundwater. Transfer of oil and chemical on land must be carried out with appropriate safety measures to prevent spillage. Discarding of waste oil and chemicals must be carried out in a manner that does not contaminate any of the water resource, and at a facility that is approved by the regulator.

Article 17: All responsibilities of rectification of a polluted groundwater resource from spillage of oil and chemicals shall be borne by the polluter. Any incidence of groundwater pollution from oil and chemical spillage should be reported to the regulator within 24 hours. The rectification works shall be carried as per the instruction of the regulator.

3.2.9 Regulation on protection of environmentally sensitive areas (2018/R-78)

This regulation was under article 4 of the Environmental Protection and Preservation Act (4/93) in order to declare standards to declare areas for protection, manage protected areas, establish environmentally sensitive areas, establish a network of protected areas, create public awareness and participation in management of protected areas, protection and preservation of Maldivian biodiversity for future generations. According to this regulation there are 7 types of protected areas; (1) Internationally recognized areas, (2) Strategic Nature Reserve, (3) Wilderness area, (4) National Park, (5) Natural Monument, (6) Habitat / Species Management area, and (7) Protected Area with Sustainable use. Relevant articles under this regulation pertaining to the proposed project are:-

- Article 12 states that a management plan must be made in order to manage the protected areas. This management plan must reflect on the developmental plans for the region.

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3.2.10 Regulation on Construction Material Import and Production Control

The purpose of the regulation is to control the quality of imported and produced materials that are used in the construction industry. The regulation specifies the materials which would be controlled under the regulation in its annex 1. Furthermore, the regulation details out the registration requirements, permits, procedures, quality controls and applicable fine of those that breach the regulation.

3.2.11 Regulation on Construction Material and Construction materials testing facilities

Under the regulation all contractors involved in the construction industry are to be registered. The regulation includes the requirements of contractor's registration, grading, implications on participating in international tenders, insurance, project licenses, Joint venture registrations, responsibilities of the registered contractors and applicable fine for breaching the regulation.

3.2.12 Regulation on protection of old trees

This regulation was made under article 4 of the Environmental Protection and Preservation Act (4/93) in order to declare standards to manage protected trees in the Maldives. The regulation states the criteria for trees to be protected; (1) trees older than 50 years, (2) trees that are threatened to extinction locally, (3) ecologically important species, and (4) due to the request of public. Relevant articles under this regulation pertaining to the proposed project are:

- Article 6 and 7 states that a radius of 2 m from the crown of the protected tree shall be protected and while allocating land of purposes special attention must be given to not disturb such trees. Further any activities that may cause damage to the trees shall not be undertaken.

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3.2.13 Regulation on Preserving greenery and Vegetation in the Maldivian Islands (2022/R-92)

The purpose of this regulation is to encourage to plant more trees and increase greenery in the islands, protection of old trees, decentralisation of the approval process for removal of vegetation, reduction of environmental impact from vegetation removal and strengthen the reporting process of vegetation removal. According to the regulation, any tree beyond the age of 50 is protected under the regulation. The registry of trees must be maintained by the council. In islands leased for tourism and other economic ventures, the proponent must report the vegetation details annually to EPA. Furthermore, coastal vegetation belt of 20 meters must be ensured in each island. For any activity that involves removal 50-200 trees, approval of the agency must be acquired and for any activity that involves removal of more than 200 trees, an EIA must be carried out.

3.2.14 Regulation on Use, Handling, and Storage of Oil

The purpose of the regulation is to reduce fire hazards caused by the mishandling of oil, to raise awareness on the proper handling methods of oil and to standardize the infrastructure of oil handling and storage facilities.

- Article 2 of the regulation details out all the aspects of vehicles that handle and transport oil on land.
- Article 3 deals with all the aspects of petrol handling in storage areas and service centres.
- Article 4 highlights the aspects of fuel handling in diesel and kerosene service centres.

Article 5 highlights the aspects of fuel pipeline from storage to meters

3.2.15 Heritage Preservation Regulation (2020/R-37)

This regulation is brought forth under article 11 of Heritage Act (12/2019) to determine, protect, and preserve the heritage of Maldives.

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- Article 4 states that cultural heritage can be portable artefacts, historical buildings, historical sites, and cultural skills or talents such as “kasabu viyun”.
- Article 5 states that the value of a heritage item or site will be determined depending on its historical importance, age, category, preservation of authentic condition, and amount of damage.
- Article 6 states that National Center for Cultural Heritage must be informed within 48 hours via the respective island (if from an inhabited island) or atoll council (if from an an inhabited island) if any historical items or sites that could be a heritage item or site is found. Portable artefacts must immediately be handed over to the island or atoll council without any damage.
- Article 6 also states that if the landowner refuses NCCH from assessing the site or items found or refuses to adhere to NCCH’s advice on how to deal with items or site, NCCH can acquire a court order under the Heritage Act (12/2019).
- Article 8 states that a 50 feet distance surrounding a heritage site will be protected. And if this distance cannot be acquired, then an adequate distance will be determined by NCCH and council after assessing the importance of the site. No developmental plans aside from those decided by NCCH can be carried out in this area without approval from NCCH.
- Article 9 states that if anybody wishes to excavate or search for heritage artefacts from a predicted historical site, necessary permits must be taken from NCCH.
- Article 12 states no heritage artefacts can only be moved within the country or abroad by its legal owner or guardian with permit from NCCH.
- Article 16 states that:
    - Damaging historical artefacts or sites will be fined an amount between MVR200,000 and MVR1000,000, and trying to damage one will be fined an amount between MVR10,000 and MVR 500,000.
    - Changing the authentic form of any heritage artefacts or sites will be fined an amount between MVR100,000 and MVR800,000, and trying to change one will be fined an amount between MVR10,000 and MVR 300,000.

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- Illegally importing or exporting heritage artefacts of Maldives or any other country will be fined an amount between MVR100,000 and MVR500,000, and trying to import or export will be fined an amount between MVR10,000 and MVR 100,000.
- Excavating sites to acquire valuable artefacts without the permission of NCCH will be fined an amount between MVR10,000 and MVR100,000, and trying to excavate without permission will be fined with MVR10,000.
- Not informing NCCH or the local council when an artefact or site is found while excavating any area in Maldives will be fined with an amount between MVR10,000 and MVR100,000.
- Spreading false rumors or information regarding heritage artefacts will be fined an amount between MVR10,000 and MVR50,000.

3.2.16 Built environment regulations

This regulation underlines the general guidelines for inhabited islands, uninhabited islands and islands used for other purposes to plan the development accordingly based on population, size, the type of works done on the island and other factors that should be taken into account. All islands are categorized according to the above-mentioned factors to regulate the development activities. Relevant articles under this regulation pertaining to the proposed project are:-

- Article 1.2 states that the Ministry of Housing and Urban Development shall be responsible for monitoring and implementation of Land Use Planning under this regulation with the directions from other relevant government Authorities.
- Article 12 states that if there are any environmentally sensitives sites on any island it shall be protected. However, this does not mean that these areas should be left untouched without any use, rather these areas shall be made use for recreational purposes or some other beneficial purpose without damaging these sites.
- Article 12.2 states that a 20 m buffer zone must be set around all Islands from the coast. However, at harbor area or other commercial areas, if adequate land is unavailable this buffer zone could be reduced.

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Annex 1 of the regulation;

- Article 5.4 states that a minimum of 200 feet buffer zone must be set from an STP to residential areas, recreational areas, parks, social spaces, or any places that produce food or drink (fish drying, water storage tank).
- 5.5.1 states that maximum area that can be allocated for a powerhouse is 45m x 45m.
- 5.5.2 states that a distance of at least 200ft shall be kept between the residential area and the powerhouse.
- 5.5.3 states that if the criteria mentioned above is not met for the island, the Ministry of Housing and Urban Development shall be consulted.
- Article 5.6 states that land for Desalination plants shall be allocated by the Ministry of Housing and Urban Development as advised by Ministry of Environment, Energy and Water.

3.2.17 Maldives National Building Code (2019/R-1020)

The Maldives National Building Code R-1020 has been published in the year 2019 and consists of the following chapters.

Part I: building code for type 1 buildings.

- Clause A1 (Classified users): For the purposes of this building code, Type 1 Buildings are classified according to type, under seven categories. A building with a given classified use may have one or more intended uses. The seven categories are:
    - Housing
    - Communal residential
    - Communal non-residential
    - Commercial
    - Industrial
    - Outbuildings
    - Ancillary

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- Clause A2 (Interpretation): In PART II of building code unless the context otherwise requires, words shall have the meanings given under this Clause
- Clause B1 (Structure): The objective of this provision is to:
    - Safeguard people from injury caused by structural failure,
    - Safeguard people from loss of amenity caused by structural behaviour, and
    - Protect other property from physical damage caused by structural failure
- Clause B2 (Durability): The objective of this provision is to ensure that a Type 1 Building will, throughout its life, continue to satisfy the other objectives of this code
- Clause C1(means of escape): The objective of this provision is to:
    - Safeguard people from injury or illness from a fire while escaping to a safe place
    - Facilitate fire rescue operation
- Clause C2 (spread of fire): The objective of this provision is to:
    - Safeguard people from injury or illness when evacuating a Type 1 Building during fire.
    - Provide protection to fire service personnel during firefighting operations.
    - Protect adjacent household units and other property from the effects of fire.
    - Safeguard the environment from adverse effects of fire
- Clause C3 (structural stability during a fire): The objective of this provision is to:
    - Safeguard people from injury due to loss of structural stability during fire, and
    - Protect household units and other properties from damage due to structural instability caused by fire.
- Clause C4 (access & facilities for the fire services): The objective of this provision is to:
    - Provide reasonable facilities to assist fire fighters in the protection of life
    - Enable fire appliances to gain access to the building.
- Clause D1(access routes): The objective of this provision is to:
    - Safeguard people from injury during movement into, within and out of Type 1 buildings,

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- Safeguard people from injury resulting from the movement of vehicles into, within and out of Type 1 buildings, and
- Ensure that people with disabilities are able to enter and carry out normal activities and functions within Type 1 buildings.

- Clause D2 (mechanical installations for access): The objective of this provision is to:
  - Safeguard people from injury and loss of amenity while using mechanical installations for movement into, within and out of Type 1 buildings,
  - Safeguard maintenance personnel from injury while servicing mechanical installations for access, and
  - Ensure that people with disabilities are able to carry out normal activities and processes within Type 1 buildings
- Clause E1(surface water): The objective of this provision is to:
  - Safeguard people from injury or illness, and other property from damage, caused by surface water
  - Protect the outfalls of drainage systems.
- Clause E2 (external moisture): The objective of this provision is to safeguard people from illness or injury which could result from external moisture entering the Type 1 building
- Clause E3 (internal moisture): The objective of this provision is to:
  - Safeguard people against illness or injury which could result from accumulation of internal moisture
  - Protect household units and other properties from damage caused by free water from occupancy in the same building.
- Clause F1(hazardous agents on site): The objective of this provision is to safeguard people from injury or illness caused by hazardous agents or contaminants on a site
- Clause F2 (hazardous building materials): The objective of this provision is to safeguard people from injury and illness caused by exposure to hazardous building materials.

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- Clause F3 (hazardous substances and processes): The objective of this provision is to safeguard people from injury or illness, and other property from damage, caused by hazardous substances or processes in buildings
- Clause F4 (Safety from Falling): The objective of this provision is to safeguard people from injury caused by falling
- Clause F5 (Construction and Demolition hazards): The objective of this provision is to safeguard people from injury, and other property from damage, caused by construction or demolition site hazards.
- Clause F6 (lighting for emergency) : The objective of this provision is to safeguard people from injury due to inadequate lighting being available during an emergency
- Clause F7 (warning systems) : The objective of this provision is to safeguard people from injury or illness due to lack of awareness of an emergency
- Clause F8 (signs) : The objective of this provision is to:
    - Safeguard people from injury or illness resulting from inadequate
    - identification of escape routes, or of hazards within or about the Type 1 building,
    - Safeguard people from loss of amenity due to inadequate direction, and
    - Ensure that people with disabilities are able to carry out normal activities and processes within buildings
- Clause G1(personal hygiene) : The objective of this provision is to:
    - Safeguard people from illness caused by infection or contamination,
    - Safeguard people from loss of amenity arising from the absence of appropriate personal hygiene facilities, and
    - Ensure people with disabilities are able to carry out normal activities and processes within Type 1 buildings.
- Clause G2 (laundering) : The objective of this provision is to ensure:
    - Adequate amenities for people to do laundering, and
    - That people with disabilities are able to carry out normal activities and processes within Type 1 buildings

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- Clause G3 (food preparation and prevention of contamination) : The objective of this provision is to:
    - Safeguard people from illness due to contamination,
    - Enable hygienic food preparation without loss of amenity, and
    - Ensure that people with disabilities are able to carry out normal activities and processes within Type 1 buildings
- Clause G4 (ventilation) : The objective of this provision is to safeguard people from illness or loss of amenity due to lack of fresh air.
- Clause G5 (interior environment) : The objective of this provision is to:
    - Safeguard people from illness caused by excessive air temperature,
    - Safeguard people from injury or loss of amenity caused by inadequate activity space,
    - Ensure that people with disabilities are able to carry out normal activities and processes within Type 1 buildings
- Clause G6 (airborne and impact sound) : The objective of this provision is to safeguard people from illness or loss of amenity as a result of undue noise being transmitted between abutting occupancies
- Clause G7 (Natural Light): The objective of this provision is to safeguard people from illness or loss of amenity due to isolation from natural light and the outside environment.
- Clause G8 (Artificial light): The objective of this provision is to safeguard people from injury due to lack of adequate lighting.
- Clause G9 (Electricity): The objective of this provision is to ensure that: In Type 1 buildings supplied with electricity, the electrical installation has safeguards against outbreak of fire and personal injury
- Clause G10 (Piped service) : The objective of this provision is to safeguard people from injury or illness caused by extreme temperatures or hazardous substances associated with building services.
- Clause G11(gas as an energy source): The objective of this provision is to:
    - Safeguard people from injury arising from the use of gas as an energy source,

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- Safeguard people and other property from the risk of fire or explosion, and
- Safeguard people from loss of amenity due to the gas supply being inadequate for the intended use.

- Clause G12 (water supplies): The objective of this provision is to:
  - Safeguard people from illness caused by infection from contaminated water or food,
  - Safeguard people from injury due to the explosion of a pressure vessel or from contact with excessively hot water,
  - Ensure that people with disabilities are able to carry out normal activities and functions within Type 1 buildings
- Clause G13(Foul water) : The objective of this provision is to:
  - Safeguard people from illness due to infection or contamination resulting from personal hygiene activities, and
  - Safeguard people from loss of amenity due to the presence of unpleasant odours or the accumulation of offensive matter resulting from foul water disposal
- Clause G14 (industrial liquid waste) : The objective of this provision is to safeguard people from injury or illness caused by infection or contamination resulting from industrial liquid waste
- Clause G15 (solid waste) : The objective of this provision is to safeguard people from injury or illness caused by infection or contamination from solid waste
- Clause H1 (energy efficiency) : The objective of this provision is to facilitate efficient use of energy.

3.3 Guidelines and Technical Specifications

This section describes the applicable guidelines and technical specifications pertaining to this proposed project.

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3.3.1 Guideline for Uprooting, Cutting and Transportation of Palms and Trees (published on 06th June 2017)

This guideline was made under Article 5(a) of the regulation on uprooting, cutting and transportation of palms and trees, to specify the guideline for giving approval to uprooting, cutting and transportation of trees. Relevant articles under this guideline pertaining to the proposed project are:-

- Article 3 states that while giving approval for uprooting, cutting and transportation of trees for any project, the following must be fulfilled;
    - The project strictly requires land clearance
    - The budget for the project has been approved
    - Approval from the relevant government body for the project
- Article 4 states that, in order to obtain approval for uprooting, cutting and transportation of trees under this guideline, the proponent must apply for approval from EPA through the application form on Schedule 1.
- Article 5 states the procedure for giving approval for uprooting, cutting and transportation of trees. The first step is for the proponent to submit information on the type, size, numbers and location of trees to EPA. If there are no prohibited trees to be removed in the area and if the total number of trees to be removed is less than 200 or the land clearance area is less than 8250 m^2, then approval shall be given under this guideline with a set of mitigation measures to be followed by the proponent.

3.3.2 Requirement for Fire Prevention Equipment in the building

This is a guideline enforced by the Ministry of Defense and National Security of the Maldives which sets out a list of requirements and standards that need to be met in fire prevention equipment provided in buildings prone to fire hazards. As the whole guideline pertains to any power generating facility, hence to this project, the main points have been highlighted as follows:-

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- **Hose reel**: Should comply with the specified standards under the guideline. The overall width of the reel should be no more than 850mm. The overall height of the Reel should be less than 850mm including Hose and integral Flexi guide for hose withdrawal guide. The overall depth of the hose reel should be no more than 150mm. The colour of the Reel should be Red, fitted with an operating instruction plate. The Hose Reels nozzle retainer or hose guide and the inlet valve should be fitted at a height of about 900mm above floor level;
- **Hose reel cabinets**: The hose reel cabinet should be Recess mounting type with or without glass-paneled door for use with the above-mentioned sized Hose Reels. Hose Reel Cabinet dimension should be no more than 900mm in width, 900mm in height, 160mm in depth (including door). The colour of the cabinet should be Red. Special permission should be taken for other Colour. Recessed Latch Type handle should be installed. Hose reel signage should be in accordance with BS 5499 or any other equable International Standard. Fixing hole should be provided;
- **Water supply for hose reel system**: Should be such that when the two topmost reels in the building are used simultaneously, each should provide a jet of about 6 m in length and will deliver less than 0.5 L. Minimum storage required for the hose reel is 2275 L and 1137.5 L up to a maximum of 9100 L for each additional reel. Tanks supplying water for domestic purposes should not be used as a suction tank for hose reel installation. The pipings for the supply of water for hose reel should be in and out galvanized schedule 40. Diameter of the piping should not be less than 50 mm;
- **Hose reel booster pump system**: Hose reel booster pump set, complete with in and out galvanized steel pipework with or without expansion vessels;
- **Fire extinguishers**: 2kg CO_2 stored pressure Extinguisher approved to BS EN 3. Aluminium Alloy Body approved to BS5045 Part 3 or any other equable International Standard. Red body with black band or Black colored head cap, swivel Horn, English screen. Fully charged. 6 Kg DCP Extinguisher (Gas Cartridge Type) approved to BS EN 3 or any other equable International Standard. Blue Body Headcap, English Screen, Fully charged. 9 Liter Water Extinguisher (Gas Cartridge Type) approved to BS EN 3 or any other equable International Standard. Red Body Headcap, English Screen, Fully

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charged. Fire Extinguishers should be located in conspicuous positions on brackets or stands where they will be readily seen by person. The carrying handle of larger heavier extinguishers should be about 01m from the floor level. But smaller extinguishers should be mounted so as to position the handle 1.5m from the floor level;

- **Cabinets for fire extinguishers**: Cabinets for fire extinguishers should be of stainless steel with or without glass-fronted doors. The colour of the cabinet should be Red or to suit the requirements of architectural surroundings. Recessed Latch Type handle should be installed. Fire Extinguisher Single Cabinets dimension should be no more than 190mm in width, 640mm in height, 180mm in depth (including door). Fire Extinguisher Double Cabinets dimension should be no more than 440mm in width, 640mm in height, 180mm in depth (including door);
- **Fire Blankets**: Fire Blankets should be certified to BS EN 1869: 1997 or any other equable International Standard. Fire Blankets should be extremely flexible and drape easily the slim pack of fire blanket should be Red or White;
- **Dry riser gate valve**: Dry riser gate valve to BS 5041/2, or any other equable International Standard, Gunmetal c/w Padlock strap, blank cap and chain. Inlet 2 ½" ASA 150 F/F. Outlet 2 ½" Inst. Female couplings to BS 336. Colour red;
- **Dry riser outlet box**: Dry riser outlet box for Dry Riser gate valve. Construction should be similar to BS 5041. Standard finish colour Red. Dry Riser outlet cabinet dimension should be as specified in the guideline;
- **Pumping in breeching**: Twin pumping in breeching, approved to BS 5041, or any other equable International Standard, Gunmetal inlets 2 x 2 ½" BS Instantaneous Male Coupling c/w non-return valves. Outlet 4" ANSI 150 F/F flange;
- **Dry riser inlet box**: Dry Riser inlet box for horizontal/vertical pattern. Double inlet to BS 5041 or any other equable International Standard finish color Red. Dry riser inlet cabinet dimension for flush mounting should be as specified in the guideline.
- **Air release valve**: Air release valve, Gunmetal, Inlet 1" BSP Male;
- **Piping for dry riser system**: The Piping for Dry Riser System should be In and Out Galvanized schedule 40. The diameter of the Piping should be not less than 100mm.

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- **Fire doors**: All fire doors should be opened to the direction of the flow of people while on emergency. These doors should be installed with a self-closing device including the Panic Latch. These Panic Latch devices should conform to BS 5725 Pt 1 or any other equable International Standard. Fire doors conforming to the method of construction as stipulated in the guideline;
- **Fire exit signs**: Photoluminescent Fire exit signs should sign each Fire Exit Door. The Symbol height should be no more than 100mm;
- **Fire detection and alarm system**: Fire Detection and Alarm System should conform to BS 5839 or any other equable International Standard. Fire Detection and Alarm System should be Analogue Addressable System with mimic diagram. A system in which signals from each detector and/or call point are individually identified at the control panel. Fire Detection and Alarm System should consist of Automatic Detectors, Manual Call Points, Control and Indicating equipment, etc. It should also cover System capable of providing signals to initiate, in the event of fire, the operation of ancillary services such as fixed fire extinguishing systems and other precautions and actions. Main Fire Control Panel should be located at the reception and the Repeater Panel should be located in the guardroom;
- **Installation and testing of wet riser system**: Wet rising systems shall be provided in every building in which the topmost floor is more than 30.5 meters above the fire appliance access level. A hose connection shall be provided in each firefighting access lobby. Wet risers shall be of minimum 152.4 millimeters diameter and shall be hydrostatically tested at a pressure 50% above the working pressure required and not less than 14 bars for at least twenty-four hours. Each wet riser outlet shall comprise standard 63.5 millimeters instantaneous coupling fitted with a hose of not less than 38.1 millimeters diameter equipped with an approved typed cradle and a variable fog nozzle. A wet riser shall be provided in every staircase which extends from the ground floor level to the roof and shall be equipped with a three-way 63.5 millimeters outlet above the roofline. Each stage of the wet riser shall not exceed 61 metres unless expressly permitted by D.G.F.S but in no case exceeding 70.15 meters;

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- **Wet or dry rising systems for buildings under construction**: Where either wet or dry riser system is required, at least one rise shall be installed when the building under construction has reached a height of above the level of the fire brigade pumping inlet with connections thereto located adjacent to a useable staircase. Such riser shall be extended as construction progress to within two floors of the topmost floor under construction and where the designed height of the building requires the installation of wet riser system fire pumps, water storage tanks, and water main connections shall be provided to serve the riser;
- **Wet riser booster pump system**: Wet riser booster pump set, complete with In and Out galvanized steel pipework with or without expansion vessel and specified in the guideline;
- Symbols, as well as installation of firefighting systems on the basis of building usage, are outlined on the table in the guideline; and
- All equipment mentioned above should be approved by the Maldives National Defense Force (MNDF) fire and rescue services before installation. Special permission should be taken if different from the guideline specifications.

3.4 International Conventions, Plans and Programs

This section describes international conventions, plans and programs that are relevant to the proposed development.

3.4.1 United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol

UNFCCC is the first binding international legal instrument that deals directly with the threat of climate change. It was enacted at the 1992 Earth Summit in Rio de Janeiro and came into force on the 21st of March 1994.

Signatory countries have agreed to take action to achieve the goal outlined in Article 2 of the Convention which addresses the “stabilization of greenhouse gas concentrations in the

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atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system," Thus all Parties to the Convention are committed under Article 4 to adopt national programs for mitigating climate change, promote sustainable management and conservation of greenhouse gas (GHG) sinks such as coral reefs, to develop adaptation strategies, to address climate change in relevant social, economic and environmental policies, to cooperate in technical, scientific and educational matters and to promote scientific research and exchange of information.

The Kyoto Protocol entered into force on the 16th of February 2005 and is an international and legally binding agreement to reduce GHG emissions globally. It strengthens the Convention by committing Annex I Parties to individual, legally-binding targets to achieve limitations or reductions in their GHG emissions. Maldives has signed and ratified both the Convention and the Protocol.

3.4.2 Paris Agreement

The Paris Agreement is also an agreement within the framework of the UNFCCC dealing with GHG emission mitigation, adaptation and finance proposed to start in the year 2020. Upon opening for signatories on 22 April 2016, 180 UNFCCC members have signed the treaty (including Maldives), however, only 22 of which ratified it so far which is not enough for the treaty to enter into force yet. The aim of the convention as described in Article 2 of the treaty is "enhancing the implementation" of the UNFCCC through:-

i. Holding the increase in global average temperature to well below 2° C above pre-industrial level and to pursue efforts to limit the temperature increase to 1.5° C above pre-industrial levels, recognising that this would significantly reduce the risk and impacts of climate change;
ii. Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and lower GHG emissions development in a manner that does not threaten food production; and
iii. Making finance flows consistent with a pathway towards low GHG emissions and climate resilient development.

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3.4.3 The Vienna Convention for the Protection of the Ozone Layer

The Vienna Convention for the Protection of the Ozone Layer is a multilateral environmental agreement which entered into force in 1988. It acts as a framework for the international efforts to protect the ozone layer. In 2009, the Vienna Convention became the first convention of any kind to achieve universal ratification. The objective of the Convention were for the Parties to promote corporation by means of systematic observations, research and information exchange on the effects of human activities on the ozone layer and to adopt legislative or administrative measures against activities likely to have adverse effects on the ozone layer. Maldives has signed and ratified this convention and adheres to it.

3.4.4 The Montreal Protocol on Substances that Deplete the Ozone Layer

The Montreal Protocol on Substances that Deplete the Ozone Layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer) is an international treaty designed to reduce production and consumption of ozone depleting substances in order to phase out the production and abundance of substances that are responsible for depletion of the ozone layer. This protocol entered into force on 1 January 1989. Since its adoption, it has undergone 8 revisions and the Maldives abide by 4 of those addendums mentioned below:-

- The London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1990);
- 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); and
- The Beijing Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1999).

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3.4.5 Agenda 21

Agenda 21 is a non-binding voluntary implemented action plan of the United Nations (UN) with regards to sustainable development. It is a comprehensive plan of actions taken globally, nationally and locally by organizations of the United Nations System, Governments and Major Groups in every area in which humans impact on the environment. It is also an outcome of the Earth Summit (UN Conference of Environment and Development) held in Rio De Jeneiro, Brazil in 1992. Maldives is among the 178 countries which adopted this action plan. Out of the 4 sections it is grouped into, the proposed development pertains to:-

i. Section I: *Social and Economic Dimensions* which is directed towards combating poverty, especially in developing countries, changing consumption patterns, promoting health, achieving a more sustainable population and sustainable settlement in decision making; and
ii. Section II: *Conservation and Management of Resources for Development* which includes atmospheric protection, combating deforestation, protecting fragile environments, conservation of biodiversity, control of pollution and the management of biotechnology and radioactive wastes.

3.4.6 Sustainable Development Goals

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

The Sustainable Development Goals are:

- No Poverty

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- Zero Hunger
- Good Health and Well-being
- Quality Education
- Gender Equality
- Clean Water and Sanitation
- Affordable and Clean Energy
- Decent Work and Economic Growth
- Industry, Innovation, and Infrastructure
- Reducing Inequality
- Sustainable Cities and Communities
- Responsible Consumption and Production
- Climate Action
- Life Below Water
- Life On Land
- Peace, Justice, and Strong Institutions
- Partnerships for the Goals

3.4.7 Convention on Biological Diversity (CBD)

The Convention on Biological Diversity (CBD), formally known as the Biodiversity Convention, is a multilateral treaty which entered into force on 29 December 1993. The convention has 3 main goals:-

i. Conservation of biodiversity;
ii. Sustainable use of its components; and
iii. Fair and equitable sharing of benefits arising from genetic resources.

The objectives of the convention is to develop national strategies for the conservation and sustainable use of biodiversity.

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3.4.8 Washington Declaration on Protection of the Marine Environment from Land-based Activities

Maldives is a signatory to the Washington Declaration on Protection of the Marine Environment from Land-based Activities which intends at setting a common goal sustained and effective action to deal with all land-based impacts upon the marine environment, specifically those resulting from sewage, persistent organic pollutants, radioactive substance, heavy metals, oils (hydrocarbons), nutrients, sediment mobilization, litter and physical alteration and destruction of habitat.

3.4.9 Regional plans and programs

In addition to the international treaties and conventions, Maldives is also a key player in the formulating and adopting of various regional plans and programs to protect the environment by actively participating in activities organised by several regional bodies. As such, Maldives is committed to the following which pertains to the proposed project: -

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

3.5 Required Permits and Approvals

The following permits and approvals shall be obtained from the relevant authority prior to commencement of construction phase of the project:-

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Table 4. Permits and Approvals required for the proposed development

Permits/Approvals	Approving Agency/Authority	Status
Concept Approval	MoT	Completed
EIA Decision Statement	EPA	Ongoing through the current EIA

3.6 Compliance of the Proposed Proposal to Statutory Requirements

All statutory requirements pertaining to this project shall be adhered to by the proponent during detail design phase, construction and operational phase. Furthermore, any changes to the legislative framework shall be considered and required changes shall be brought to project components as necessary.

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4. PROJECT DESCRIPTION

This chapter describes the specific components of the proposed project in detail as per the approved ToR which is given the appendix section Appendix C of this EIA report.

4.1 Project location

Angaga Island Resort and Spa is located towards the southern end of South Ari Atoll with coordinates of 258056.92m Easting and 404026.80m Northing. The size of the island is approximately 42,372 sqm and found approximately 98km away from Velana International Airport. The Figure 3 shows the location of the island Angaagaa in the South Ari Atoll and the Figure 4 shows the location of the proposed project.

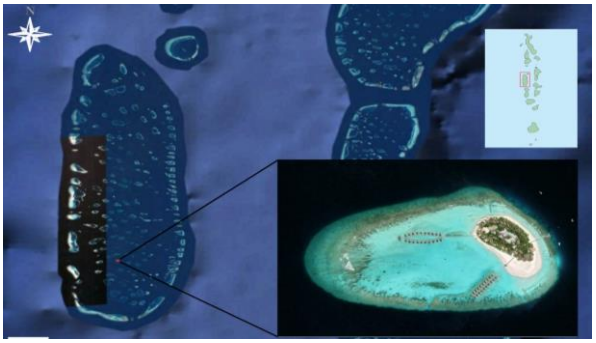

Figure 3: location of angaga in South Ari Atoll

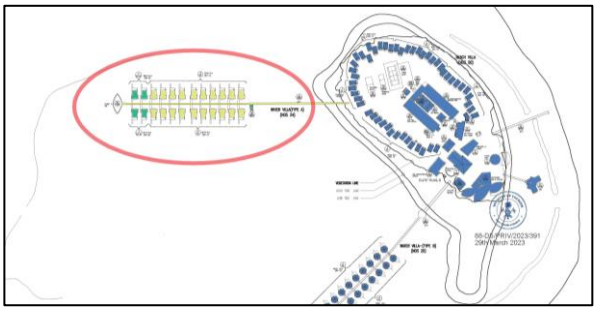

Figure 4: project location

The following Figure 5 shows the environmental sensitive and protected areas around 5km from the project site. For protected areas, ADh.Hurasdhoo is around 5km away from the project site. Further, at 1.5km away from project location, the environmentally sensitive site of angaga thila is located which is known for frequent turtle sightings.

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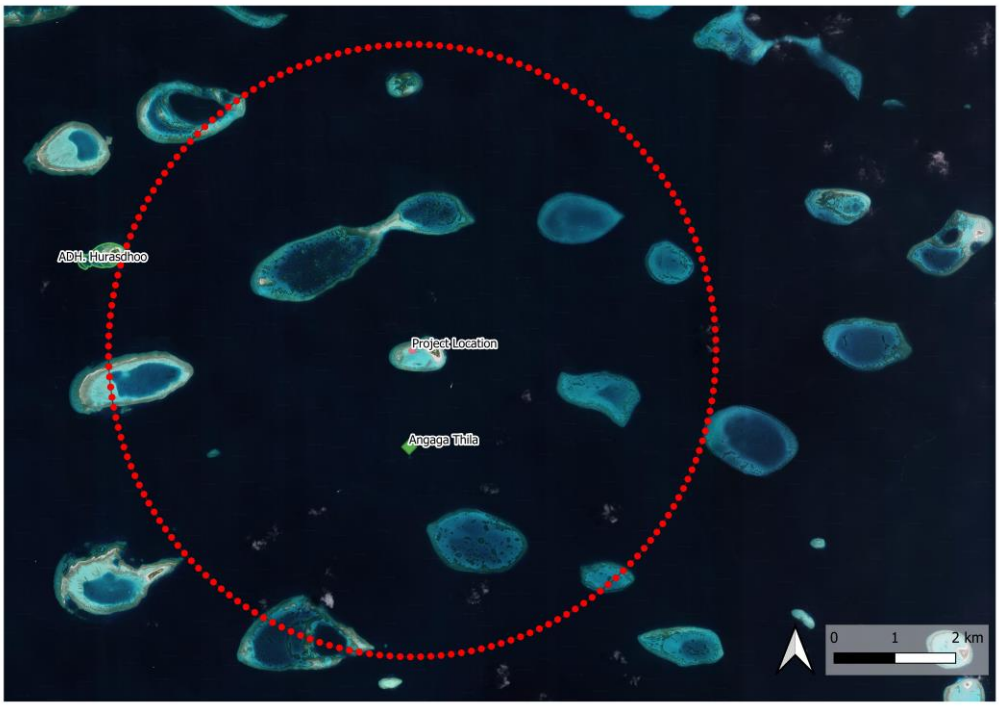

Figure 5: environmentally protected and sensitive areas in project vicinity (5 kilometers)

4.2 Project overview

Angaga Island Resort and Spa is looking to upgrade its facilities with some additional structures along with some modifications over the current building scheme. Essentially the upgrade is required as the water villas has reached its end-of-life cycle as per the manufacturer and the wood footings of the water villas are damaged. As such the resort wishes to completely demolish the existing water villas and construct new water villas at the same footprint with the addition of 4 new villas and some changes to the villa designs. The Figure 6 show a partial print of the proposed project component, the components highlighted in yellow are existing components out of which the overwater villas will be demolished and renewed. The components in green are areas of new development with additional structures to the existing facility. The approved site plan is provided in appendix D of this EIA report.

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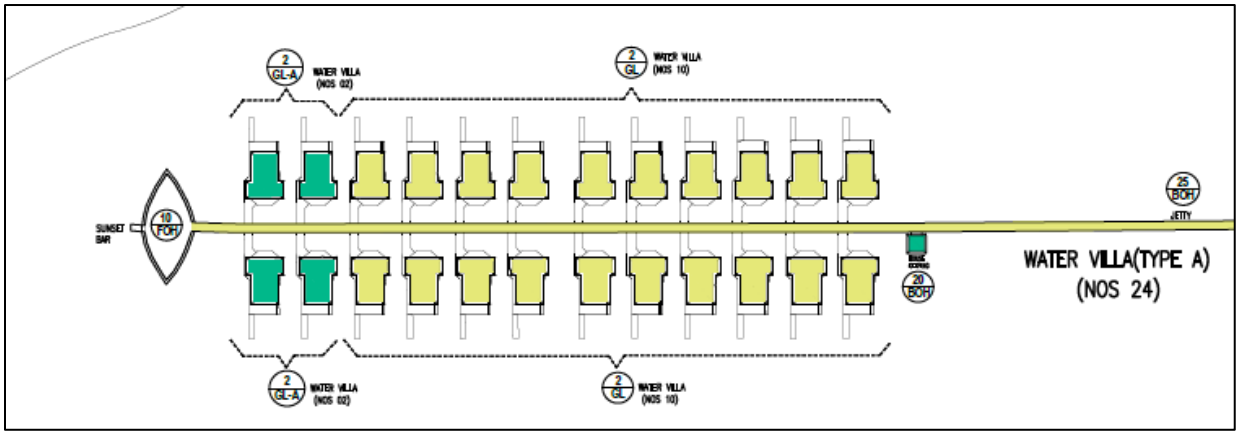

Figure 6: proposed project components

4.3 Project components

This section describes in detail the project activities that are likely to cause significant impacts to the environment.

4.3.1 Demolishing existing water villas

The existing 20 water villas will be demolished as the water villas has structures has reached its end-of-life cycle and the wood footings of the water villas are damaged. The Figure 7 shows an image of a damaged footing. As most of the structures are existing structures are constructed from wood, an estimated 80% of the demolition waste will be recycled or reused with the resort itself. The remaining 20% of the demolition waste will be transferred to nearby Islands which the resort has mutual arrangements. The Figure 8 shows the existing water villas to be demolished.

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Figure 7: damaged footing

Figure 8: existing water villas

4.3.2 Service hut

A new service hut will be built under the proposed project. The location of the service hut is provided in Figure 9. The service hut is of 10.89 sqm. The floor plan of the service hit is provided in Figure 10 and the roof plan is provided in Figure 11.

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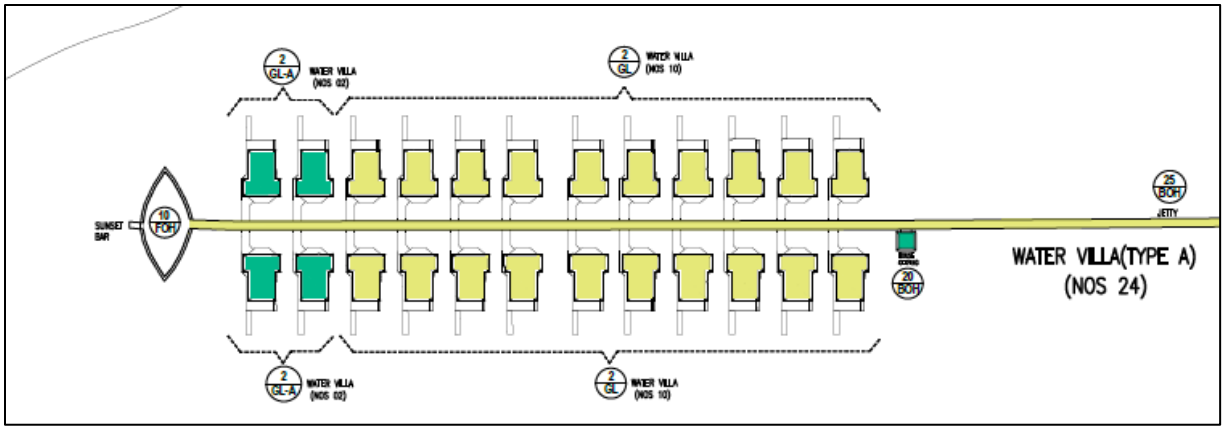

Figure 9: location of the service hut

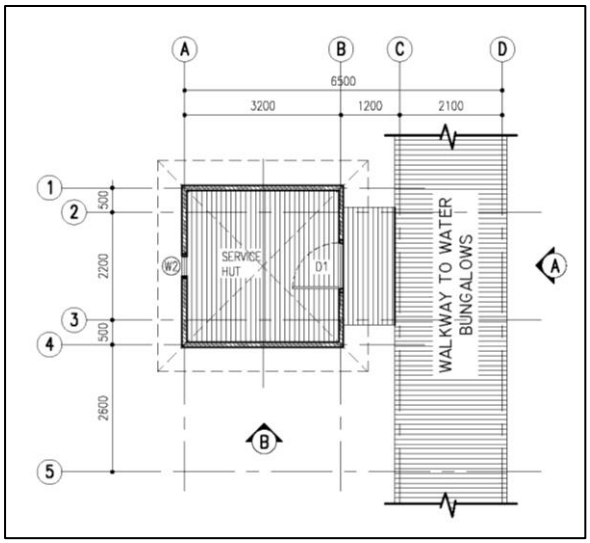

Figure 10: floor plan of service hut

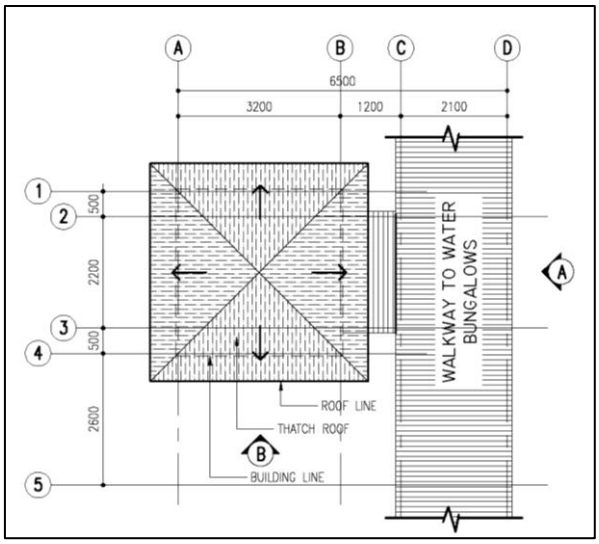

Figure 11: roof plan of the service hut

4.3.3 New water villas and associated walkways

A total of 24 water villas will be constructed under the proposed project. Twenty of them will be replacing existing structures with four new additional water villas. The water villas will be

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single room apartments with associated bath, shower (both open and closed) and deck. Each villa will have an area of 55.78 sqm. All of the interior and exterior walls of the water villas are drywall panels with smooth putty. Emulsion paint will be done on the interior of the villas while the exterior will have putty textured paint finish. The floor plan of the proposed design is show in Figure 9. Furthermore, they walkway/jetty (100ft length, 2.5m width) will also be refurbished under the proposed project.

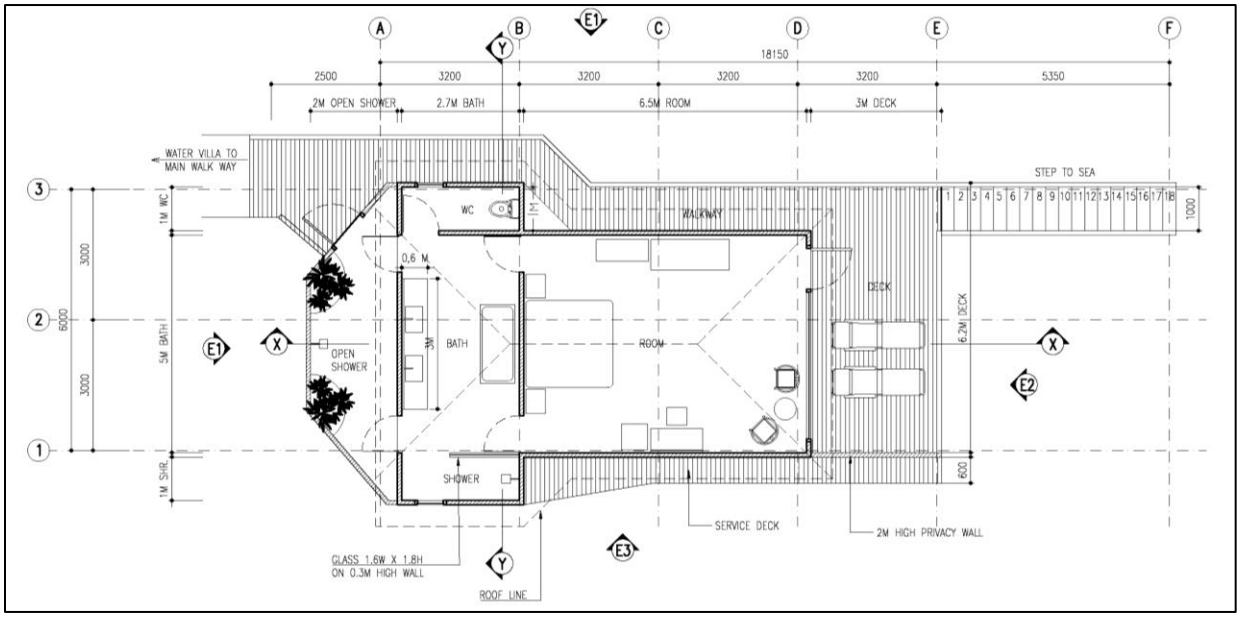

Figure 12: floor plan of water villa

4.3.4 Restaurant rehabilitation

Need concept approval drawings and scope

4.3.5 Safety measures during construction and operation

All necessary precautions will be taken to protect personal and property from hazards due to falls, injuries, toxic fumes, or other harm. During construction works the necessary safety signboards will be put up in working areas. Further, safety gear would be used by laborers, for

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instance, safety boots and hard hats. All painting and corrosion protection work, including inside the building will be performed under strict safety conditions.

All necessary precautions will be taken to protect personal and property from hazards due to falls, injuries, toxic fumes, or other harm. All painting and corrosion protection work, including inside the villas will be performed under strict supervision.

4.3.6 Description of existing facilities

The resort is a four-star accommodation centre and has beach villas and water villas. The public areas of the resort include reception, office, restaurants, bars, coffee shop, dive center / water sports center, gaming centre, volleyball court, tennis court, badminton court, shop, library, clinic, gym and spa.

The back of house (BOH) of the house includes the following facilities executive building, staff building, mess room, kitchen, water production and storage facilities, wastewater facilities, laundry, powerhouse, waste management facilities, fuel sheds and mosque.

4.3.7 Tasks already completed

Up to date, the concept for the project has been approved and the works of EIA are ongoing.

4.4 Project inputs and outputs

The following two tables details the estimated project inputs and outputs for the works to be undertaken in the proposed project.

Table 5: Major project inputs

Input resource(s)	Source/ type	Qty/Volume	Source of resource
Construction phase			
Man Power	Local and expatriate	30	Proponent
Machinery and equipment	concrete machine excavator	04 03	Proponent
Materials	Aggregate	10500 bags	Proponent

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	Sand Cement Steel 6mm Steel 12mm PVC pipe (12 inch) PVC pipe (8 inch) Wood Plywood 6mm WPC wood 2.5m WPC wood 6m	7000 bags 3500 bags 11 tones 35 tones 425 pipes 230 pipes 45 tones 300 pieces 6500 pieces 1000 pieces	
Water	Desalinated water	150 ltrs/day	From existing resort operations
Nose and mouth covering (COVID19)	Face masks	Large quantities	Proponent
Operation phase			
Water and Electricity	Existing network	Large quantities	From existing resort operations

Table 6: Major project outputs

Project outputs	Method of generation/Qty	Method of control
Construction phase		
Construction wastes	Demolition wastes Waste oils Wastewater Greenhouse gases, effluents General waste from workers – 44.2 kg per day	construction and waste oil transferred to Thilafushi for disposal.
Noise	Localized to the project site	Unavoidable, but could be minimized by limiting working hours to daytime only and completing the project within the earliest possible duration.
Operation phase		
New water villas and service hut	By project work	NA
Waste oil	From mechanical equipment's, machinery and vehicles	Stored in barrels and transported to Thilafushi.
Waste	From operations	Managed by the existing waste management facility in the island
Waste water	From operations	Managed by the existing waste water management facility in the

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		island

4.5 Project Management

All the aspects of project construction and operational phase activities are described in detail under this section.

4.5.1 Mobilization

All materials and machinery to be transferred via barge as shown in Figure 14 provided below.

Figure 13: proposed mobilization route

No labour accommodation will be constructed as the labour force will be housed within existing accommodation facilities within the Island. The proponent has sufficient empty accommodation on the island to house the additional staff on the island. the staff will be primarily housed in a quarantine facility if they arrive from a COVID 19 hotspot then moved to rooms later. Furthermore, no temporary facilities will be constructed in the island as all the works will be

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carried out on the water villa site and the materials will be delivered straight to the site on the barge.

4.5.2 Construction and operational phase waste management

Any construction waste shall be properly managed and shipped routinely to Thilafushi for disposal. Proper construction sign boards shall be placed for the safety of the workers and general public who use the road.

Fuel and chemical management are to be handle with utmost care. Spillage control mechanisms will be in place prior to execution of works and labour force will be trained prior to commencement of the work. A dedicated environmental and social safeguards officer will be employed by the proponent to ensure the safety checks are in place to ensure the implementation of the mitigation and monitoring measures specified in the current report.

If a spill does occur, following actions shall be followed;

- Spill clean-up kits are to be readily available at site
- Works are to be halted immediately and alert all the staff in the vicinity of the spill
- Staff are to take relevant personal protective measures to be ready for spill clean up
- Find the root cause of spill and mend effectively
- Clean up the spill
- Report the incident

4.5.3 Measures to protect human health during construction and operation

The proposed project site is on an uninhibited island. The proponent and the contractor are responsible for the safety of the staff, and visitors; health and safety rules must be followed strictly.

- Safety signs and boards must be installed at work site.
- Fire extinguishers must be installed at site.
- The proponent and the contractor will ensure that all the supervisors are trained and qualified to identify, report, response to, and mitigate any health code violation on site.

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- The proponent, contractor and other supervisory bodies will ensure all the health and safety procedures are followed while in the project site.
- All the precautions and steps will be taken to ensure the safety of the employees. Safety gear will be worn all the time.
- The proponent must ensure that the contractor provides numerous first aid kits on site.
- The proponent must ensure that the contractor trains enough staffs in basic first aid drills both terrestrial and marine. Hence making these staff available throughout the project work hours while setting the duty roster.
- The proponent must ensure that the contractor reports all medical emergencies to the hospitals.
- If the use of the equipment requires licenses or special permits, the contractor should ensure the staff are licensed.
- All tools and equipment will be handled by competent staff.
- All staff must be trained to follow the emergency plan
- Health checks and safety checks will be administered before commencement of work.
- All project activities will be carried out in the presence of a qualified supervisor.
- The staff will be trained in fire extinguishing drills and appropriate fire extinguishing equipment will be placed at easily accessible points.
- Flammable material if stored on site, will be stored at site appropriately.
- Any tools stored on site will be stored appropriately.
- Oils, grease and lubricants will be stored as specified above in section.

Mosquitoes reduction, high temperature/ heat stroke management and drowning prevention measures are to be taken on site. Drugs are sprayed and mosquito nets are used in the accommodation area; Appropriate drugs are prepared in case of heatstroke. To prevent drowning, a strict management system is to be formulated and performed under supervision.

Basic first aid facilities and safety gears shall be made readily available by the proponent during the construction phase of the project as per the regulation on safety standards for construction work. In case of an emergency, the workers shall be taken to resort health center and

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in case of major incidents they shall be taken to a hospital in the greater Male' region (IGMH / Tree top / ADK / Dharumavantha/ Hulhumale' hospital).

Special consideration will be given to take all possible preventive measures of the current pandemic of Covid-19 during the construction and operation phase of the project. As such, the recommendations of the Health Protection Agency will strictly be enforced whilst sensitisation sessions will be undertaken to internal controls of health and safety to all the work force

During the operational phase basic first aid facilities and safety gears shall be made readily available to the working staff and guests. Occupation health and safety guidelines shall be strictly followed by all personnel.

4.5.4 Potential accident and hazard scenarios and how to manage them

Potential hazard scenarios during this project are oil/chemical spills that might injure the workers and pollute the environment. These potential hazard scenarios and how to manage them are detailed in the emergency preparedness and response plan and the health and safety plan.

4.5.4.1 Emergency plan in case of spills

The proponent must ensure that the contractor has an emergency plan, an emergency coordinator and the alternative emergency coordinator.

4.5.4.1.1 Overall emergency plan

The overall emergency plan must be site specific and drafted upon by the contractor and the proponent considering the features of the island and the available facilities of the island. The emergency plan must be understood and followed by all staff. A typical emergency plan must include the following.

- The emergency plan should be followed and executed without delay in case of an emergency.

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- Safety Sign Boards and Safety lights must be installed at the work site.
- Fire Extinguishers must be installed at work site.
- All staff must learn the basics of the emergency plan.
- Assembly points must be decided prior to mobilization
- Points of relief must be equipped with medical kits and fire safety kits
- Spill kits must be installed near the storage sites and in easily accessible areas.
- Alarms must be installed and tested
- Informed drills must be carried out at a schedule.
- All staff must be informed that they could call in an alarm.
- All emergency coordinators should be trained well with the alternative.
- In case of an emergency the point of reference must be the coordinator or the alternative.
- In case of an emergency, the emergency coordinator or the alternative must be informed primarily
- All staff must strictly follow the instructions of the emergency coordinator.
- Authorities must be informed by the coordinator or the alternative
- The contractor is required to take the following measures in order to ensure minimal pollution in case of a spill.
- Use serviced machinery to reduce toxic emissions
- Service the machines in use during the work process.
- Keep spill kits on the island and portable spill kits on the machines
- Bund all necessary lubricants and oils stored on site.

4.5.4.1.2 Emergency plan for spill response at the proposed project location

Spills on construction sites can have drastic consequences to people and the environment.

After a thorough analysis of the action in hand, the responsible party is to follow the action plan as specified. However, the best form of action is prevention therefore the following spill prevention measures must be implemented on site.

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General Precautions

The following general precautionary measures shall be applied to all construction works areas to minimize the risk of accidental spillage;

- Maintain good site housekeeping practices and ensure all materials, chemicals and wastes are properly stored and placed in appropriate disposal areas onsite at the end of each day.
- Avoid disorder and storage of unnecessary materials in working areas.
- Open flames and smoking shall be prohibited within the construction site; smoking may be permitted only at designated smoking areas.
- Stacked containers should be secured from falling.
- Large / heavy containers should be stored on the floor as far as possible to prevent falling.
- Warning signs, fences and locks where appropriate should be deployed for storage place of hazardous materials, chemicals, fuel and oil, etc.

Construction Materials

Unexpected release of large amounts of suspended solids, in case of accidents, human negligence or mechanical failure would result in adverse water quality and marine ecology impacts. Hence, precaution and prevention measures are required to minimize the risk of such accidental spills. The following measures shall be applied to all construction vessels involving transport of materials that may give rise to unexpected release of large amounts of suspended solids;

Prior to transport of materials;

- Bottom opening of barges shall be fitted with tight fitting seals to prevent leakage of material.
- Vessels shall be regularly inspected to ensure no leakages and any leakages shall be repaired quickly prior to mobilization of the vessels.
- Barges shall not be filled to a level which will cause overflow of materials or pollution of water during loading or transportation.

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- Adequate freeboard shall be maintained on barges to reduce the likelihood of decks being washed by wave action.

During transport;

- Vessels shall follow the pre-defined routes and marine traffic arrangements to minimise the risk of collision.
- Vessels shall follow the designated entry / exit points into and out of the construction site boundary.
- Vessel speeds shall be limited to 10 knots or less within the construction works area and hotspots.
- Transits of vessels operating within the construction works areas will be monitored and managed

Chemicals, Oils and Fuels

For chemicals, oils and fuels (if used for the excavators, etc.) required and used onsite, the following measures shall be applied:

For procurement;

- Label all chemical storage containers and tanks in accordance with the EPD 'Code of Practice on the Package, Labelling and Storage of Chemical Wastes'.
- An up to date list of chemicals, chemical waste and fuel oil should be maintained.

For storage;

- Suitable containers should be used which are resistant to the stored oil fuel, chemical / chemical waste to avoid leakage.
- Containers should be checked before use and container lids should be closed tightly to avoid leakage of chemicals and chemical waste.

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- Chemical waste storage areas should be located in a designated area that is sheltered on at least 3 sides and the top, and is locked and kept clean and free from obstruction.
- Incompatible chemicals should be separated.
- Chemical, oil and fuel containers should be kept under eye level as far as possible.
- Drip trays or bunds should be used for storage containers of chemicals and oil / fuel tanks and should have a capacity equal to 110 % of the storage capacity of the largest tank.
- Chemical storage area and drip trays should be inspected daily to ensure the containers are in good condition and there are no openings which oil / chemicals can possibly leak out. Any damage / openings to the storage area and drip trays should be repaired or replaced immediately.
- Where chemicals are temporarily taken outside the sheltered chemical storage area, the chemicals including the drip trays / bund should be covered by waterproof tarpaulins and kept free of rainwater.

For transfer / transport;

- Pumps should be used to transfer large quantities of oil, fuel, chemical / chemical wastes instead of pouring.
- Oil, fuel, chemical / chemical wastes should be transferred slowly to prevent spillage or overfilling.
- Suitable trolley should be used to transport chemicals / chemical wastes to other location.

For use;

- Chemical quantities / dosage required during each use shall be carefully calculated / measured to prevent any excess chemicals being generated and released.

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- Drilling fluid used in drilling activities should be reconditioned and reused as far as possible.

Spill response

Effective spill response comes down to the reediness of the contractor to a potential event. This in effect enables the contractor to respond to any related un identified event as well. Spill response simplified can be shown in as below.

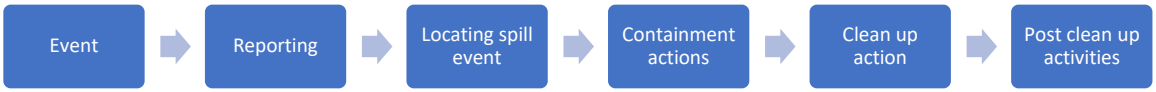

Figure 14: spill response procedure

In this specific project, three major types of spill involved are listed.

Construction Phase		
Spill Types	Land Based Activities	Marine based Activities
Fuel/ Oli	✓	✓
Chemicals	✓	✓

Locating and Reporting

In case of machinery operators, a part of their training includes maintenance and, emergency action, and reporting in case of break, failure, and spill. In addition, all staff must be trained to identify, quantify, contain temporarily, and report a spill. Emergency containment actions must be taken accordingly. Emergency kits available must be used as fit.

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Locating and Reporting

In case of machinery operators, a part of their training includes maintenance and ,emergency action, and reporting in case of break, failure, and spill. In addition , all staff must be trained to identify, quantify, contain temporarily, and report a spill.

Emergency containment actions must be taken accordingly. Emergency kits available must be used as fit.

Emergency kit must contain	Personal protective gear
	Universal Chemical pads
	Acid neutralizers
	Disposable bags
	Broom and Dustpan
	Floating curtains
	Bund Curtains

Reporting must have the following parameters;

Staff form, report spill	Date,Time,Staff.....Comments .... Containment action taken	Type of spill Source of spill location Estimated time of break Time of notification to the response head Staff form, report spill
Operator form report spill	Date,Time,Staff..... Comments .... Containment action taken	Vehicle number location Malfunction Type of spill Source of spill Estimated time of break Time of notification to the response head

After reporting, the response head must follow directions from the government/regulator to the fullest extent.

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4.5.5 Decommissioning and operational phase of the project

Once the project has been completed, construction team leaves the site after performing the required site clearance. Any waste will be transported to Thilafushi for disposal. All heavy machinery brought to the site will be demobilized. Upon completion of the project, the new infrastructure will be managed under the existing operation of resort.

4.5.6 Project duration and schedule of implementation

The construction will commence once the EIA process has been completed. Estimated date is May 2023. Construction works is expected to be completed by August 2023. Refer to appendix G for a detailed work plan of the proposed project. The entire project is estimated to be completed within 4 months from project commencement date. A summary of the major milestones is provided in the following Table 7.

Table 7: major milestones of the project

Task Description		**Duration / Days**
Refurbishment of water villas project at Angaga		89
	Mobilization	2
	In-survey and setting out	4
	Commencement	2
Demolition and columns installation	Material Delivery	3
	Demolition and columns installation	28
	Concrete works	20
	Finishing works	20
Demobilization	Site Clearance	3
	Out-survey	3
	Final Demobilization	2
	Final Inspection and Handover	1

Construction progress will be reported to the proponent by the contractor on weekly progress reports and meetings. It is also important to have onsite monthly meeting with key

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stakeholders such as the resort management in order to ensure smooth operations during the construction period.

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5. EXISTING ENVIRONMENT

This chapter describes the existing environmental conditions of the proposed project site. Sections 5.1 describes the general environmental condition of the Maldives and 5.2 outlines the general climatic conditions by analyzing data from the meteorological center of the Maldives. Sections 5.3 to 5.4 details the specific environmental conditions at the proposed project site.

5.1 The Maldivian Setting

Maldives, officially known as the Republic of Maldives and sometimes referred to as the Maldive Islands, is an island nation (Zahid, 2011) consisting of nearly 1192 islands on a double chain of 26 natural atolls (administratively divided into 20 atolls), 80-120 km wide, in the Laccadive Sea in the Indian Ocean (State of the Environment 2004, 2004). Elevating less than 3 meters above mean sea level, with 80% of land area less than 1 m, Maldives is the flattest country in the world. The total area is about 107,500 km^2 of which roughly 300 km^2 of landmass (Zahid, 2011), with a population of about 338, 434 (as per September 2014 census) (Maldives' Population Dynamics: Policy Prospects for Human Growth and Opportunity, 2016) spread over 194 inhabited islands (Statistical Yearbook of Maldives 2010, 2010). Stretching 860 km from latitude 7°6"35"N, crosses the Equator to 0°42"24"S, and lies between 72°32"19"E and 73°46"13"E longitude (Zahid, 2011). These coral Atolls are located on the 1600 km long Laccadives-Chagos submarine ridge extending into the central Indian Ocean from the SW coast of the Indian sub-continent (State of the Environment 2004, 2004).

The Atolls vary greatly in shape and size as well as the characteristics of the Atolls, reefs and reef islands vary considerably from north to south. The northern atolls are broad banks, discontinuously fringed by reefs with small reef islands and with numerous patch reefs and faros in the Lagoon whereas in the southern atolls, faros and patch reef are rarer in the Lagoon, continuity of the atoll rim is greater and a larger proportion of the perimeter of the Atolls is occupied by islands. The islands also differ depending on location, form and topography. The islands vary in size from 0.5 km^2 to around 5.0 km^2 and in shape from small sandbanks with sparse

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vegetation to elongated strip islands. Many have storm ridges at the seaward edges and a few are characterized by swampy depressions in the center (State of the Environment 2004, 2004).

Located on the equator, Maldives experiences a warm, humid tropical climate or a monsoonal climate with two distinct seasons known as the northeast monsoon (dry season) from January to March and southwest monsoon (wet season) from May to November (State of the Environment 2004, 2004). The southwest season brings in torrential rain (Zahid, 2011) and rainfall varies from north to south along the atoll chain, with a drier north and wetter south (State of the Environment 2004, 2004). Rainfall varied from 1,407 mm to 2,707 mm interannually over the last 30 years. May, August, September and December are the wettest months and January to April the driest (State of the Environment 2004, 2004).

The annual and seasonal temperatures vary very little with a mean annual temperature of 28°C (State of the Environment 2004, 2004); however, the diurnal temperature fluctuates from 31°C during the day to 23°C at night. This is associated with the small size of the islands and the tempering of the hot days by cooling sea breezes surrounding the islands (Zahid, 2011). The highest and lowest temperatures on record are 36.8°C on May 1991 and 17.2°C on April 1978 respectively (State of the Environment 2004, 2004).

Ocean currents are driven by the monsoon winds with the westerly flowing currents dominating the northeast monsoon and easterly currents dominating the southwest monsoon. Changes in current flow patterns occur in April and December corresponding to the transition periods of the southwest and northeast monsoons respectively. Currents near the shoreline slightly differ from oceanic currents depending on the location, orientation and morphology of the reefs and underwater topography (Zahid, 2011).

Sea surface temperature (SST) is reasonably constant throughout the year and ranges between 28 to 29 °C. Mean monthly SST rises from December/January to April/May. However, May 1998 experienced a mean monthly SST of 30.3 °C which is expected to occur every 20 years. Furthermore, temperature drops rapidly to below 20 °C at a depth of 90-100 m (State of the Environment 2004, 2004).

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5.1.1 Geology and Geomorphology

Earth's crust, called the lithosphere, consists of 15 to 20 moving tectonic plates. The plates can be considered as cracked shell that rest on the hot and molten rock of Earth's mantle and fit closely against one another. The heat from radioactive processes within the planet's interior causes the plates to move toward and away from each other which is known as tectonic shifts (NOAA, 2021).

Maldives in located on the Indo-Australian plate which is among the 7 major plate tectonic boundaries found on Earth. The Indo-Australia plate which is a combination Australian and Indian Plates covering a total area of about 58,900,000km2. However, they are generally considered to be two separate plates (Earthhow, 2021).

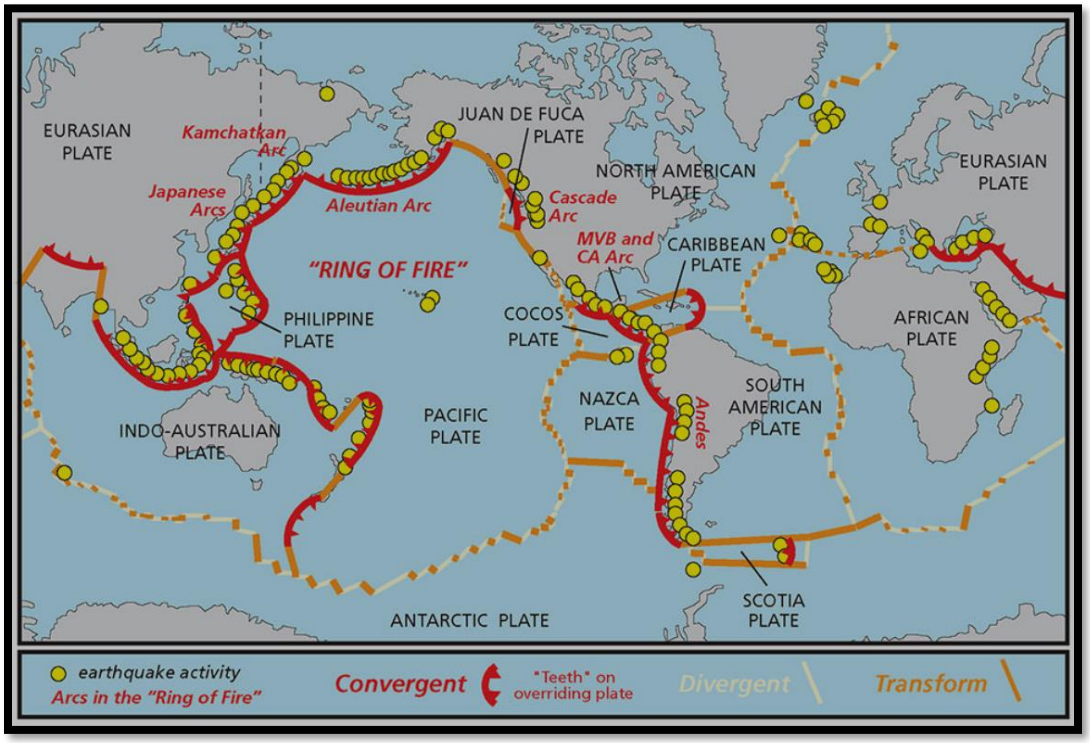

Figure 15 : Shows all the major tectonic plates and their general movements

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Maldives is an archipelago of islands. Maldives is made up of 26 natural chain of atolls covering over 90000 square kilometer in the sea. The islands stretch for 822 km from north to south, with the greatest width from west to east being 130km. The land area of all the islands amounts to 298km2 (Belopsky & Droxler, 2004).

The inner sea of the atolls mostly have shallow depths compared to the rest of the outer sea with depths ranging from 300 to 500m (Purdy & Bertram, 1993). The following figure shows a general bathymetric map highlighting the changes in depth within and outside waters in and around Maldives.

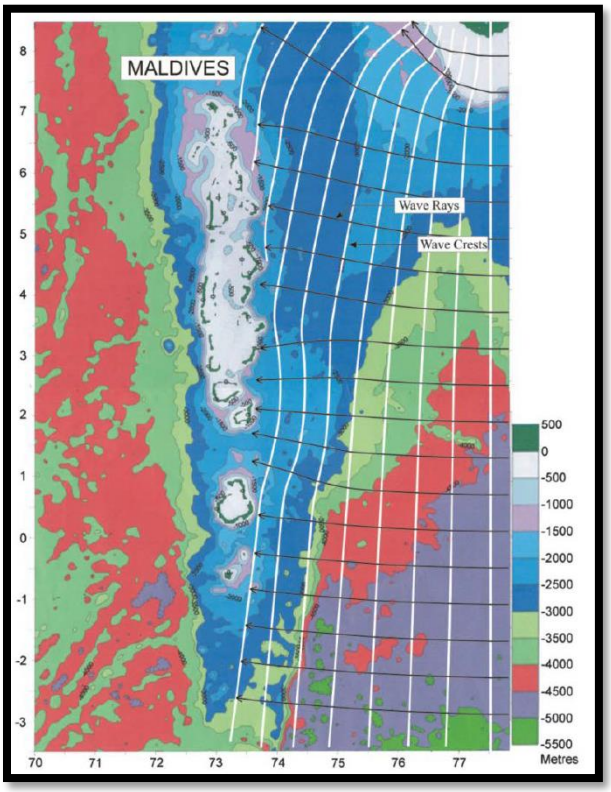

Figure 16: Shows the general bathymetry of Maldives (riyan Pte.Ltd, 2013)

Most of the islands have high peripheral storm berms formed due to overwash with maximum elevations of 2.2m above mean sea level (MSL). The present-day beach is deposited

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against the vegetation line of the island. The seaward boundary is defined by a distinct break in slope associated with the transition from unconsolidated beach sediment to the fixed reef flat substrate in which beach and shoreline move freely. Beach width varies considerably for each individual island (Kench, P S; Brander, R W, 2006).

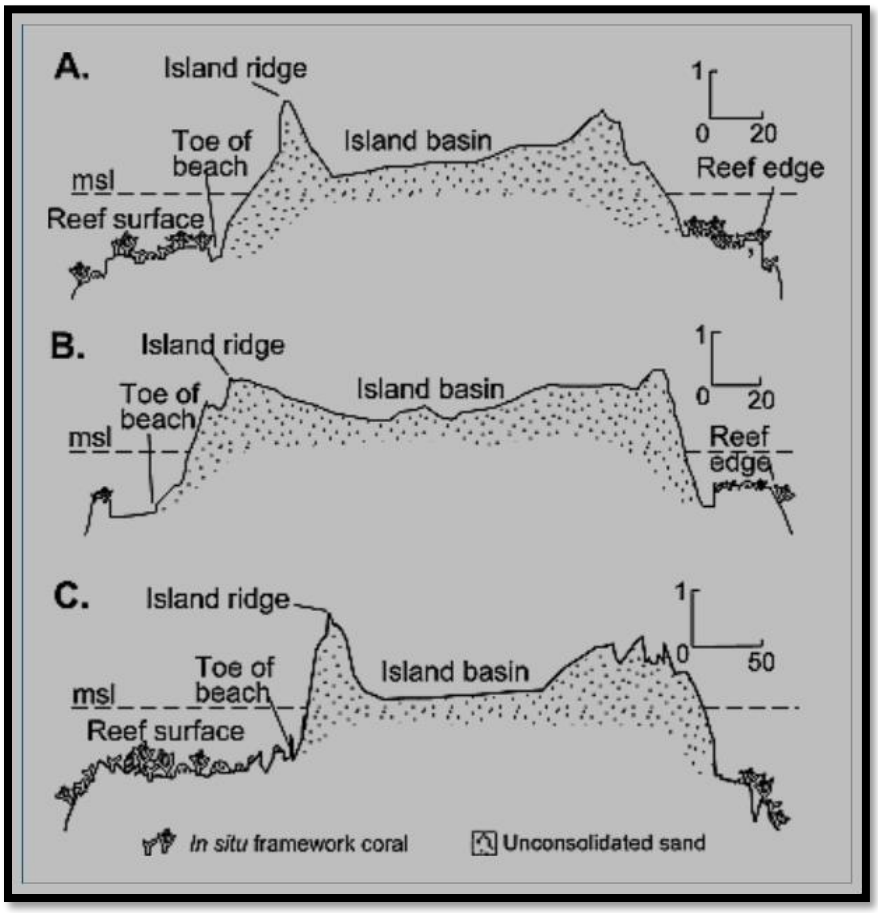

Figure 17: Shows some morphological features in an island system (Kench, P S; Brander, R W, 2006).

5.1.2 Waves

Hydrodynamics features in Maldives have been very poorly studied. (Young, 1999) shows wave climate data for a ten-year period for each world regional zone. Wave height was measured

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by satellite (Radar Altimeter), whereas a global wave model was used to precise wave directions. It indicates that the dominant swell approaches from southerly directions (Figure 10). On a seasonal basis, swell is from the south-southwest from April to November (SW monsoon) with a peak significant wave height (Hs) of 1.8m in June, and from the south to southeast directions from November to March (NE monsoon) with minimum Hs of 0.75m in March.

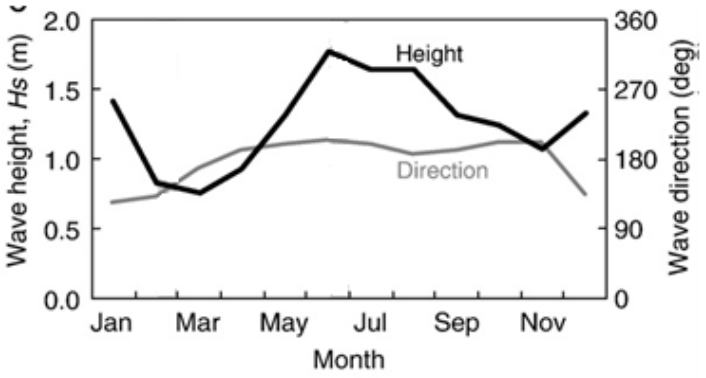

Figure 18: Ten year mean monthly wave height and direction for the central Maldives. Source: Young (1999).

The work of (Contestabile, Lauro, Galli, & Vicinanza, 2017) in a report published in 2017 regarding wave energy in the Maldives showed that Young's findings were accurate. They showed that the wave energy in the South (average significant wave height 1.5 m) is higher and diminishing towards the Northern islands (average significant wave height 1.3 m). Furthermore, there is a change in wave energy in the Eastern and Western side of the Maldives which are much more evident for extreme events. The maximum significant wave height in the West is 3.59 m and 3.05 in the East. The main reason for these difference in wave energy is because the majority of the swell waves approach the Maldives from the S-SW direction.

In addition to the swell waves Maldivian islands are impacted by local wind generated waves. Wind waves are generated due to monsoonal winds in the Maldives. Therefore, the strength and direction of wind waves is dictated by the strength and direction of the winds. Since the monsoonal winds are strongest in the SW monsoon between April-July, it is during this period the strongest wind waves would be generated.

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5.1.3 Currents

In the Indian Ocean the Maldivian archipelago has relatively stronger currents (Riyaz, 2016). Current speeds in the channels between the atolls can vary between 0.51-0.77 m/s while the currents in the channels within the atolls are stronger and the E-W oriented channels having the strongest currents between 1.5-2.6 m/s (Rober Gordon Univeristy, 2011).

In the Maldives currents are predominantly caused by the complex interaction of oceanic currents, tidal currents and local wind induced currents. The major current that flows through the Maldives is caused by the monsoonal winds. During the SW monsoon the currents flow from W-E and during the NE monsoon from E-W (Rober Gordon Univeristy, 2011). Other factors which influence the currents are waves, local bathymetry and topography. The resultant currents at a specific location in the Maldives is determined by the complex interaction among the aforementioned factors.

Tidal currents are caused by the horizontal movement of water which is caused by the regular rise and fall of the sea level due to tides (Riyaz, 2016). The strength of the tidal currents are determined by the tidal ranges and follow the same periodicities as the tide meaning the tidal currents would be weaker during low tide and vice versa. In general, the tidal currents flow eastward during flood and westward during ebb.

5.1.4 Tides

The tides in the Maldives are semi-diurnal with diurnal inequalities meaning there are two high and two lows everyday with different heights (Rober Gordon Univeristy, 2011). In addition to the daily variation in tides, there are variations in tides due to the lunar cycle which are caused by the varying gravitation pull of the moon due to the position of the moon. When the moon and the sun is aligned in a straight line the gravitational pull is greatest and this causes a spring tide. When the moon and the sun are aligned at 90^0 their combined gravitational pull is at the minimum and this causes a neap tide.

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With reference to mean sea level (MSL) the mean higher high water is +0.34 m and mean lower low water is -0.36 m (Riyaz, 2016). However, it has been reported that the highest astronomical tide was at +0.64 and lowest astronomical tide at -0.56.

Table 8: mean tidal variations in the Maldives (Riyaz, 2016).

Tide Level	*Referred to MSL*
highest astronomical tide (HAT)	+0.64
mean higher high water (MHHW)	+0.34
mean lower high water (MLHW)	+0.14
mean sea level (MSL)	0.00
mean higher low water (MHLW)	-0.16
mean lower low water (MHLW)	-0.36
lowest astronomical tide (LAT)	-0.56

5.2 Climatic Conditions

The Bureau of Meteorology of Maldives has compiled a range of climate variables since 1975 from five different meteorological stations located across the Maldives. Climate variables including temperature, rainfall, and wind were analyzed for the nearest meteorological station to ADh. Angaga Island Resort and Spa, which is Hulhule' meteorological center at geographic coordinates of 336465.00 m E, 463760.00 m N, about 28.23 Km from ADh. Angaga. Location of Hulhule' meteorological center with respect to ADh. Angaga is on Figure 19 below.

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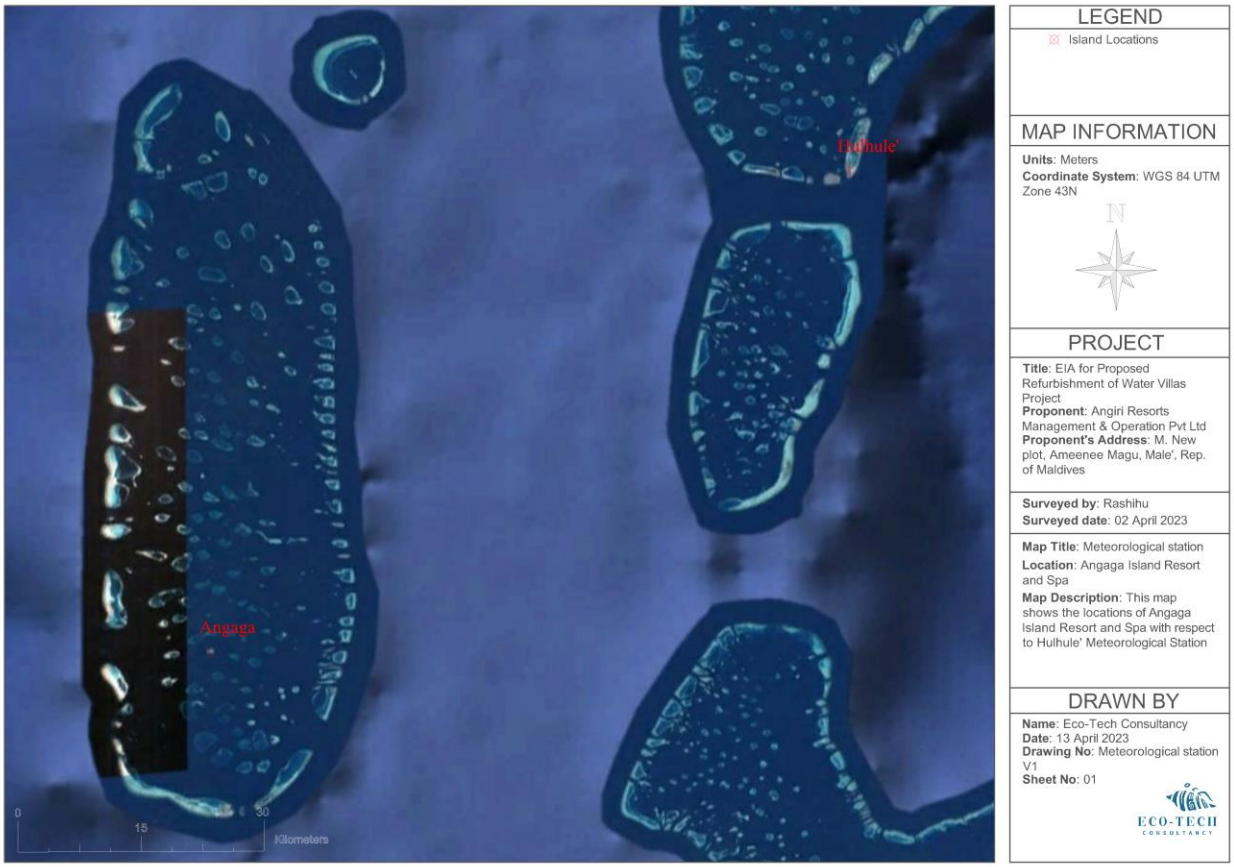

Figure 19: location of ADh. Angaga Island Resort and Spa with respect to Hulhule' meteorological center

5.2.1 Temperature

Analysis of temperature data shows that the variation in temperature throughout the year is generally very minimal, however, daily temperature ranges from 34.9°C during the day to 19°C at night. Looking at the monthly variation in temperature, the highest temperature was recorded for the month of April from the meteorological station in Hulhule' reading 31.8°C over the past 47 years. With regards to the minimum temperature, the lowest temperature at Hulhule', 25.4°C was recorded for November (Figure 20).

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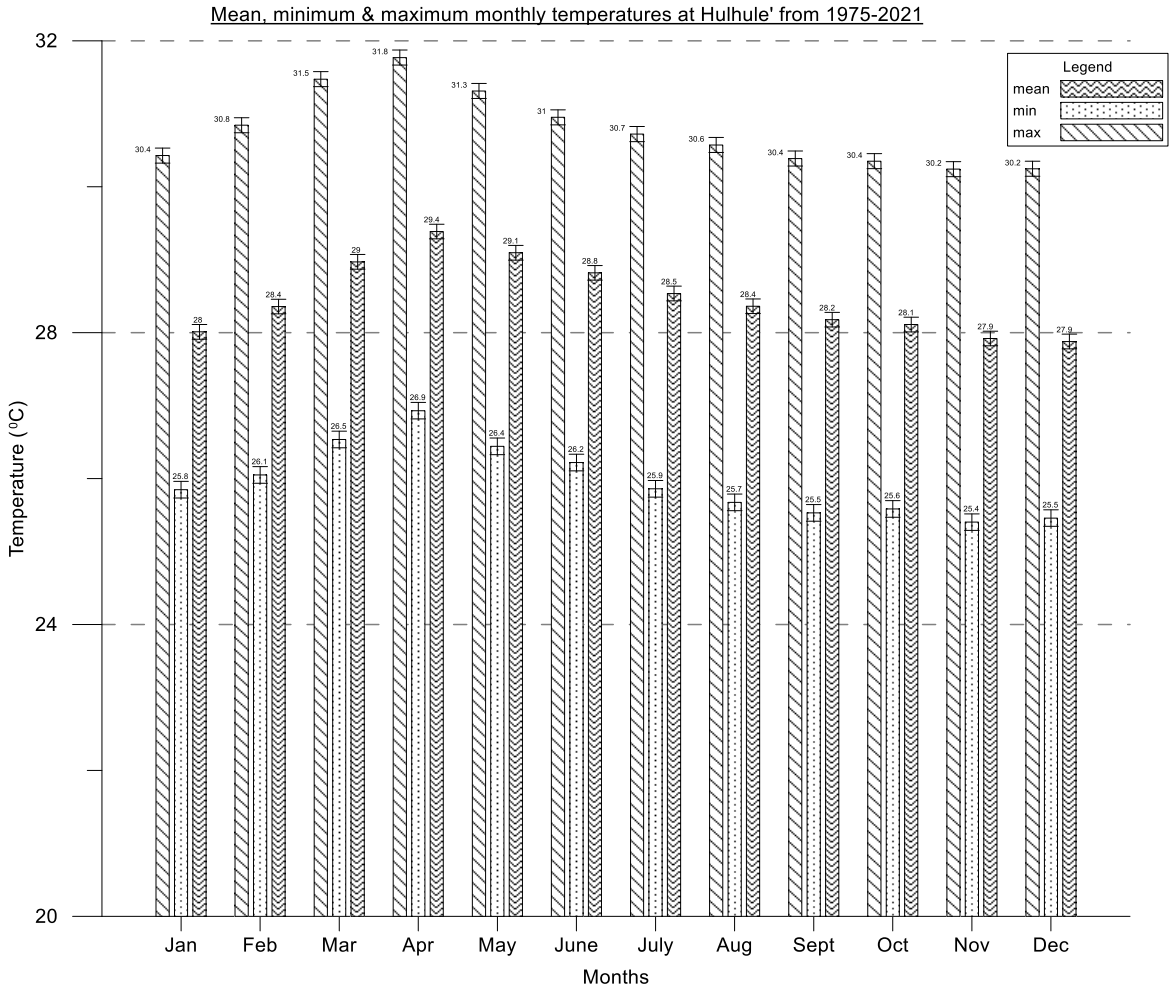

Figure 20. Mean, minimum and maximum monthly temperatures (°C) for Hulhule from 1975 to 2021 (Data obtained from the Bureau of Meteorology, Maldives)

5.2.2 Rainfall

Analysis of rainfall data from 1975 to 2021 at Hulhule' meteorological station shows that the mean monthly rainfall follows the traditionally defined seasons with most rain occurring from May to December and little rain falling outside these months. The highest amount of rain was

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observed during the month of October with 235 mm of rain on average and the lowest rain was experienced in February, averaging only about 39.6 mm of rain over the past 47 years.

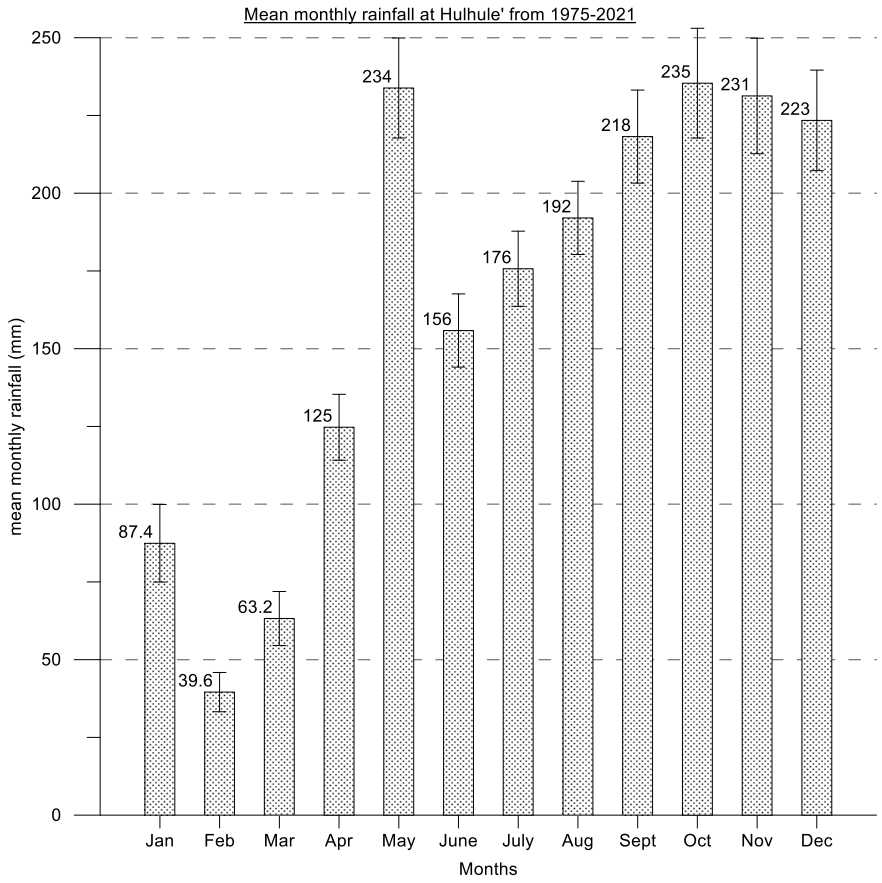

Figure 21. Mean monthly rainfall (mm) for Hulhule from 1975 to 2021 (Data obtained from the Bureau of Meteorology, Maldives)

5.2.3 Wind

Climate in the Maldives is dominated by the Indian monsoon climate South West (SW) monsoon and North East (NE) monsoon. The Indian monsoon system is one of the major climate systems of the world, impacting large portions of both Africa and Asia.

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The period of the year during which prevailing winds are from south to westerly direction is known as the SW monsoon (Kench, Parnell, & Brander, 2009). The period during which prevailing winds are from north-easterly directions is known as NE monsoon. Transitions from NE to SW monsoon and vice versa are distinctly different from SW or NE monsoon. During these transition periods the wind becomes more variable.

The SW monsoon lasts between May and September while the NE monsoon lasts between December and February. The period between March and April is the transition period from the NE monsoon to SW monsoon known locally as the *Hulhangu Halha*, while the transition period from SW monsoon to NE monsoon is known as *Iruvai Halha. Iruvai Halha* is from October to November (Table 9). SW monsoon is generally rough and wetter than the NE monsoon. Storms and gales are infrequent in this part of the globe and cyclones do not reach as far south as the Maldivian archipelago.

Table 9: The four seasons in the Maldives. Source (Danish Hydraulic Institute, 1999).

Season	Month
NE-Monsoon	December
	January
	February
Transition Period 1	March
	April
SW-Monsoon	May
	June
	July
	August

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	September
Transition Period 2	October
	November

By analyzing the available wind data from the meteorological station a windrose was drawn (Figure 21 and Figure 22). The wind speed classes have been categorized according to the beaufort wind scale (Trujillo & Thurman, 2016). According to this scale wind speeds of 4-6 knots are light breeze, 28-47 knots are gales and wind speeds greater than 48 knots are considered as storm. The following table shows the beaufort wind scale.

Table 10: beaufort wind scale

Beaufort number	Descriptive term	Wind Speed (knots)
0	Calm	0-1
1	Light air	1-3
2	Light breeze	4-6
3	Gentle breeze	7-10
4	Moderate breeze	11-16
5	Fresh breeze	17-21
6	Strong breeze	22-27
7	Near gale	28-33
8	Gale	34-40
9	Strone gale	41-47

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10	Storm	48-55
11	Voilent storm	56-63
12	Hurricane	64 +

Looking at the mean wind speeds and direction for Hulhule', it was observed that the strongest winds occur from W and WNW directions (in the SW monsoon) and NE, ENE, and E direction (in the NE monsoon). Winds from the South and SE were less prevalent and with comparatively low speeds. Majority of the times, winds occur at a speed of 7 to 16 kn which is generally known as gentle to moderate breeze. Mean wind speeds above 22 kn occurred from the Western quadrant (W and WNW) to a very low occurrence.

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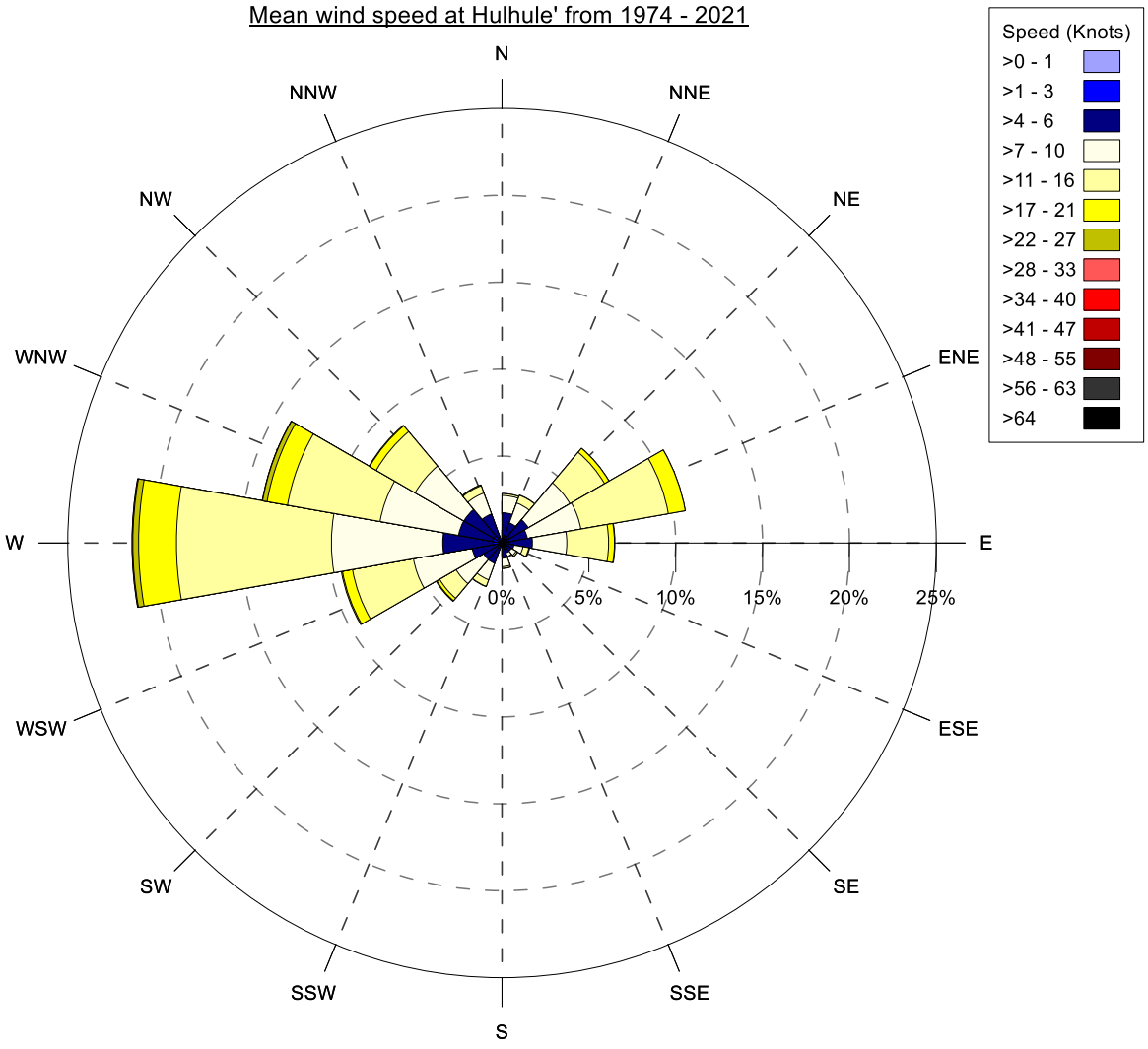

Figure 22. Mean wind speeds for Hulhule from 1975 to 2021 (Data obtained from the Bureau of Meteorology, Maldives)

With respect to maximum wind speeds, visual inspection of the wind rose plot coincides with that of the mean wind speeds. Approximately 2% of the times, wind speeds had gone as high as > 40 kn at this region. The highest recorded maximum wind speed for the region was 62 kn on

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3rd November 1978 during the data collection period. The most common maximum wind speed is between 7-27 kn.

Wind rose plots for both maximum and mean wind speeds show that winds from the West are dominant (17 % of the times).

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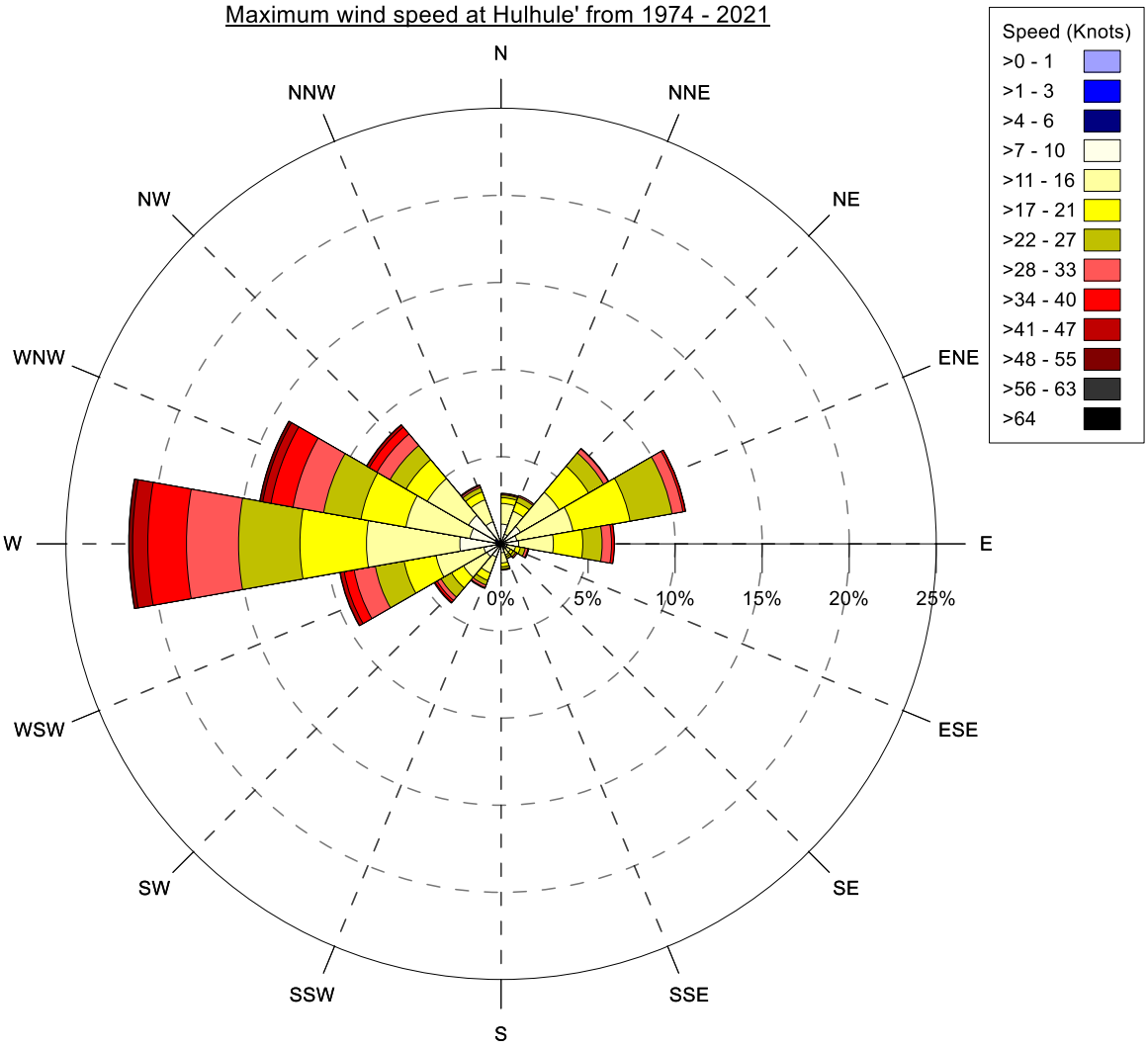

Figure 23: Maximum wind speeds for Hulhule from 1975 to 2021 (Data obtained from the Bureau of Meteorology, Maldives)

5.3 Marine Environment of Angaga

This section describes the site-specific marine environmental conditions of the proposed project site. The general setting of ADh. Angaga Island Resort and Spa and marine water quality near the proposed project site is presented.

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5.3.1 General Island Setting

Angaga Island Resort and Spa is located at the center of south Ari Atoll with coordinates of 258056.92m Easting and 404026.80m Northing. The size of the island is approximately 42,372 sqm and found approximately 98 km away from Velana International Airport. Angaga Island Resort and Spa is the only island in the reef system. The land area of ADh. Angaga is only about 4.4 ha surrounded by 36.6 ha house reef. The closest inhabited islands to ADh. Angaga Island Resort and Spa are ADh. Mandhoo and ADh. Dhangethi at distances of approximately 13.5 km and 15.8 km respectively. Furthermore, there are several resorts located nearby with the closest one being Mirihi Island resort at 5.7 km away. Additionally, an environmentally sensitive area named Angaga Thila is located within a 1.7 km distance.

Angaga Island Resort & Spa is a luxurious retreat nestled in the heart of the Maldives. This stunning resort is located on a tiny island in the southern part of Ari Atoll, surrounded by fine to intermediate white sandy beaches and turquoise waters. With only 45 villas, ADh. Angaga offers an exclusive holiday experience. Guests can enjoy world-class amenities such as an infinity pool, a state-of-the-art fitness center, and an indulgent spa, offering a range of treatments. Despite Angaga being a relatively small island, moderate amount of birdlife could be encountered within the island, especially during nature walks or birdwatching tours.

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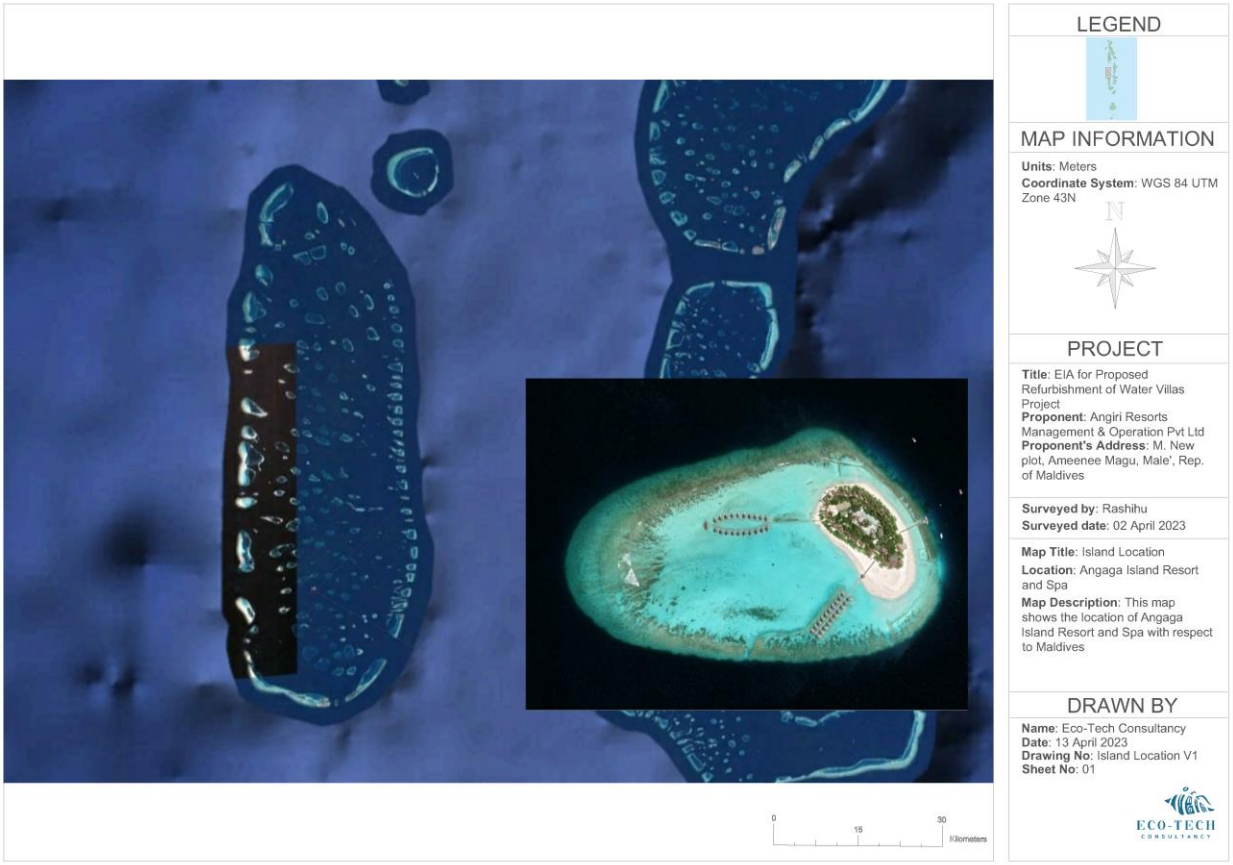

Figure 24. location of angaga in South Ari Atoll

5.3.2 Currents and Coastal Dynamics

Angaga is located near the center of South Ari atoll. To the SE of the island lies number of reef systems starting from the outer rim of the atoll which would obstruct the incoming swells from SE direction. Furthermore, to the SE lies Meemu and Vaavu Atoll with extensive reef systems and Islands, therefore the intensity of swell waves reaching the Island from this direction would be very low.

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During the NE monsoon the winds predominantly blow from ENE. Towards this direction there are plenty of reefs and a few islands. Therefore, the effective fetch from this direction would be low and hence the Island would experience moderate wind waves from this direction.

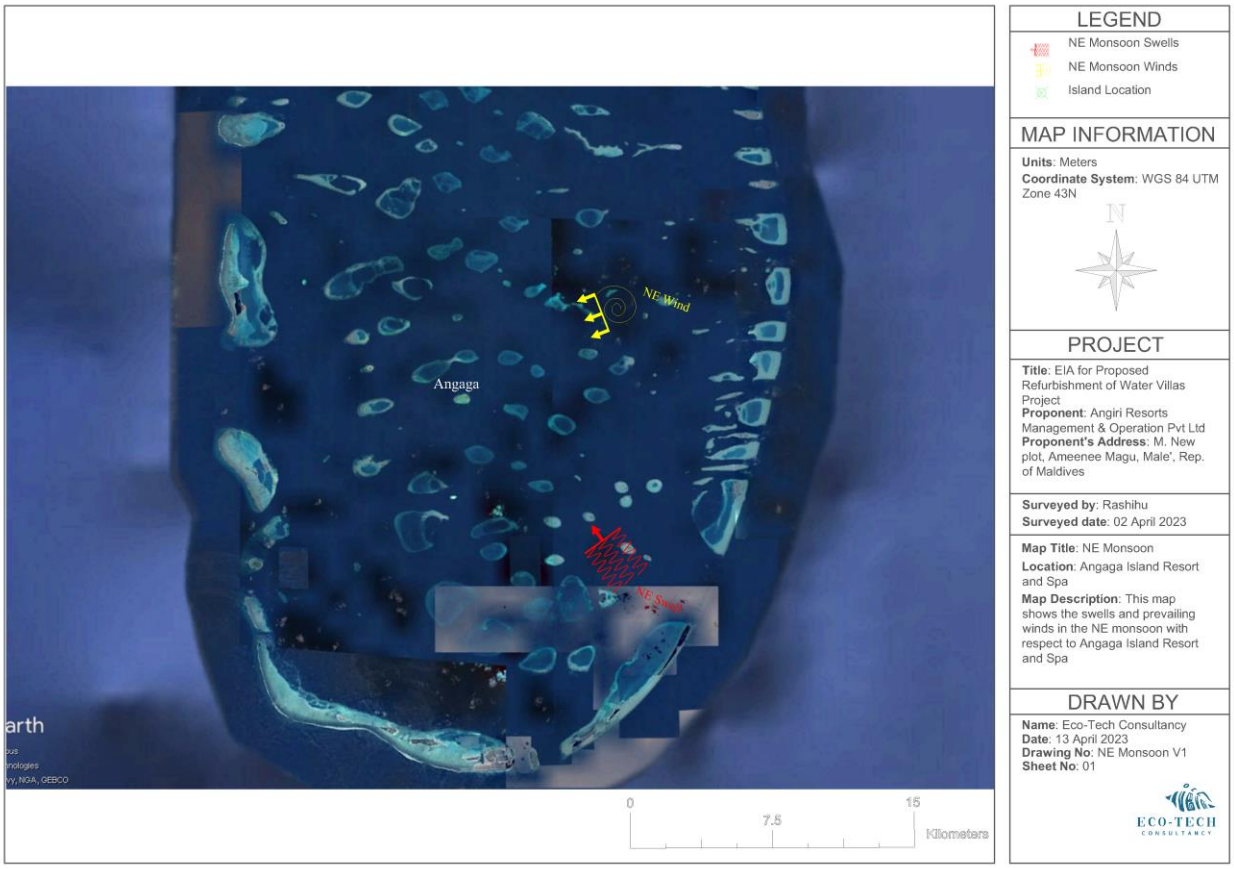

Figure 25. Approach of wind and swell waves to angaga in NE monsoon

During the SW monsoon, swells would approach the island from south to SW directions. To the SW of the island lies number of reef systems similar to the SE of the atoll. With these natural barriers in place, the intensity of swell waves reaching the island from this direction would be moderate.

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The strongest winds during SW monsoon comes from the W and WNW direction. In this direction there are only a few islands that can help reduce effective fetch to some extent, which in turn would reduce the intensity of the wind waves from this direction.

Overall, the strongest waves to Angaga would most likely come from the W, WNW and ENE direction.

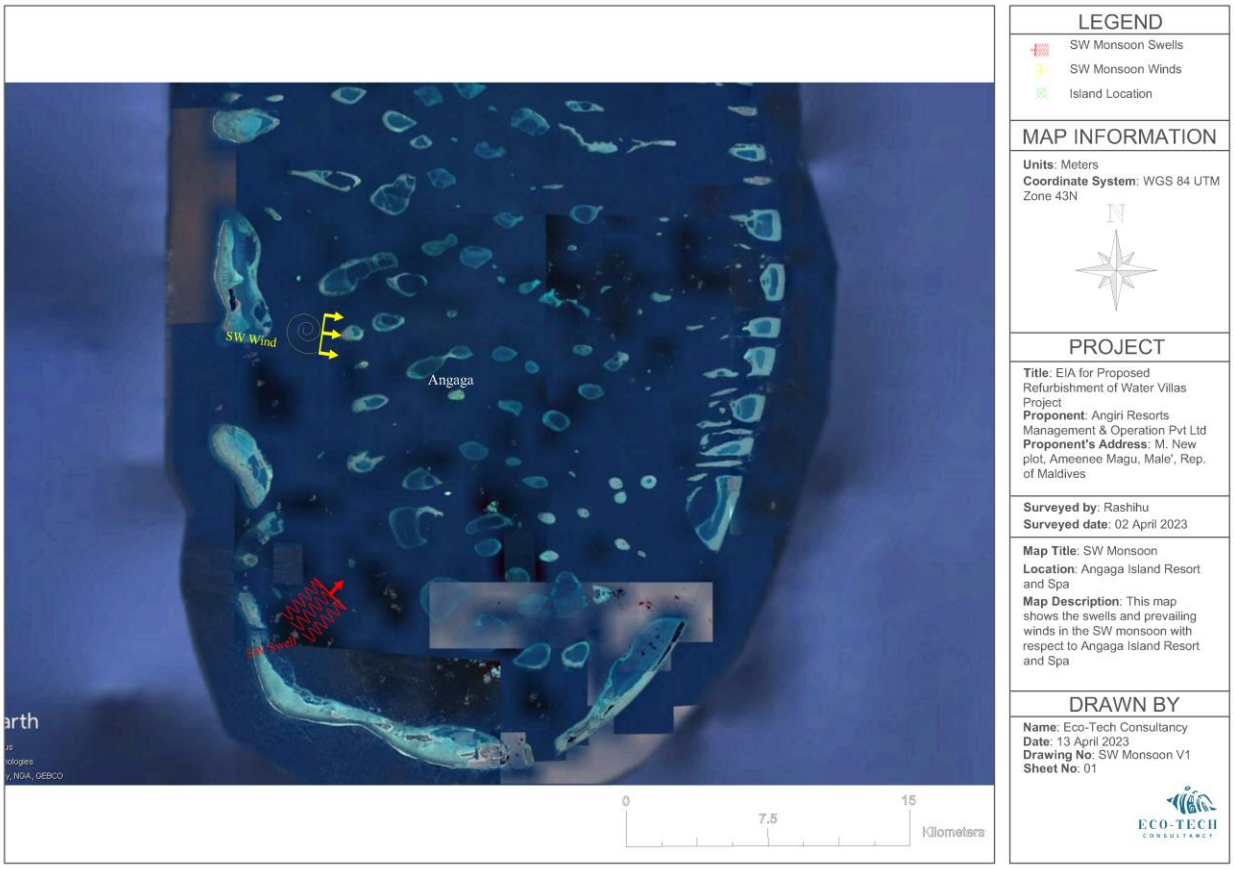

Figure 26: approach of wind and swell waves to Angaga in SW monsoon

The current measurements were taken during the transition period from NE monsoon to SW monsoon when the general pattern of incoming current direction through the Maldives starts to change from east to west. During data collection period the tide was almost at flood. The results

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show a westerly flowing current expected of the NE moon and flood tide. The strongest current speed recorded from the drogue runs at 0.189 m/s near the edge of the northern reef.

With the presence of high energy currents combined with wind induced nearshore waves can radically influence the longshore drift of the island, especially the northern coast of the island. It was observed during the survey that even in moderate weather and ocean conditions, the waves tend to reach and break on to the existing beach villas before returning back to the sea.

Schematic diagrams showing the measured current patterns on Angaga reef flat is shown in below.

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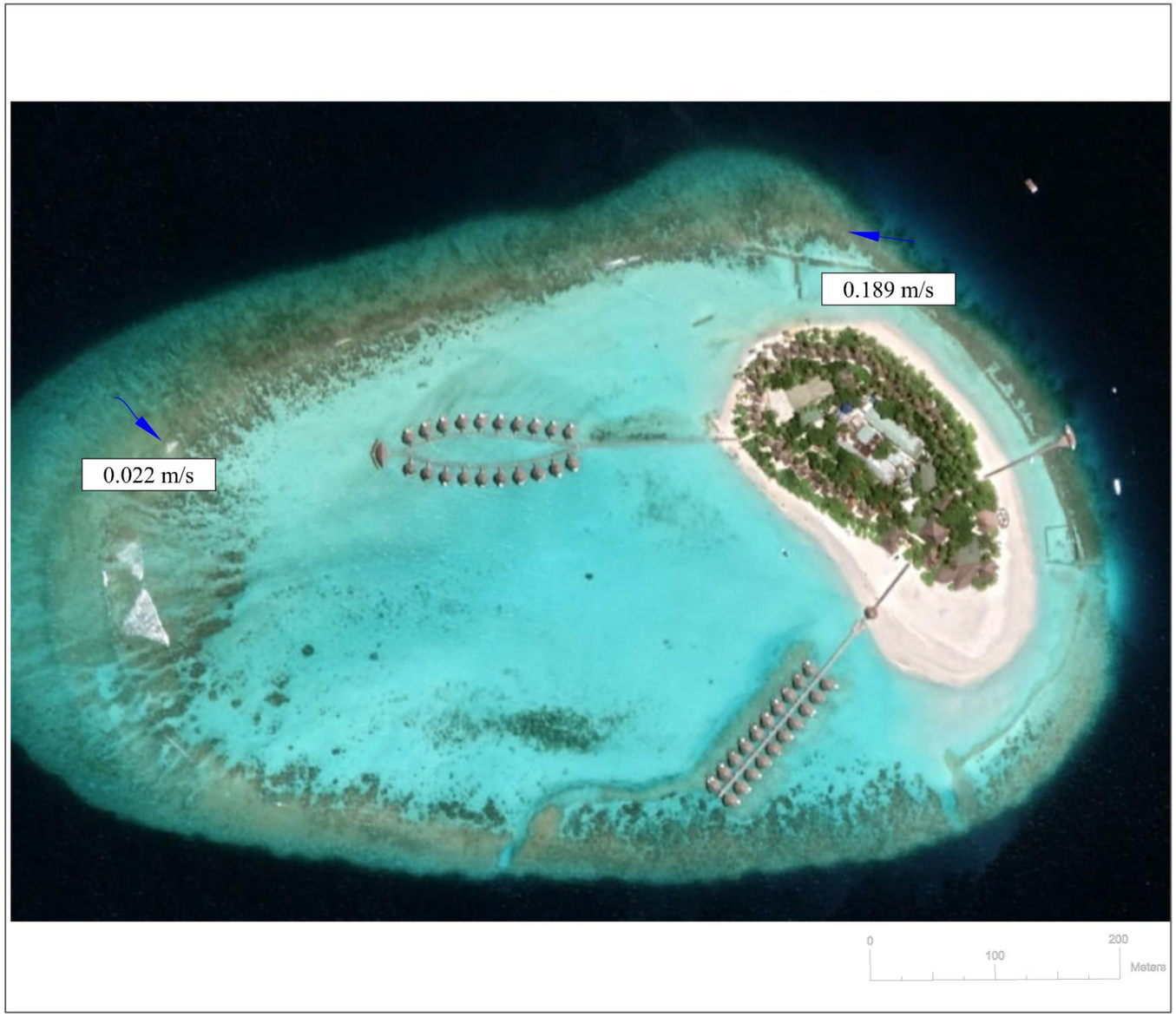

LEGEND

Current direction

MAP INFORMATION

Units: Meters
Coordinate System: WGS 84 UTM Zone 43N

N

PROJECT

Title: EIA for Proposed Refurbishment of Water Villas Project
Proponent: Angiri Resorts Management & Operation Pvt Ltd
Proponent's Address: M. New plot, Ameenee Magu, Male', Rep. of Maldives

Surveyed by: Rashihu
Surveyed date: 02 April 2023

Map Title: Currents
Location: Angaga Island Resort and Spa
Map Description: This map shows the currents at the surveyed locations at the Angaga Island Resort and Spa Western and Northern side reef edge

DRAWN BY

Name: Eco-Tech Consultancy
Date: 13 April 2023
Drawing No: Currents V1
Sheet No: 01

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Figure 27: measured currents in Angaga reef flat

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5.3.3 Seasonal Erosion

From the aerial images it can be observed that Angaga exhibit moderate changes to the shoreline between seasons. According to the images most of the erosion is occurring near the tips of the northern side and get accreted further south. Annual net change is moderate enough that the island but it's still maintaining its original shape, suggesting that Angaga is still spatially exhibiting a dynamic equilibrium. It can be observed that erosion of the northern coast started from 2016.

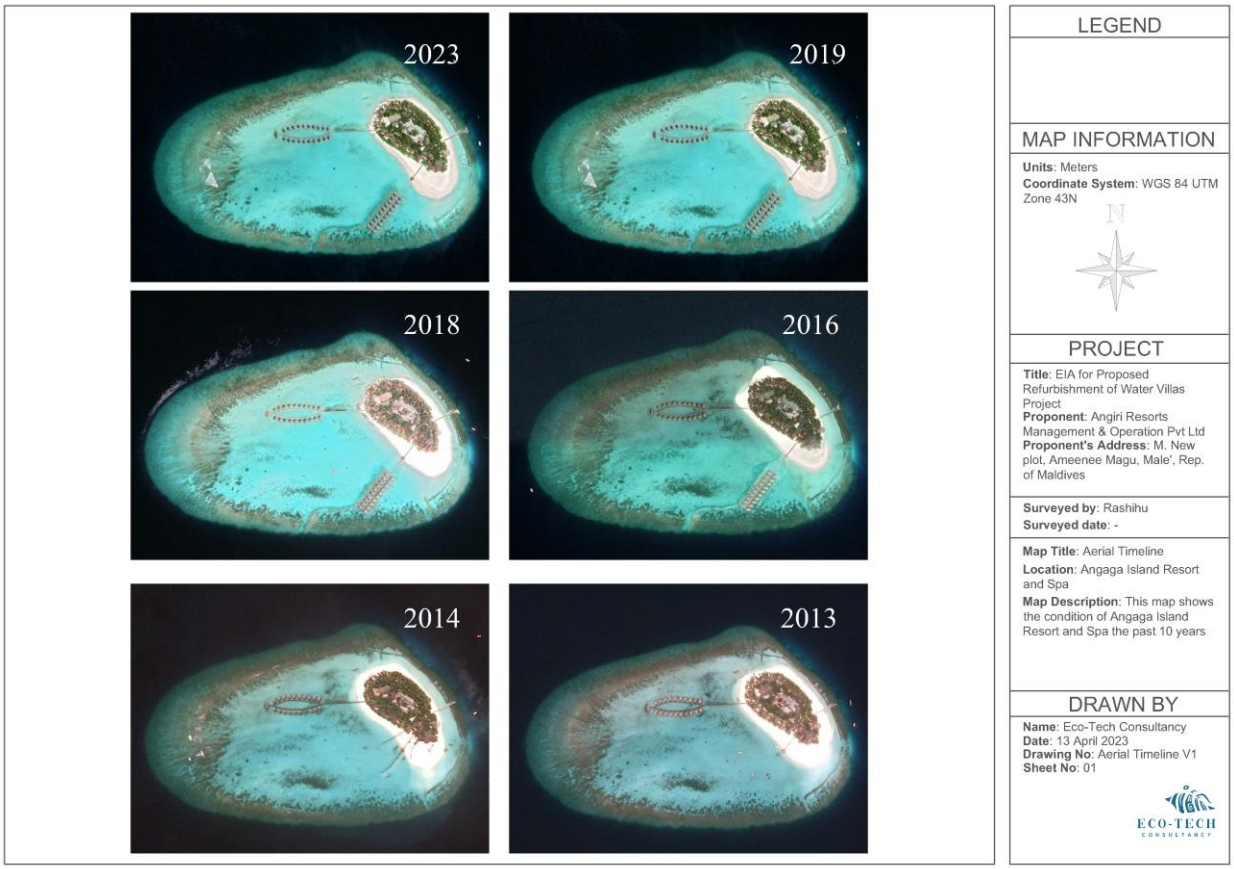

Figure 28: Aerials pictures of Angaga over the past years (adopted from google earth)

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Figure 29: northern side of Angaga, picture taken on April 2022

5.3.4 Seabed Sediments

Upon visual inspection of the seabed sediments on the reef flat of Angaga from different locations, it seems that sediments are coarser in the higher energy regions of the reef flat, namely areas on either side of the walkway; towards the North and South of the water villas. Finer sand was found at the center of the clearing between the two walkways. So, during the construction phase the sediment plume would be smaller and easier to control as coarse sand surround the project site.

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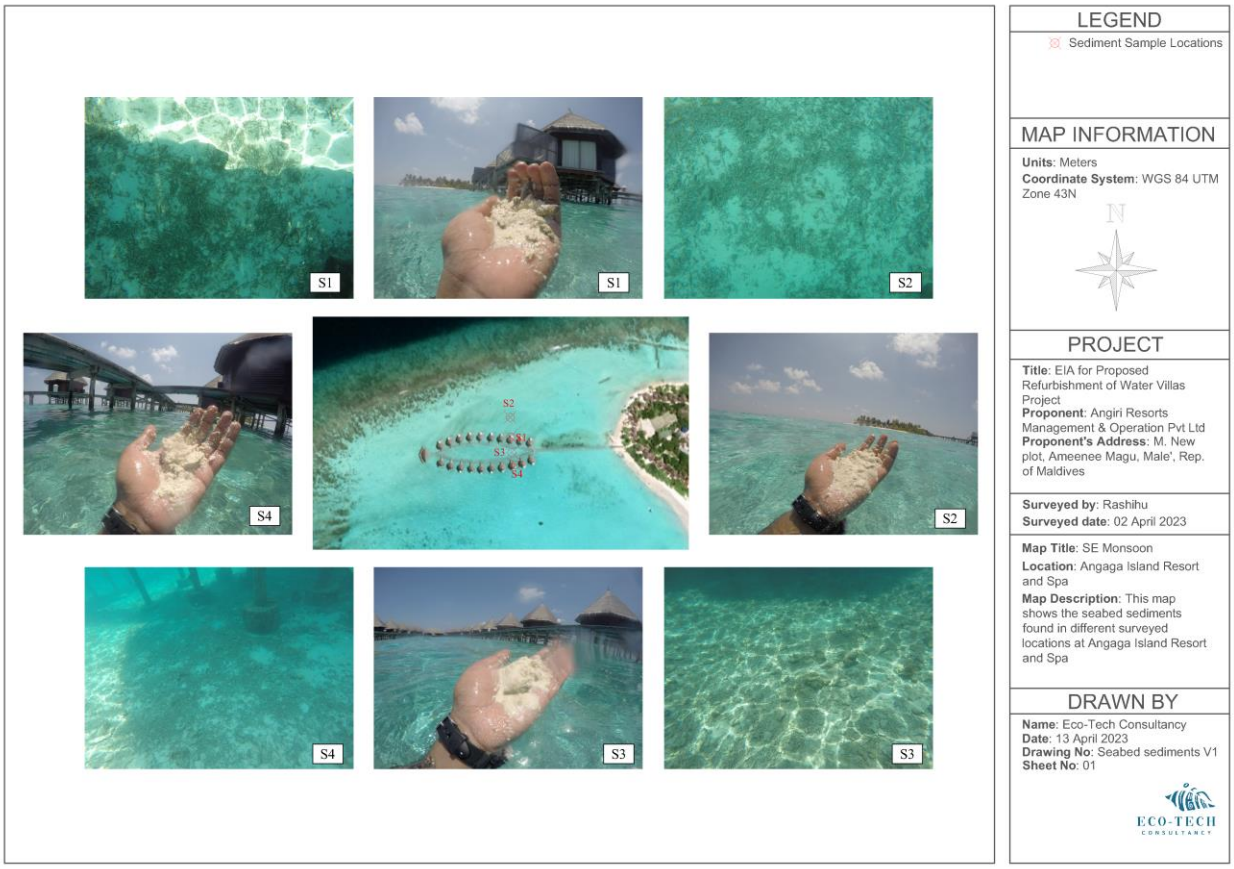

Figure 30: seabed sediments at the proposed construction site in Angaga

5.3.5 Benthic Substrate

During the snorkeling session, it was observed that the proposed project area had overall very low live coral cover. At site D2 and D3 the majority of the area were covered in rocks (RC) while Rubble (RB) dominated at site D1 and C. Highest coral cover was observed ay site D3 with 8.0%.

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5.3.5.1 Major coral categories

The results show that the total live coral cover of the project area was low (3.6%), the dominant substrate is rubble (44.8%) followed by rock (44.6%). Live coral cover was highest at Site D3 (8.0%). The detailed percentages of coral cover in transects are shown in Table 11 and Figure 31 below.

Table 11: Major benthic categories

MAJOR CATEGORY (% of transect)	C	D1	D2	D3	Mean	CI 95%+	CI 95%-
HC	4.4	0.0	2.0	8.0	3.6	5.3	1.9
SC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OT	0.0	0.0	0.0	0.8	0.2	0.4	0.0
NIA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RKC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RC	24.8	2.0	80.8	70.8	44.6	63.3	25.9
RB	66.4	77.6	14.8	20.4	44.8	60.7	28.9
SD	4.4	20.4	2.4	0.0	6.8	11.4	2.2
SI	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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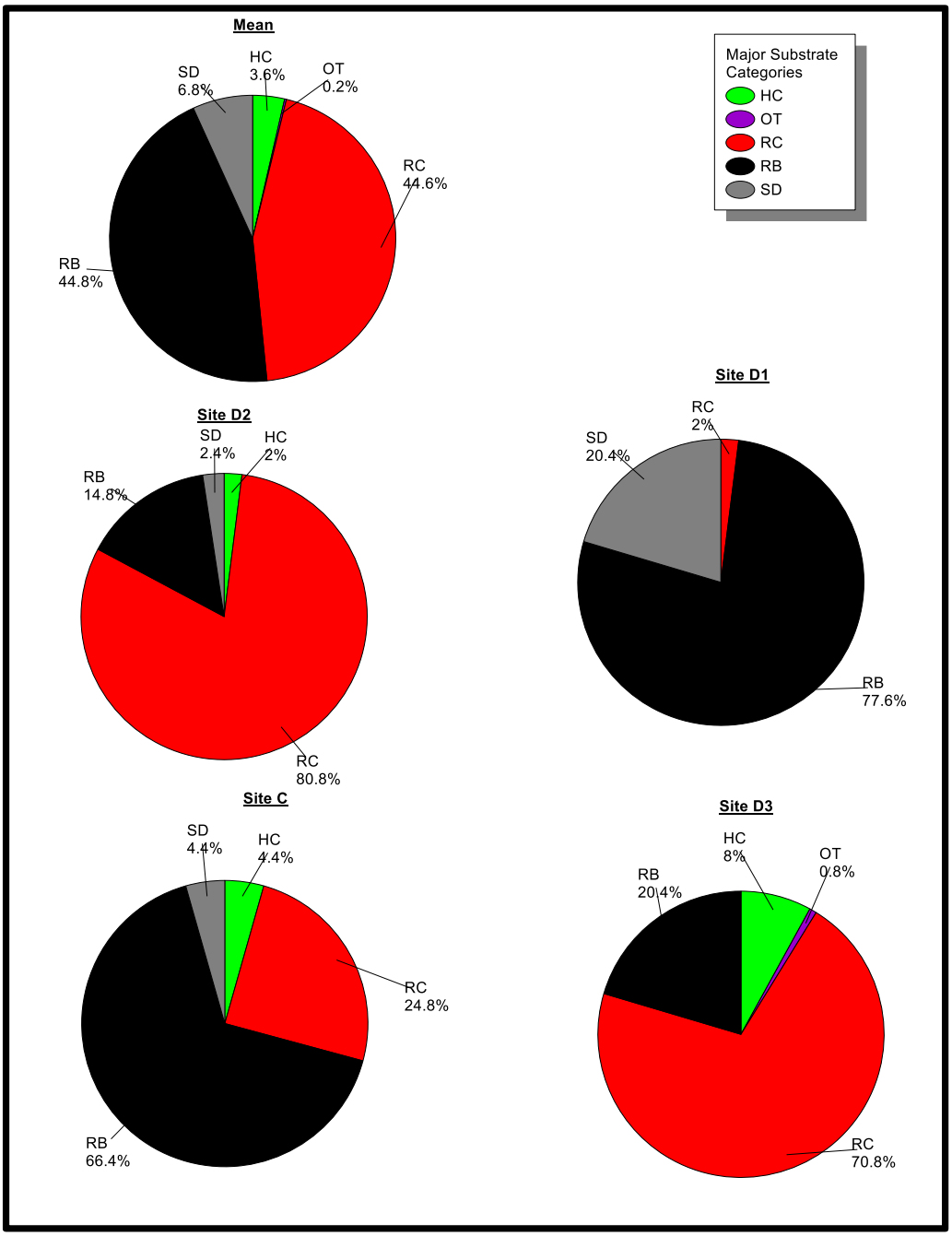

Figure 31: Major substrate categories of all transects and their mean (top left)

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5.3.5.2 Sub categories

The results show that proposed project area had low coral diversity. The coral categories found at the reef flat were *Acropora Submassive* (1.9%), *Acropora Digitate* (0.8%), *Coral Massive* (0.5%) and *Acropora Tabular* (0.4%).

Rubble dominated the lagoon with 44.8% followed by rock at 43.5%. Details are shown in in Table 12 and Figure 32 below.

Table 12. Percentage of substrate subcategories at Kanuhura project area

SUBCATEGORIES (% of transect)	C	D1	D2	D3	Mean	CI 95%+	CI 95%-
Acropora Branching (ACB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Acropora Digitate (ACD)	1.20	0.00	0.00	2.00	0.80	1.29	0.31
Acropora Submassive (ACS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Acropora Tabular (ACT)	1.20	0.00	0.00	0.40	0.40	0.68	0.12
Acropora encrusting (ACE)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coral Branching (CB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coral Foliose (CF)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coral Massive (CM)	0.40	0.00	0.40	1.20	0.50	0.75	0.25
Coral Mushroom (CMR)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coral Submassive (CS)	1.60	0.00	1.60	4.40	1.90	2.81	0.99
Coral encrusting (CE)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heliopora (CHL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Millepora (CME)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Soft Coral (SC)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zoanthid (ZO)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Halimeda (HA)	0.00	0.00	0.00	0.80	0.20	0.40	0.00
Other (OT)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Algal Assemblage (AA)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Macraoalgae (MA)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dead Coral (DC)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sponges (SP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coralline Algae (CA)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dead coral with Algae (DCA)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Rock (RCK)	24.80	2.00	80.80	66.40	43.50	61.73	25.27
Turf Algae (TA)	0.00	0.00	0.00	4.40	1.10	2.20	0.00
Rubble (RB)	66.40	77.60	14.80	20.40	44.80	60.71	28.89
Sand (S)	4.40	20.40	2.40	0.00	6.80	11.42	2.18
Silt (SL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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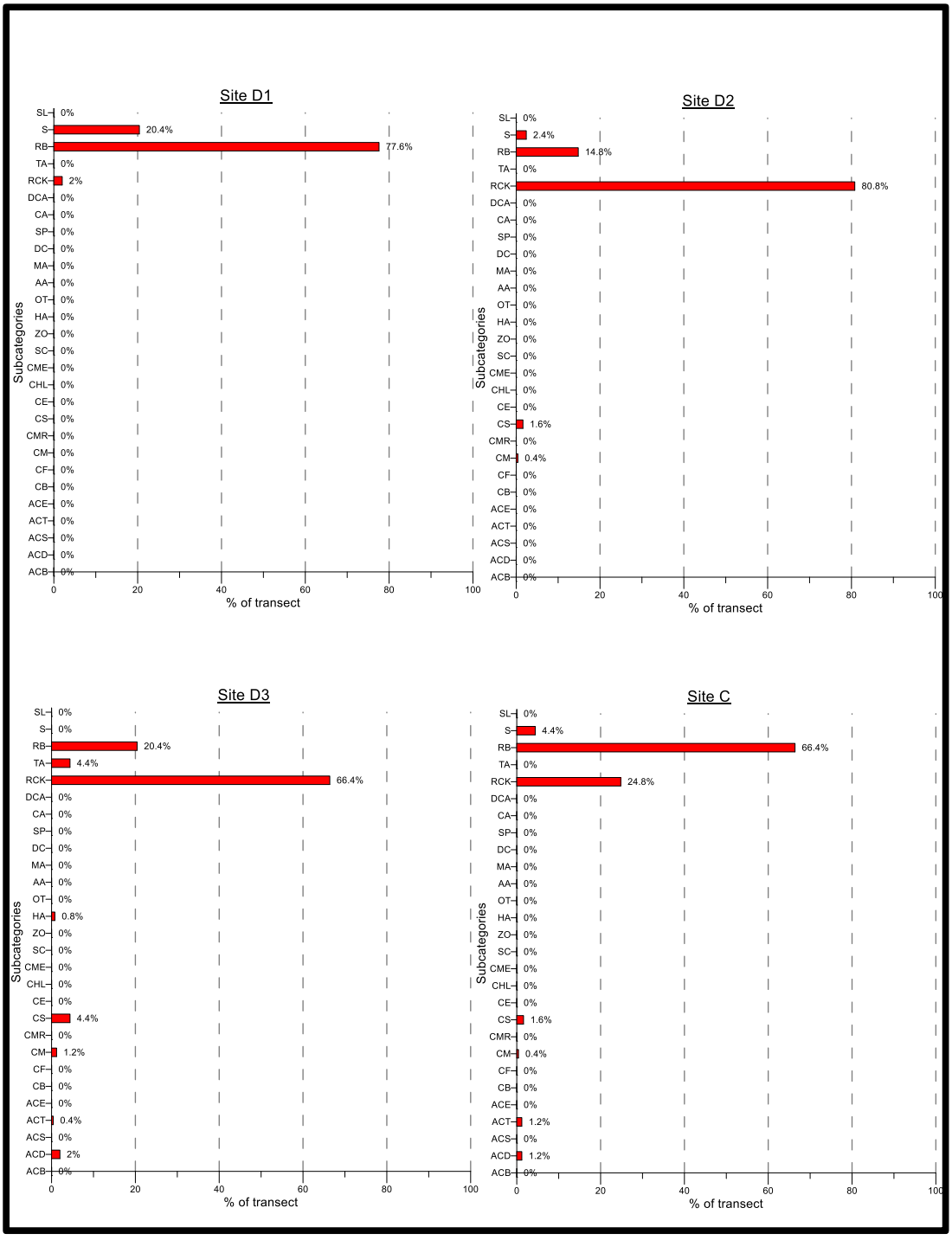

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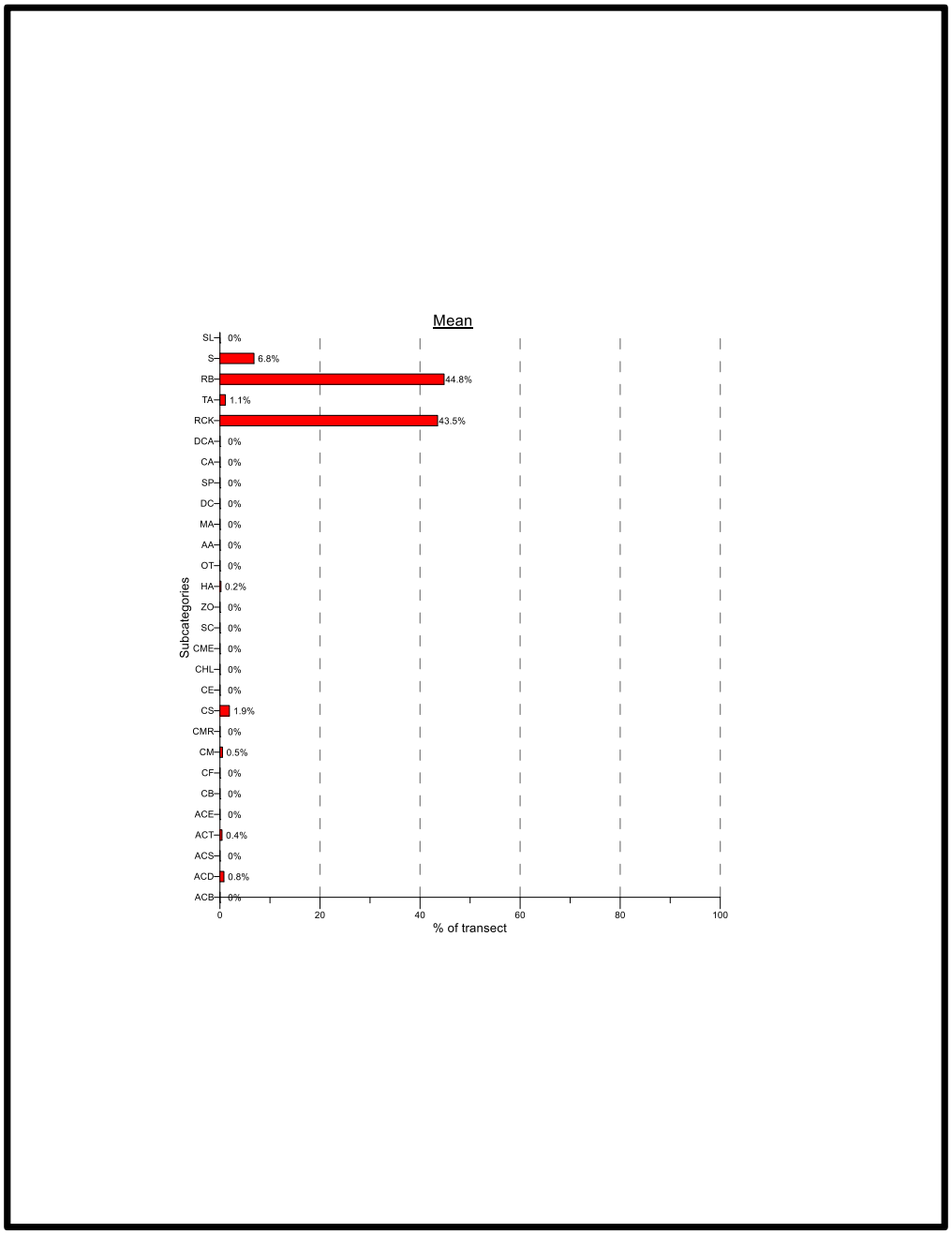

Figure 32: Subcategories of each transect and their mean

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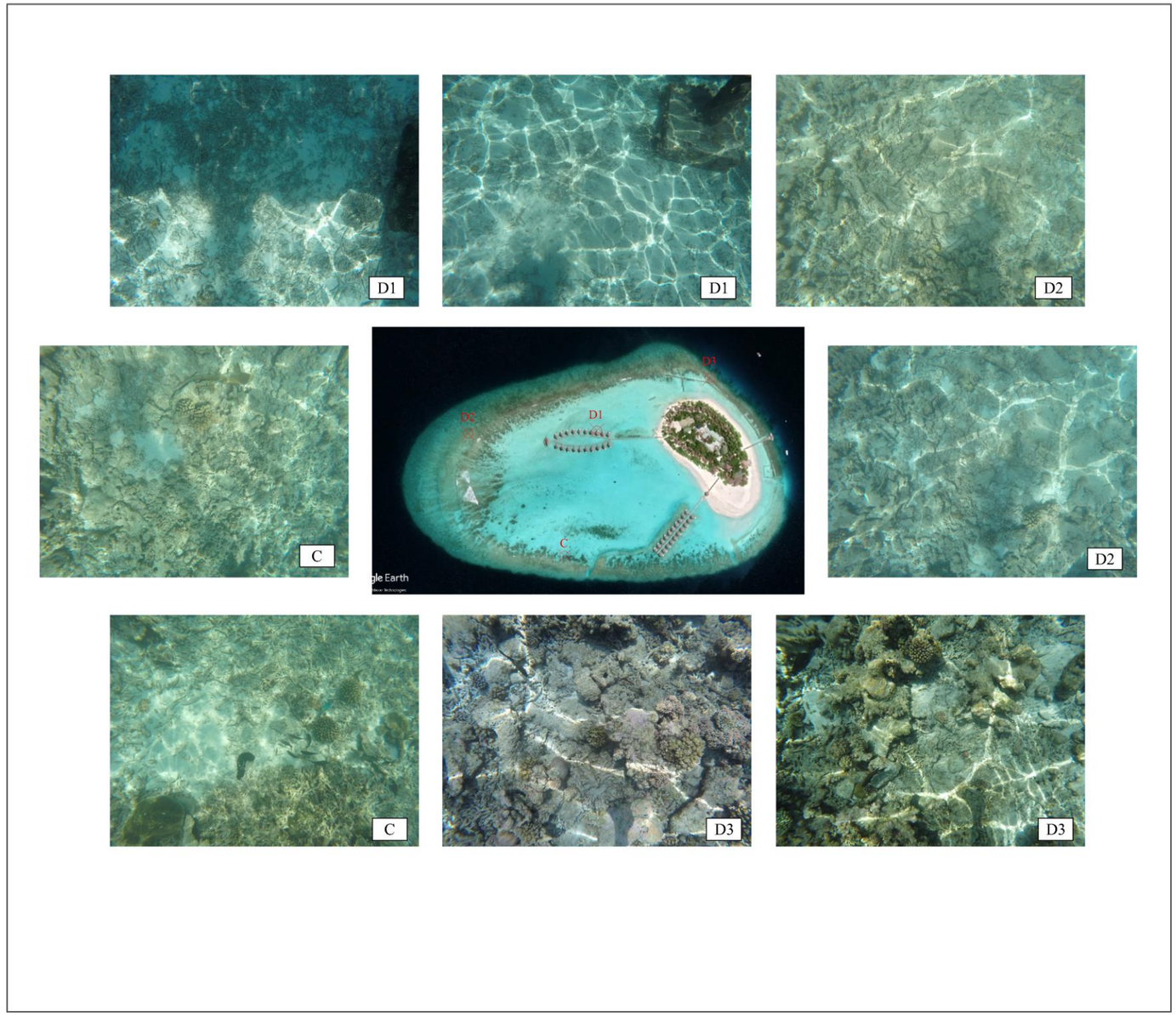

LEGEND

Marine Sample Locations

MAP INFORMATION

Units: Meters
Coordinate System: WGS 84 UTM Zone 43N

N

PROJECT

Title: EIA for Proposed Refurbishment of Water Villas Project
Proponent: Angiri Resorts Management & Operation Pvt Ltd
Proponent's Address: M. New plot, Ameenee Magu, Male', Rep. of Maldives

Surveyed by: Rashihu
Surveyed date: 02 April 2023

Map Title: Benthic Substrates
Location: Angaga Island Resort and Spa
Map Description: This map shows the benthic substratum at the surveyed locations at the Angaga Island Resort and Spa Western side reef flat

DRAWN BY

Name: Eco-Tech Consultancy
Date: 13 April 2023
Drawing No: Benthic Substartes V1
Sheet No: 01

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Figure 33: benthic substrates at the surveyed location in Kanuhura

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5.3.6 Fish Census

A total of 495 individuals were recorded at the proposed project area on the lagoon and reef flat of kanuhura from the 4 fish visual census that were conducted, they represent 21 species from 20 genera, and 16 families. The most abundant species were *Spratelloides gracilis* (abundance 300), followed by Wrasse fish (abundance 64) and Acantharus fish (abundance 51).

The most abundant families of fish were Clupeidae and Labridae (relative abundance 60.6% and 12.9%) followed by Acanthuridae (relative abundance 11.1%).

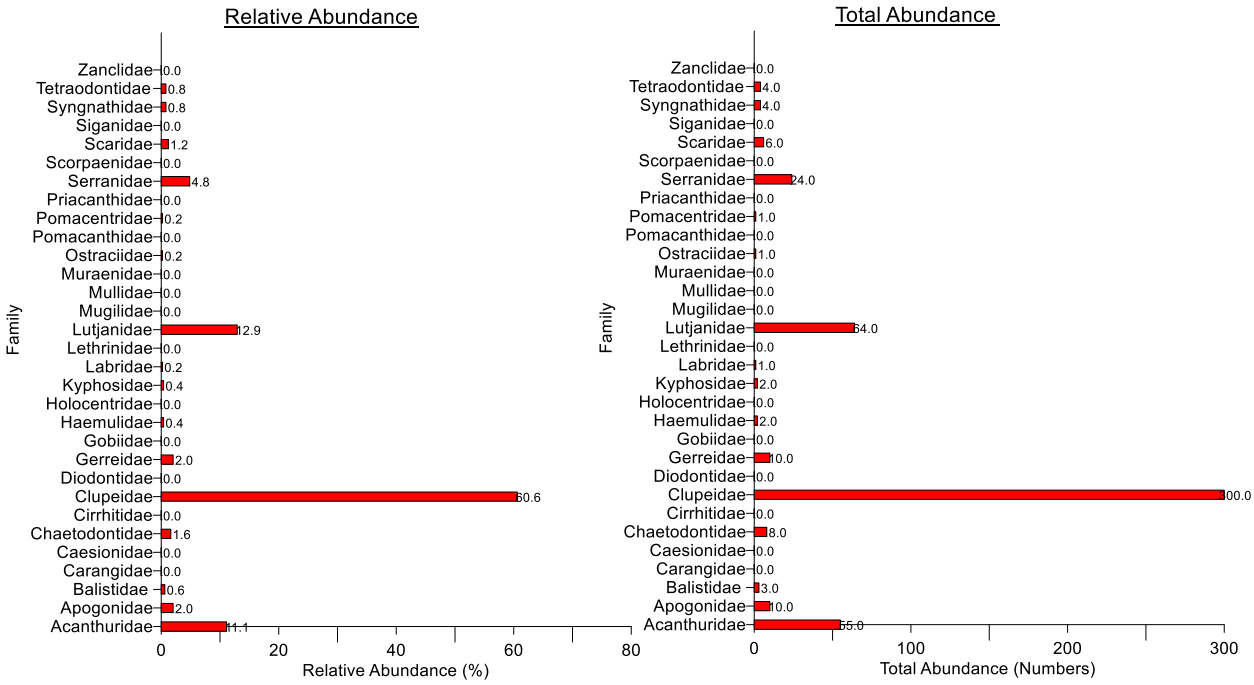

Figure 34: Total abundance (bottom) and relative abundance (top) of fish at Angaga reef

Looking at the differences in fish abundances at different sites, site C and D3 displayed similar number of families. Site D2 had the lowest fish diversity; at this site only 6 families were found. It was observed that site C had the highest fish diversity with 12 families.

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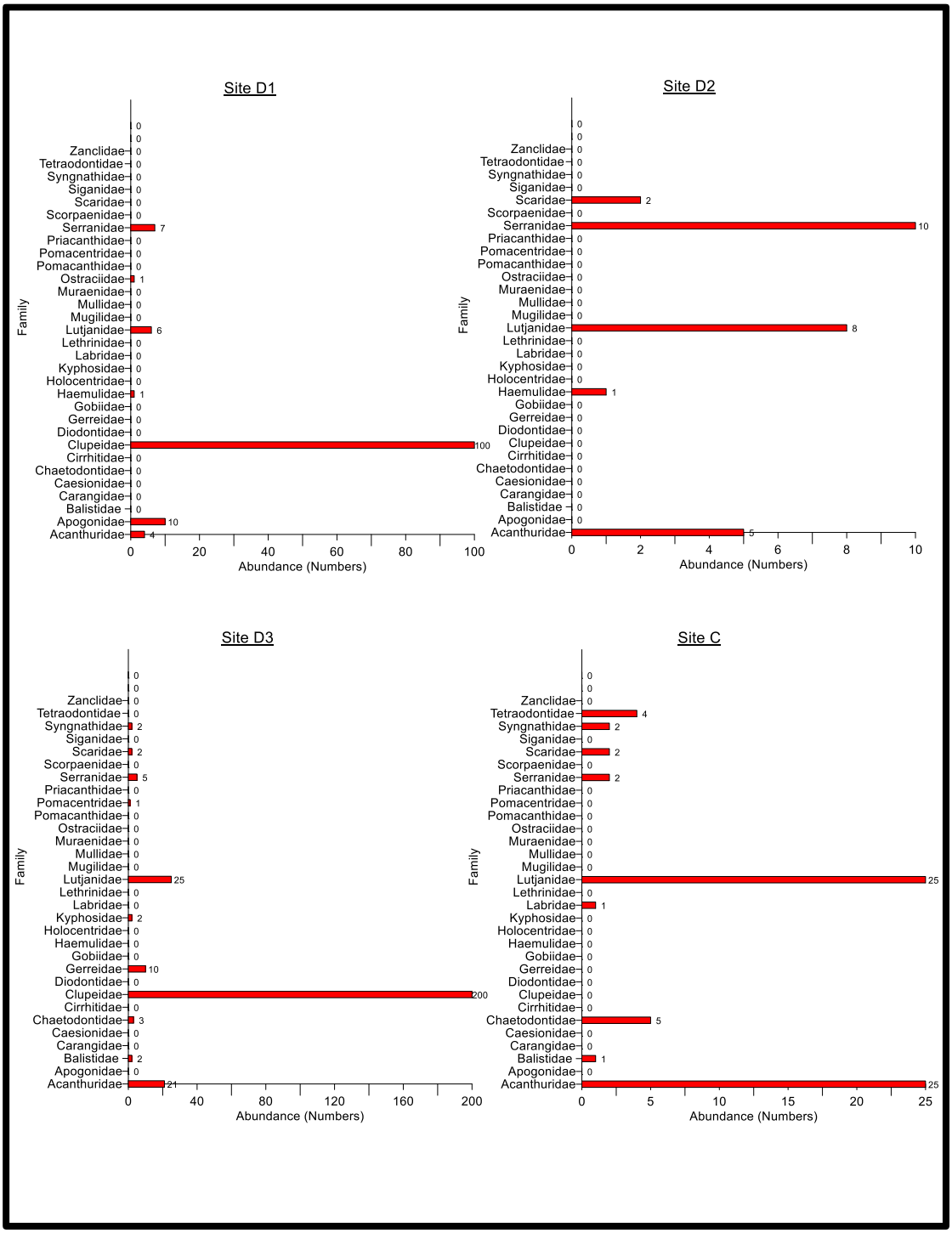

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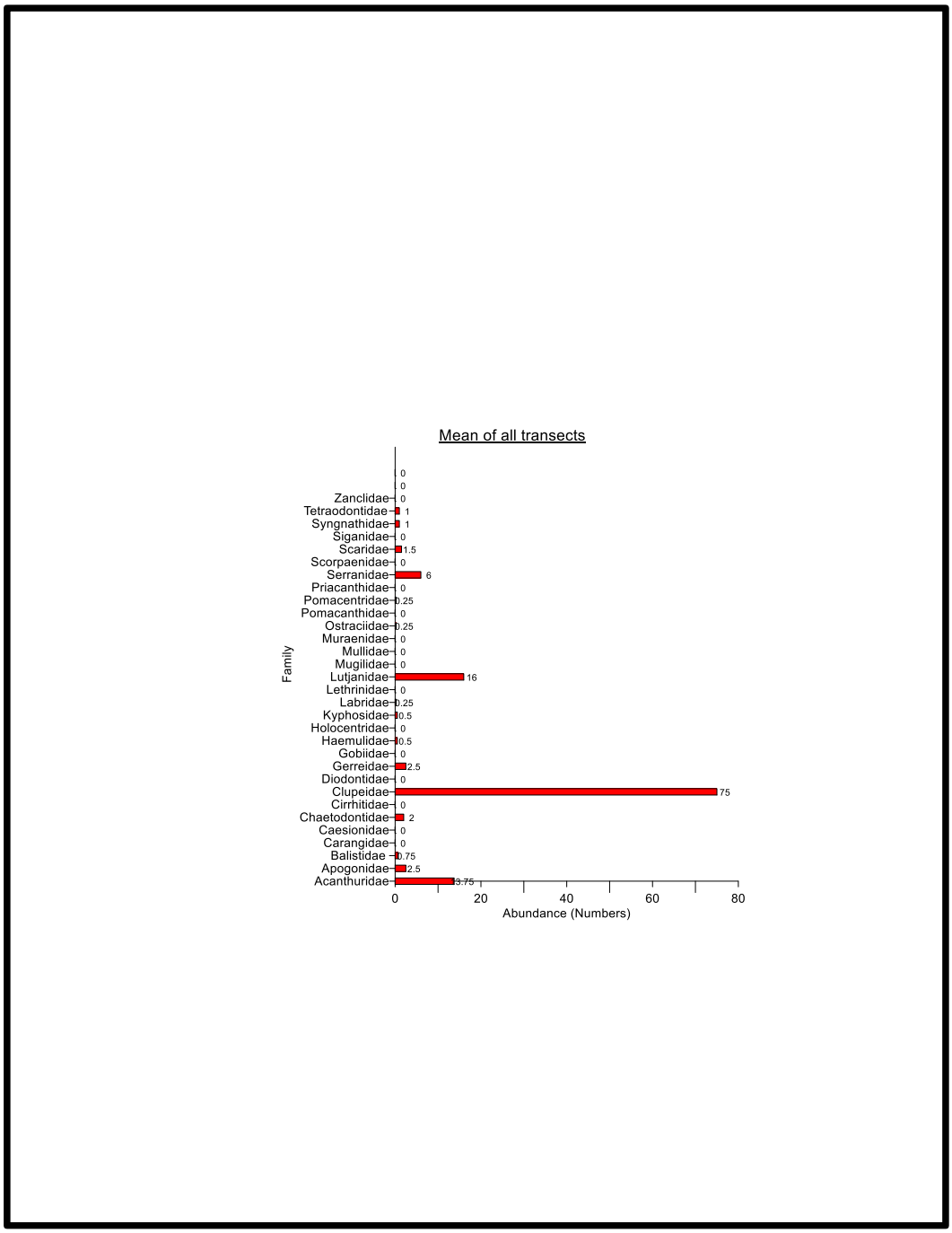

Figure 35: abundance of fish at the surveyed locations in Angaga reef flat

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5.3.7 Marine Water Quality

Marine water quality was compared with a set of internationally agreed optimal ranges as follows;

Table 13: marine water quality optimal ranges

Location	Optimal Range	Reference
Temperature (0C)	180C - 320C *Changes should not surpass 10C above the average long-term maximum	GBRMPA, 2009
pH	8.0-8.3 *Levels below 7.4 pH cause stress	EPA
Salinity (%)	3.2% - 4.2%	GBRMPA, 2009
Turbidity (NTU)	3-5 NTU >5 NTU causes stress	Cooper et al. 2008

Marine water test results from MWSC water quality assurance laboratory is attached in **Error! Reference source not found.** of this report.

Among the tested parameters, all were within the optimal ranges.

Table 14: marine water quality test results (parameters exceeding optimal ranges are highlighted in red) for Angaga

Location	D1	D2	D3	C
Temperature (^{0}C)	24.3	24.1	24.2	24.0
pH	8.2	8.2	8.2	8.2
Salinity (%)	3.410	3.385	3.361	3.369
Turbidity (NTU)	0.112	0.135	0.102	0.110
TDS (mg/L)	25800	25800	25600	25900
TPH (mg/L)	<0.036	<0.036	<0.036	<0.036

**Ex-situ temperature readings*

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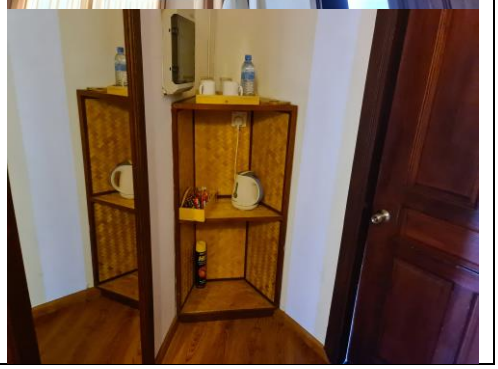
5.4 Terrestrial Environment of Angaga

This section describes the site-specific terrestrial environmental conditions of the proposed project site. The structural environment and noise level results are presented.

5.4.1 Structural Environment at Project Site

There are 20 water villas within the project site along with a jetty walkway. The water villas were still fully furniture with functioning utility services. The condition existing water villas and walkway are summarized on the Table 15.

Table 15: condition existing water villas and walkway on project site

Building or infrastructure	Location	Condition	Use	Pictures
Interior of Water villas	Project site	-Functioning -Fully furnished -Furniture partially outdated	Provide goods and services	 

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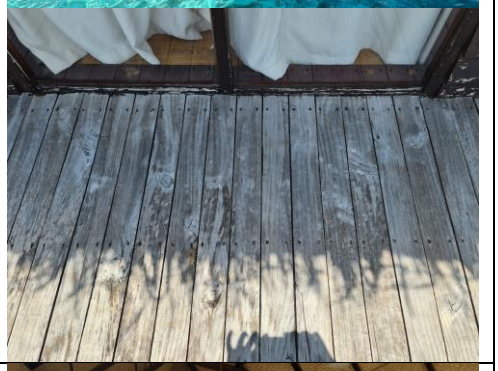
Exterior of water villas	Project site	-Functioning -Partially outdated -Moderately weathered -Loose deck flooring	For accommodation	 
Restaurant	Project Site	-Functioning -Fully furnished	To serve foods and drinks.	 

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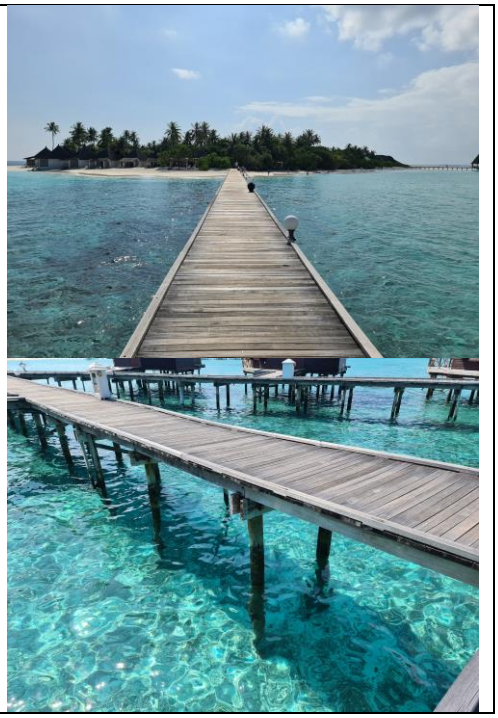
Walkway	On project site	-Extremely weathered and degraded -Shaky and unsafe -Some walkway footings have been eroded completely. -Wooden planks are used to provide support to the weak foot columns	Provide access to the water villas	

5.4.2 Terrestrial Megafauna

On the project location, 2 caged *Ara Ararauna (Macaw)* and moderate number of *Melopsittacus Undulatas (Budgerigar)* were observed. No other terrestrial megafauna was encountered.

5.4.3 Noise

Noise, defined as unwanted sound, is perceived as an environmental stressor and nuisance and is associated with physical, mental and psychological stresses in humans. Exposure to continuous noise over 85-90 dB over a lifetime can lead to progressive hearing loss with an increased threshold of hearing sensitivity. Indirect effects of noise pollution include inducing non-auditory effects such as sleep disturbance and annoyance which eventually lead to stress responses, then symptoms and possibly illness. Noise exposure during sleep may increase blood pressure,

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heart rate and finger pulse amplitude as well as body movements. Physiological symptoms associated with noise exposure include nausea, headache, argumentativeness, mood changes and anxiety (Stansfeld & Matheson, 2003).

Noise levels requisite to protect public welfare and health against hearing loss, annoyance and activity interference as identified by the EPA of the United States specified noise levels of 70 dB as the level of environmental noise which will prevent any measurable hearing loss over a lifetime. Likewise, levels of 55 dB outdoors and 45 dB indoors are identified as preventing activity interference and annoyance. The latter are considered those which will permit spoken conversation and other activities such as sleeping, working and recreation which are part of the daily human activities (EPA Identifies Noise Levels Affecting Health and Welfare, 2016).

Children in particular are extremely vulnerable to both auditory and non-auditory health effects of noise. Studies of children exposed to environmental noise have consistently found effects on cognitive performance, decreased motivation, cardiovascular effects, endocrine disturbances as well as noise annoyance (Stansfeld & Matheson, 2003).

Table 16 shows the ambient noise level in and around the proposed project site and control locations. The geographic coordinates for the locations are given in Table 3 and Figure 2. The noise levels at all surveyed locations were between 50-60 dB which is a cause for concern as this level of noise is identified to prevent activity interference and annoyance. However, the noise was attributed mainly through people and waves. The site N1 was the site with the maximum noise level recorded with 57.8 dB.

Table 16: ambient noise levels in Angaga

Code	Time	Location	Noise level (dB)			Observations
			Min	Max	Avg	
N 1	17:00	Project site	46.6	57.8	52.2	People walking
N2	17:00	Nearest Beach villa	53.1	55.4	54.25	Crashing of waves

5.5 Hazard Vulnerability

The United Nations Development Program (UNDP) has compiled a very thorough study to develop a risk profile for the Maldives in order to determine the probability of hazards across

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different regions of Maldives based on geological evidence, historical data and projections derived from theoretical analysis (Developing a Disaster Risk Profile for Maldives, Volume 1: Main report, 2006). Likelihood of storm hazards for the island under concern are analyzed using this disaster risk management study done by the UNDP and likelihood of flooding is analyzed using rainfall data from the nearest meteorological center to each island. Some project site specific data are also obtained from consultation with the relevant stakeholders.

5.5.1 Storms

In addition to monsoonal heavy rains and strong winds, hazardous weather events which regularly affect the Maldives are tropical storms or tropical cyclones and severe local storms (thunder storms/thunder squalls) (Developing a Disaster Risk Profile for Maldives, Volume 1: Main report, 2006).

Every so often, tropical cyclones hitting the Maldives are highly destructive due to associated strong winds that exceed a speed of 150 km/hr, heavy rainfall of above 30-40 cm in 24 hrs and storm tides that often exceed 4-5 m. Strong winds often damage vegetation, houses, communication networks and roads. Heavy rainfall is associated with serious flooding. Cyclonic winds can sometimes cause a sudden rise in sea level along the coast, leading to a storm surge. The combined effect of surge and tide, which is known as ‘storm tide’, can cause catastrophic events in low lying areas, flat coasts and islands such as the Maldives (Developing a Disaster Risk Profile for Maldives, Volume 1: Main report, 2006).

Hazards associated with thunder storms include strong winds often exceeding a speed of 100 km/hr, heavy rainfall, lightning and hail. Such thunder storms are very frequent in the equatorial region, which is where the Maldives lie, however, they are less violent at this region. Moreover, land areas are more frequently hit by thunder storms than the open ocean. Strong winds generated by severe local storms generate large wind-driven waves which are hazardous for the Maldives (Developing a Disaster Risk Profile for Maldives, Volume 1: Main report, 2006).

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5.5.2 Cyclonic Winds

Studies of historic data suggests that even though the northern islands of the country were affected by weak cyclones which formed in the southern part of Bay of Bengal and the Arabian Sea, in general the Maldives islands were less prone to tropical cyclones. According to the cyclonic wind hazard zone classification, the north most islands represent the highest risk region and the hazard risk decreases moving down south (Developing a Disaster Risk Profile for Maldives, Volume 1: Main report, 2006).

On a scale of 1-5, with 5 being the highest risk zone, ADh. Angaga falls under the moderate-risk zone (Figure 26) (Developing a Disaster Risk Profile for Maldives, Volume 1: Main report, 2006).

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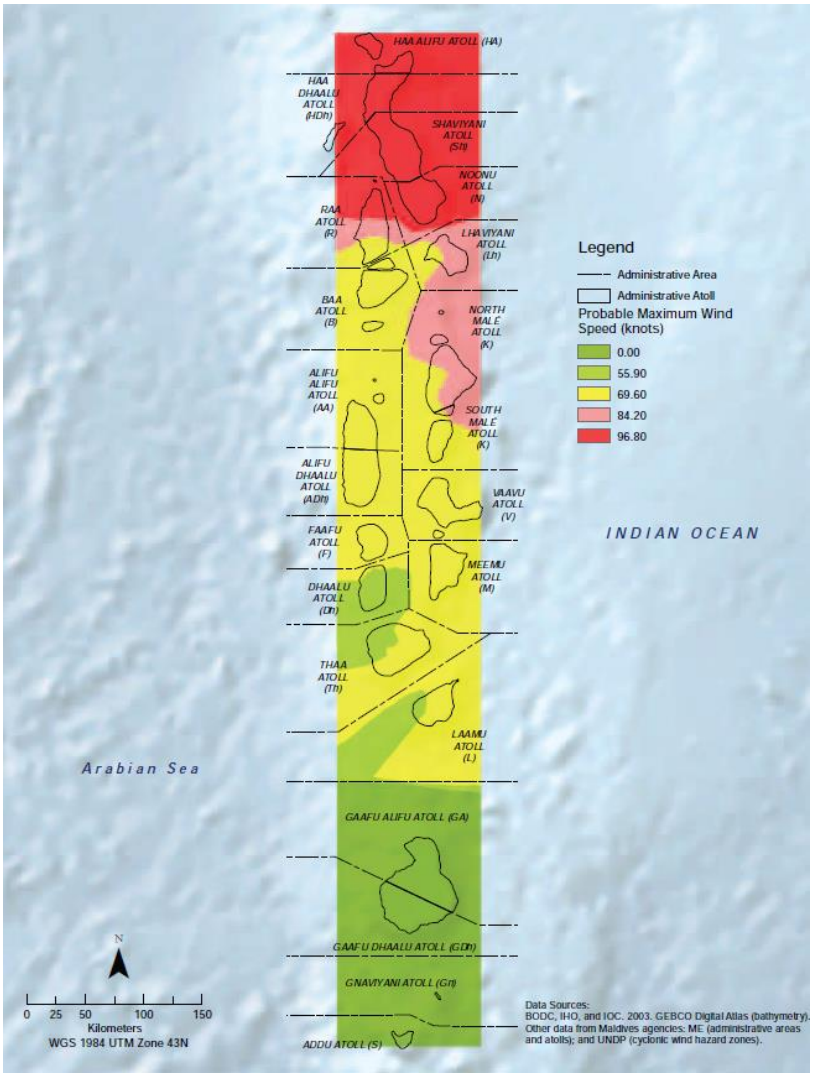

Figure 36: Cyclonic wind hazard map of the Maldives; from red to green, red being the highest at risk (Multihazard Risk Atlas of Maldives, 2020)

5.5.3 Storm Surge

According to the bathymetric surveys of the entire Maldives, the ocean slope towards the eastern side is steeper than the west coast which indicates that the eastern islands of the Maldives are more vulnerable to higher surge hazard compared to the western islands. Accordingly, the

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country has been divided into 5 broad storm surge hazard zones from 1-5, with 5 being the highest risk category. According to this zoning, Angaga is in very low risk zone (Developing a Disaster Risk Profile for Maldives, Volume 1: Main report, 2006).

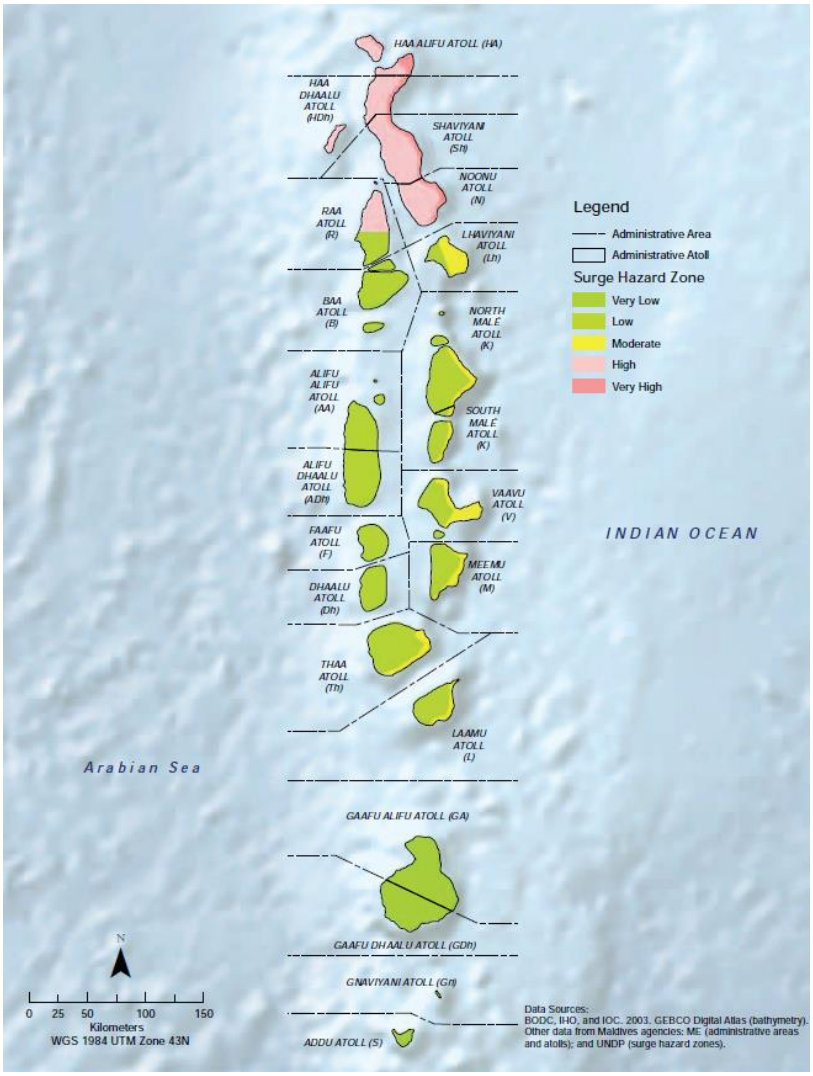

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Figure 37: Storm hazard map of the Maldives from pink to green, pink being highest risk (Multihazard Risk Atlas of Maldives, 2020)

5.5.4 Flooding

Rainfall data from Hulhule' meteorological station have been used to analyze the flood and drought years across Hulhule'region. Data has been standardized against the overall mean from each station. Deducing from standard deviation of rainfall from long-term mean, it can be concluded that if the difference between long-term mean and standard deviation is >1, that corresponding year is a flood year whereas if this difference is <-1 it may be considered a drought year.

As such, analysis of rainfall data from Hulhule' station shows that this part of the Maldives experienced more rain deficient years than heavy rainfall years (10 years). As for flooding, 7 years (from 47 years of data) observed rainfall >1 standard deviation from the long-term mean (Figure 26) indicating that flooding is an uncommon occurrence at this part of the Maldives. In addition, the 10-year moving average predicts that 2022 will have a rainfall lower than the long-term mean.

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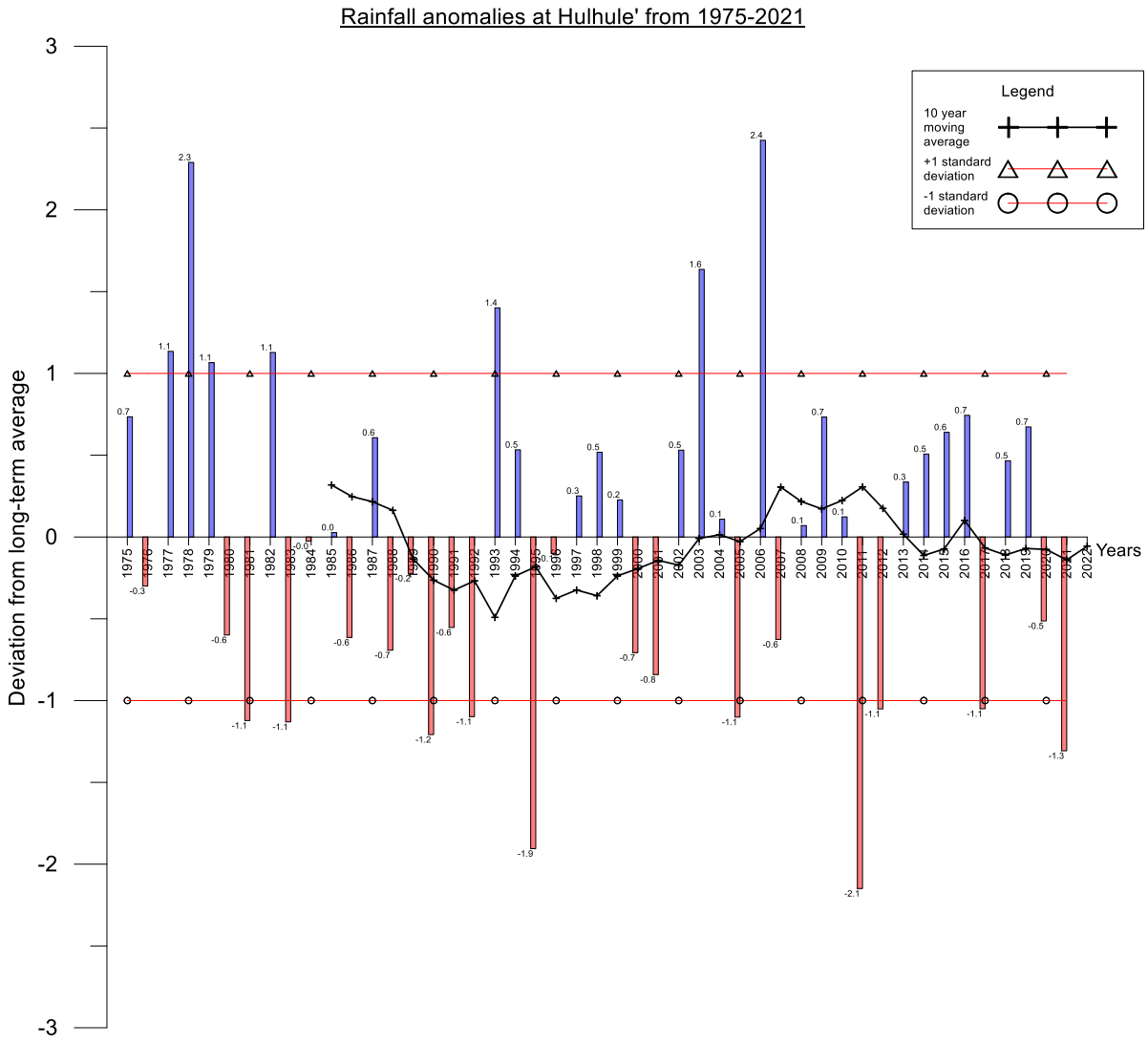

Figure 38: Rainfall anomalies for Hulhule' from 1975 to 2021 with the 10-year moving average. Red lines indicate +1 and -1 standard deviations from the mean. (Data obtained from the Bureau of Meteorology, Maldives).

However, there are other factors that greatly influence risk of flooding for instance alterations to the islands size, width and topography. An island's risk to flooding may vary despite similar rainfall patterns. As per the consultation with the resort management, it was found that the island does not experience any floodings due to rain.

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5.5.5 Seismic Activity

Seismic waves are created when the earth's lithosphere releases a sudden burst of energy shaking the surface of the planet. Earthquakes are manifested when fault lines or tectonic plates move due to these seismic waves. When this occurs at large magnitudes at the seabed, it can cause tsunamis. Only three major events of magnitude above 7.0 had struck the region between 1979 and 2004 (Developing a Disaster Risk Profile for Maldives, Volume 1: Main report, 2006).

Angaga is located in the Central region which is in the lowest risk zone.

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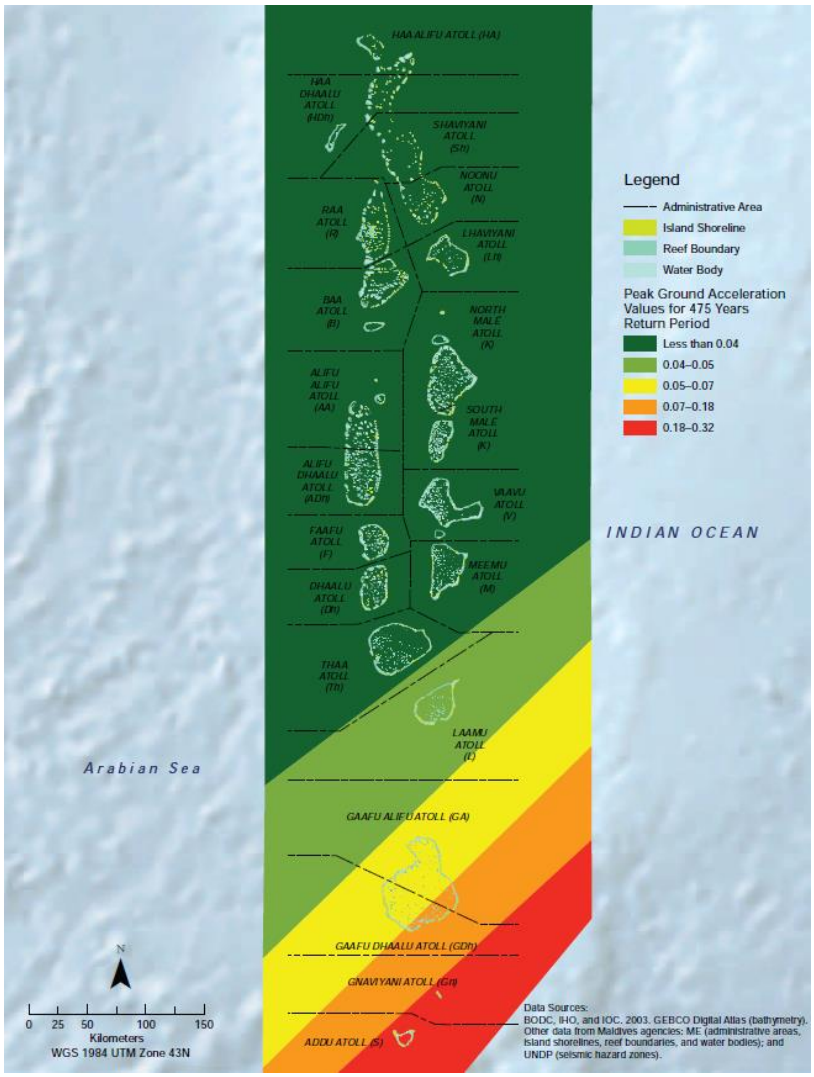

Figure 39 Seismic hazard zoning map of the Maldives from green to red, red being the highest at risk (Multihazard Risk Atlas of Maldives, 2020)

5.5.6 Tsunami

Tsunamis are destructive oceanic waves generated due to disturbances on the sea floor such as earthquakes, volcanic eruptions, underwater landslides, or even meteorite impacts.

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In 2004 the second largest tsunamigenic earthquake globally recorded hit Indonesia and generated tsunamis 3-10 meters high travelling across the Indian Ocean striking Maldives with waves ranging 1.2-4.2 m. Out of 198 inhabited islands, 13 were destroyed, 56 sustained major physical damage, and 121 faced moderate damage from flooding.

95% of tsunamis that effect Maldives are generated from the eastern source zones. The risk is high for eastern fringe of eastern atolls, though eastern fringe of some western atolls is also at high risk. By observing bathymetric contours, the islands have been categorised into 5 zones with 1 being the lowest hazard level. Angaga is in a very high-risk zone.

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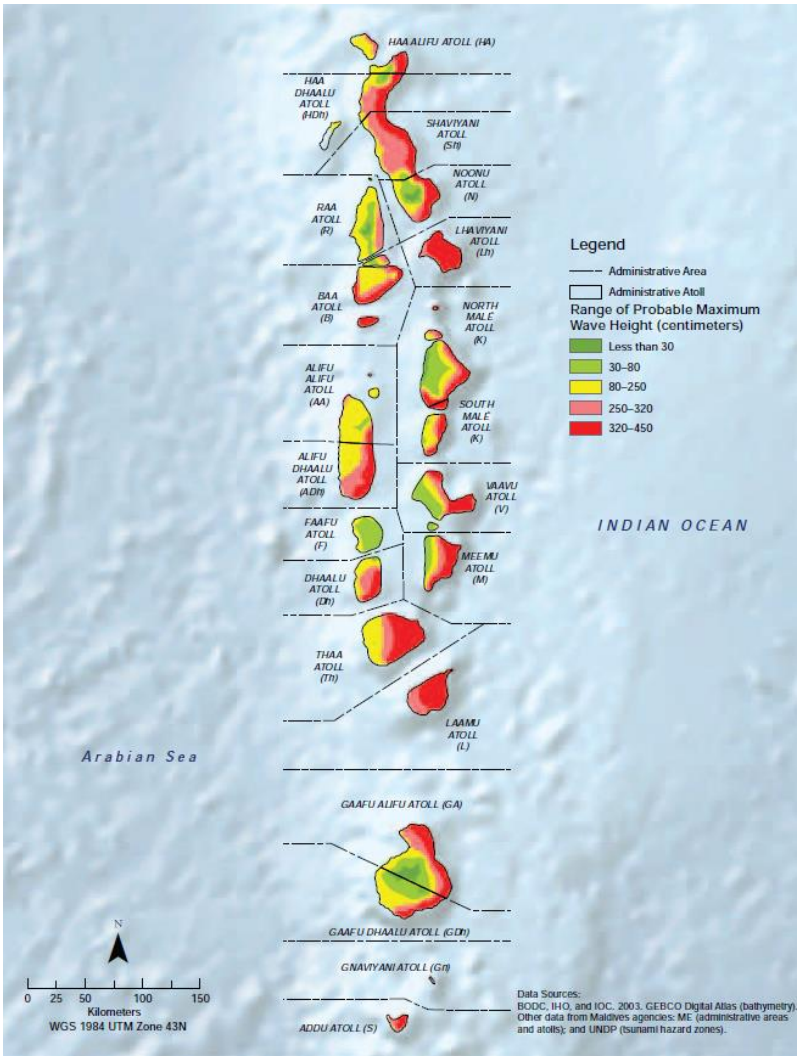

Figure 40: Tsunami hazard zoning map of Maldives (Multihazard Risk Atlas of Maldives, 2020)

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6. STAKEHOLDER CONSULTATION

This section describes the stakeholder consultation method and the summary of the outcomes from each of the consulted stakeholders.

6.1 Consultation Method

An email request for stakeholder consultation was sent out to the relevant stakeholders with the approved ToR and a project brief. If the stakeholder wishes for a stakeholder consultation meeting, a meeting was supposed to be held at a convenient time and venue. An option was also given to provide the recommendations and suggestions regarding the proposed project to us in writing, whereby the stakeholder could send us an email highlighting their concerns and recommendations.

For the public consultation and for any meetings held, the consultant starts by giving the stakeholder(s) a brief overview of the proposed project. In the case of public consultation, prior to project brief, the EIA process of the Maldives was briefly explained. After the project brief discussions are opened for the participants to ask for additional information regarding project components or to give recommendations and suggestions for the proposed project.

6.1.1 Invitations

The following table highlights the email requests sent out to stakeholders inviting for the stakeholder consultations. For the stakeholders that did not respond, the table shows the date at which the invitation was initiation sent and any follow up reminders. The proof for the invitations and reminders is given in the section 6.1.5 under the table Table 21.

Table 17: invitations sent out to stakeholders

Stakeholder	Initial Invitation Sent Date	Reminders	Responded Date
Alif Dhaalu Atoll Council	05th April 2023	First reminder; 16th April 2023 via email and tried calling on the same day at	Did not respond

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		12.30 PM.	
MoT	05th April 2023	None sent	05th April 2023

6.1.2 Consulted Date and Venues

The following table gives the consulted date, time and venues for each responded stakeholder(s).

Table 18: consultation date, time and venues

Stakeholder	Date	Time	Venue
MoT	05th April 2023	10:59 PM	E-mail response

6.1.3 Contact Details for all Participants attended to Consultations

The following table gives the contact details of all participants which have attended the consultation meeting(s) for this EIA or contributed via email response.

Table 19: contacts of all stakeholders consulted

Stakeholder	Name	Designation	Contact
MoT	Fathimath Zaina Shareef	Senior Environment Officer	fathimath.zaina@tourism.gov.mv

6.1.4 Attendance Sheets for Consultation Meetings or proof of consultations

The following table shows the attendance sheets for consultation meetings (if any) and email proof of consultations with stakeholders.

Table 20: Attendance sheets (if any) and email proof for stakeholder consultations

Stakeholder	Attendance Sheet

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MoT

es@tourism.gov.mv <es@tourism.gov.mv> Wed, Apr 5, 2023 at 10:59 PM
To: Mahfooz Abdul Wahhab <mahfooz@ecotechconsultancy.com>
Cc: Ibrahim Fikree <ibrahim.fikree@tourism.gov.mv>, sinan@tourism.gov.mv

Dear Mr, Mahfooz,

Greetings from the Ministry of Tourism.

With regards to your email and the TOR received, requesting for a stakeholder consultation to carry out the EIA for the proposed project, please find the below comments,

- The project shall be carried out in accordance with the approved coastal modification letter (88-DS/PRIV/2023/391),
- Address all the terms highlighted in the approved ToR (Ref: 203-ECA/PRIV/2023/238) of this project,
- To minimize environmental damage special care and protection measures need to be undertaken during the project implementation stage,
- Proper and effective mitigation measures should be implemented during the project implementation stage,
- Include all possible information (permits/approvals) issued by the relevant authorities for the project,
- Proper waste management mechanisms should be in place during construction and operational phase of the project.
- Undocumented or illegal labors shall not be allowed during the construction and operational stage.
- Proper health and safety measures and emergency first aid shall be provided to the project team,
- Adequate temporary facilities including labor accommodation, electricity, water, site office and temporary storage area shall be provided during the implementation phase of the project.
- Should fulfill all regulatory requirements prior to the commencement of the project activities.

Thank you.

https://mail.google.com/mail/u/1/?ik=e02a5d47b0&view=pt&search=all&permthid=thread-a:r-8744837664904756961&simpl=msg-a:r26640156078405... 2/4

4/6/23, 1:48 AM Gmail - Request for EIA stakeholder consultation meeting for EIA for the Proposed Refurbishment of Water Villas Project at Angaga...

Best regards,

Fathimath Zaina Shareef
Senior Environment Officer
Development, Environment and Monitoring Section

6.1.5 Proof of Invitations sent out for not responded stakeholders

The following table shows the proof of email invitations sent out for the stakeholders that did not respond.

Table 21: proof of invitation sent out to stakeholders

Stakeholder	Partial print of invitations sent out

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Alifu Dhaalu Atoll Council	**Request for EIA stakeholder consultation meeting for EIA for the Proposed Refurbishment of Water Villas Project at Angaga Island Resort and Spa, South Ari Atoll** 2 messages **Mahfooz Abdul Wahhab** <mahfooz@ecotechconsultancy.com> Wed, Apr 5, 2023 at 2:55 PM To: admin@adh.gov.mv Cc: secretariat@ecotechconsultancy.com, "Ibrahim R. Adam" <rashihu@ecotechconsultancy.com> Dear Sir, We would like to have an EIA stakeholder consultation with your team regarding the captioned EIA. The points we would like to clarify from your side are mentioned in the attached document. Best Regards, ECO-TECH CONSULTANCY Mahfooz Abdul Wahhab Managing Director Eco-Tech Consultancy Pvt. Ltd M. Husnoovilaa, Unigas Magu, Male', 20296, Kaafu Atoll, Maldives Website: www.ecotechconsultancy.com (+960) 9994467 **3 attachments** **230405 Stakeholder Consultation_Atoll Council.docx** 160K **230405 Approved ToR-EIA for the Proposed Refurbishment of Water Villas Project at Angaga Resort, South Ari Atoll.pdf** 627K **230403 project brief_refurbishment of water villas_Angaga.pdf** 2581K **Mahfooz Abdul Wahhab** <mahfooz@ecotechconsultancy.com> Sun, Apr 16, 2023 at 12:33 PM To: admin@adh.gov.mv Cc: secretariat@ecotechconsultancy.com, "Ibrahim R. Adam" <rashihu@ecotechconsultancy.com> Dear Sir, Gentle reminder about the EIA stakeholder consultation. Best Regards,

6.2 Consultations Undertaken

Stakeholder consultations were undertaken with the MoT. The summary of outcomes is given for each stakeholder below and the responses from the proponent for the concerns raised.

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6.2.1 Ministry of Tourism

The table below shows the concerns, suggestions and recommendations made by MoT regarding the proposed project along with the proponents' responses for the concerns (if any) which were raised.

Table 22: outcomes of the consultation with MoT

Concerns / Suggestions raised	Proponents Response
The project shall be carried out in accordance with the approved coastal modification letter (88-DS/PRIV/2023/391).	The project will be carried out in accordance with the approved EIA and the permits from MoT
Address all the terms highlighted in the approved ToR (Ref: 203-ECA/PRIV/2023/238) of this project.	The EIA will cover all aspects highlighted in the ToR
To minimize environmental damage special care and protection measures need to be undertaken during the project implementation stage.	The mitigation measures highlighted in the EIA report will be followed
Proper and effective mitigation measures should be implemented during the project implementation stage.	
Include all possible information (permits/approvals) issued by the relevant authorities for the project.	The EIA report will include a list of permits issued
Proper waste management mechanisms should be in place during construction and operational phase of the project.	Waste management will be as per the waste management regulations and guidelines
Undocumented or illegal labors shall not be allowed during the construction and operational stage.	All staff which will involved in this project are internally sourced, the companies HR will ensure all staff hired as per best practices
Proper health and safety measures and emergency first aid shall be provided to the project team.	Will ensure these are fulfilled
Adequate temporary facilities including labor accommodation, electricity, water, site office and temporary storage area shall be provided during the implementation phase of the project.	
Should fulfill all regulatory requirements prior to the commencement of the project activities.	

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7. POTENTIAL IMPACT ANALYSIS

The impacts from any project can be categorized into two broad categories; constructional and operational impacts. Constructional impacts are the potential impacts which might arise during the construction stage of the proposed project. Operational impacts are the potential impacts which might arise once the newly constructed project facilities become operational.

7.1 Impact Assessment Methodology

The proponent and the consultants have conducted a risk-based environmental review as part of the planning process (Risk Management-Principles and Guidelines, 2011). Data has been drawn from a wide range of sources, including existing similar EIA reports. Similar EIA reports reviewed for the formulation of this EIA include but not limited to the reports mentioned under section 1.8.

The impact assessment was conducted based on professional judgment and expertise of the consultants as well as evaluation of the baseline data and consultation with the stakeholders. This provides an outline on how to identify potential impacts associated with the proposal and evaluate the likelihood and consequences. The impact assessment methodology utilized was also consistent with the methodology outlined in AS/NZS ISO31000 (AS/NZS ISO 31000 : 2009 Risk management - Principles and guidelines, 2009).

The first stage of this methodology was to identify potential impacts. To ensure that all potential impacts were identified, it was important that any specific environment and/or community impact issues were determined based on the locations of the project components as well as type of service to be provided (Wild Environment, 2012). As such, the impacts identified were:-

1. **Construction Phase Impacts:-**
    - Mobilization impacts- Noise
    - Mobilization impacts- Oil spills at sea
    - Mobilization impacts- covid episode due to workforce

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- Generation of site clearance, demolition and constructional waste
- Vibration impacts
- Air Quality-GHGs
- Air Quality-Dust
- Noise Pollution
- Groundwater quality- oil and chemical spills
- Impacts on marine environment
- Impacts on terrestrial environment- soil and ground
- Risk of accidents and pollution on workers and resort staff/guests
- Impacts on landscape integrity and scenery
- Socio-economic impacts

2. Operational Phase Impacts:-

- Air Quality- GHGs
- Ground and marine water quality- negative
- Impacts on marine environment
- Impacts on hydrodynamics
- Impacts from waste
- Health and safety of working staff and tourists
- Impacts on landscape integrity and scenery
- Socio-economic impacts
- Risk of hazards- storm surge
- Risk of hazards- sea level rise
- Risk of hazards- fire and other workplace accidents

The significance of impacts was assessed using the following matrix (Table 23).

Table 23. Impact assessment matrix (Wild Environment, 2012)

Likelihood		Consequences				
		Minimal (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
	Remote (1)	Negligible	Negligible	Very low	Low	Medium
	Unlikely (2)	Negligible	Very low	Low	Medium	High
	Possible (3)	Very low	Low	Medium	High	Very high

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	Likely (4)	Low	Medium	High	Very high	Significant
	Certain (5)	Medium	High	Very high	Significant	Significant

Characteristics of the impacts on Table 24 is used to determine the consequences (minimal (1), minor (2), Moderate (3), Major (4), Catastrophic (5)) of each identified impact. For each specific consequence there is 5 likelihood categories (Table 23). Therefore, if an impact has Moderate (3) consequence but a likelihood of Remote (1), then that impact would have "very low" significance. However, if the likelihood is Certain (5) then the impact would have "Very high" significance

Criteria used for assessing the identified impacts are as follows. Note that likelihood and consequences were judged based on the design consideration for the proposed development. These criteria were measured against the impact (if the impact occurred), to ecological and/or human health (Wild Environment, 2012):-

- Likelihood:-
  - Remote- May occur only in exceptional circumstances;
  - Unlikely- Could occur at some time;
  - Possible- Might occur at some time;
  - Likely- More likely to happen than not (i.e. a probability of > 50 %); and
  - Certain- Will probably occur in most circumstances.
- Consequences:-
  - Minimal- Impact has no significant risk to environment either short term or long term;
  - Minor- The impact is short term and causes very limited risk to the environment;
  - Moderate- Impact gives rise to some concern, may cause long term environmental problems but are likely short term and acceptable;
  - Major- Impact is long term, small scale and environmentally risky. Impact severely damages the environment; and
  - Catastrophic- Impact is long term and irreversible, large scale and detrimental to the environment.

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The likelihood measures the probability of occurrence of an event whereas consequences evaluate the significance of impact on the environment in the event of an incident. Based on the likelihood and consequences for each of the identified impacts, the significance level is determined (Table 23).

Impact characteristics such as the type of impact, nature of the impact, impact range, impact duration as well as reversibility of the impacts were assessed using the grading scales for which are given on Table 24 below.

Table 24. Grading scale of the characteristics of impacts

Characteristic of impact	Grading	Explanation
Type	Direct	Direct impacts without intervening factors or intermediaries
	Indirect	Triggered by but not immediate effect of the proposed project
Nature	Positive	Impacts resulting in a desirable effect
	Negative	Impacts resulting in an undesirable effect
	Cumulative	Impacts of an action when combined with impacts from projects or actions that have been undertaken recently or will be carried out in the near future.
Range	Local	Impacts limited to project site
	Island	Impacts of importance at island level
	Atoll	Impact of importance at Atoll level
	Nation	Impacts of national character
Duration	Short-term	Occurring over a short period of time
	Intermittent	Impacts occurring at irregular intervals
	Long-term	Occurring over a long period of time
	Continuous	Impacts occurring continuously
Reversibility	Reversible	Previous state (or equivalent) can be restored
	Irreversible	Not able to alter the consequence of impact

7.2 Justification for selected Impact Prediction and Assessment Method

The most common methods of impact prediction include the usage of checklist, matrices, networks, overlays, GIS and computer expert systems. The use of any single method has its disadvantages for instance checklist maybe easy to understand and use but it does not distinguish between direct and indirect impacts (UNEP, 2002). Matrices are good for displaying EIA results and links actions to impacts however have the disadvantage of double-counting of impacts.

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Networks can distinguish between direct and indirect impacts but can be very complex. Overlays are good at displaying spatial impacts but does not address impact duration and probability. GIS and computer expert systems are good for impact identification and spatial analysis but requires a lot of data.

The employed method in this EIA is a combination of all of the above-mentioned methods with the addition of profession judgement of the consultant from past experiences that provide an easy and simple method to analyze impacts with limited data. The method can distinguish between direct, indirect and cumulative impacts while linking project activities to impacts. The method distinguishes impacts that can realistically be detrimental to the environment by linking consequences of an impact to its probability of occurrence. Finally, this method consumes very less time and hence rapid assessments can be made which is especially advantageous in the Maldives where EIA consultants are expected to complete EIAs in a very short duration.

7.3 Limitations and Uncertainties in Impact Prediction and Assessment Method

Risks and uncertainties are inherent in any environmental and ecological problem-solving technique and needs to be acknowledged and incorporated in any decision-making process. Risk is the chance that an adverse outcome occurs while uncertainty arises from an imperfect understanding of a system due to uncertainty about facts (McAlpine, et al., 2010). Our understanding of the environment is limited mainly due to the lack of long-term data and complexity of the ecosystem. For example, the assessments were done during one season and impacts are predicted based on these assessments. However, how the magnitudes of these impacts and how they behave in nature during the other season is quite uncertain.

The potential environmental impacts from the proposed project are all predicted, hence there may be variables affecting the accuracy of these impacts due to natural variations such as site conditions and uncertainties in scales and magnitudes. While every attempt has been made to accurately predict the potential impacts from this project, there are unforeseen and uncertain

factors which might cause deviations in the impacts outlined herein. For instance, a natural phenomenon.

Moreover, assessment of existing conditions requires a benchmark against which these conditions can be compared, however, lack of such benchmarks is a great hindrance to analyzing the environmental impacts in some instances. In addition to this, limited time availability and lack of available factual information are among major limitations to impact predictions. In the Maldives, more often than not, limited availability of published information on environmental and social environment of the islands has led to the dependency on verbal communication with locals and other stakeholders which are not always very accurate.

To add, a major uncertainty arises from the lack of information about the project activities from developers which leads to assumptions being made based on the experience of consultants, for example the proposed development will be designed and built conforming to international standards, the working staff at the facility will be well trained, will follow O&M procedures and operational plan diligently and the prescribed mitigation measures in this EIA report will be followed by the proponent

Anyhow, based on the risk assessment outlined above, the environmental impact assessment is set out below:-

7.4 Construction Phase Impacts

This section describes the significance (Table 25) and impact characteristics for the construction phase impacts.

Table 25. Predicted impacts and anticipated significance of impacts during construction phase of the project

Potential Impacts	**Likelihood**	**Consequence**	**Significance**
Mobilization impacts- Noise	Certain	Minimal	Medium
Mobilization impacts- Oil spills at sea	Possible	Minimal	Very low
Mobilization impacts- covid episode due to workforce	Possible	Minimal	Very low
Generation of site clearance, demolition and constructional waste	Possible	Minimal	Negligible
Vibration impacts	Unlikely	Minimal	Negligible
Air Quality-GHGs	Certain	Catastrophic	Significant

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Air Quality-Dust	Certain	Minimal	Medium
Noise Pollution	Certain	Minimal	Medium
Groundwater quality- oil and chemical spills	Possible	Minimal	Very low
Impacts on marine environment	Certain	Catastrophic	Significant
Impacts on terrestrial environment- soil and ground	Certain	Minor	High
Risk of accidents and pollution on workers and resort staff/guests	Possible	Minor	Low
Impacts on landscape integrity and scenery	Certain	Moderate	Very high
Socio-economic impacts	Remote	Minimal	Negligible

Impacts during construction phase of the project are mainly anticipated to be short-term and reversible (Table 26) as most impacts will last only for the duration of the construction phase of the project.

Table 26. Characteristics of predicted impacts during the construction phase of the project

Potential Impact	**Type**	**Nature**	**Range**	**Duration**	**Reversibility**
Mobilization impacts- Noise	Direct	Negative	Local	Short-term	Reversible
Mobilization impacts- Oil spills at sea	Direct & Indirect	Negative	Local	Short-term	Reversible
Mobilization impacts- covid episode due to workforce	Direct & Indirect	Negative	Island	Short-term	Reversible
Generation of site clearance, demolition and constructional waste	Direct	Negative	Local	Short-term	Reversible
Vibration impacts	Direct	Negative	Local	Intermittent	Reversible
Air Quality-GHGs	Direct	Negative & Cumulative	Nation	Long-term	Irreversible
Air Quality-Dust	Direct	Negative	Local	Intermittent	Reversible
Noise Pollution	Direct	Negative	Local	Short-term	Reversible
Groundwater quality- oil and chemical spills	Direct	Negative	Local	Short-term	Irreversible
Impacts on marine environment	Direct & Indirect	Negative & Cumulative	Nation	Long-term	Irreversible
Impacts on terrestrial environment- soil and ground	Direct & Indirect	Negative	Local	Intermittent	Irreversible
Risk of accidents and pollution on workers and resort staff/guests	Direct	Negative	Local	Short-term	Irreversible
Impacts on landscape integrity and scenery	Direct	Negative	Island	Short-term	Reversible
Socio-economic impacts	Direct	Positive	Local	Short-term	Reversible

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7.4.1 Mobilization Impacts - Noise

Noise is expected to be generated due to the direct activities of the project from the mobilization of barge, high-bed excavator and other heavy vehicles to the resort. The impact is expected to be negative as the tourists residing in the close by villas to the mobilization site during the transfer of heavy machinery. The range of the impact would be localized to and around the project site as the mobilization site is planned to be within the project site itself. Noise disturbance maybe be experienced by the tourists residing in the closer villas to the mobilization site due to the increase in noise levels during the transfer of heavy machinery. The impact is expected to be short-term as the mobilization will be completed within a short period of time. This impact is reversible as once the mobilization is over, the impact ceases. Considering the aforementioned characteristics of the impact, the consequences from the impact is minimal as it does not pose a significant risk to the environment. The likelihood of this impact occurring is certain as noise would definitely be generated from vehicles and barge. Therefore, the significance score for this impact is medium.

7.4.2 Mobilization impacts – Oil spills at sea

The potential for oil spills at sea arises due to the direct activities of this project from the operation of barge and vehicles. Indirect impacts are also envisaged to marine life due to pollution from spills reducing the marine water quality. The impact is of negative nature as the marine environment would be polluted. However, the impact would be localized to the barge landing area. The impact is expected to be short-term as the mobilization would be completed on a short period of time and reversible as water quality will revert back to normal quickly as there is moderate currents at the proposed barge landing location. Considering the aforementioned characteristics of the impact, the consequences from the impact is minimal. The likelihood of this impact occurring is possible, hence the significance score for this impact is very low.

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7.4.3 Mobilization impacts – covid episode due to workforce

The potential for an outbreak of covid19 arises due to the direct activities of this project from the mobilization of workforce as the proponent has indicated that workers from male would be transferred to the resort for the proposed project. The impact is negative as spread of covid within the mobilized workforce could in turn spread to the resort staff and guests (indirect impact). Since the whole resort maybe effected due to covid spreading, the range of this impact is at Island level. The impact is expected to be short-term as the workforce will be mobilized for an estimated six months as per the project schedule from the proponent. Now that the majority of people are vaccinated the covid19 virus is not life threatening as such the impact is considered reversible and the consequences minimal. The likelihood of this impact occurring is possible, hence the significance score for this impact is very low.

7.4.4 Generation of site clearance, demolition and constructional waste

Waste would be generated due to the direct activities of the project from the demolition of the existing water villas, walkway and restuarent, from form works during construction of water villas and walkway jetty, and packaging waste from finishing works and installation of utitlities to the water villas. The impact is of negative nature as if not properly managed it is aesthetically not pleasing and has potential to pollute and contaminate surrounding areas. It is anticipated that only the project site and surrounding areas will be impacted hence the range is local. The impact is short-term and reversible as will be alleviated once waste is removed. Hence, this impact does not pose significant risk to the environment scoring a consequence rating of minimal. The likelihood of this impact occurring is possible as there is always potential for workers negligence to properly manage waste. As this impact is not certain (possible) the impact scored a final rating of negligible.

7.4.5 Vibration impacts

This impact arises due to the direct activities of the project from the operation of vehicles. The impact is of negative nature as the vibrations may damage any nearby buildings. The range of this impact is local as the buildings adjacent to the waste transfer route will be impacted (if any)

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during the transfer of the demolition waste from the water villa construction site to the resorts waste management centre. There are no buildings adjacent to the project site as the nearest buildings are the beach villas on land. This impact would be intermittent as vibration would be generated during operation of heavy machinery only and will cease once the operation stops (reversible). Hence consequences anticipated from this impact are minimal. The likelihood of this impact occurring is unlikely as there is no adjacent building to the project site and it is unlikely that the operation of heavy vehicles would generate vibrations that could damage the buildings. The final significance score for this impact is negligible.

7.4.6 Impacts on air quality – GHGs

Impacts on air quality during the constructional phase is a direct impact generally credited to operation of machinery and equipment which require electricity and vehicles which burn fuel. The main contributor would be the operation of barge/tug boats or other heavy vehicles that will be used to transfer heavy machinery and equipment to the project site. Additionally, the high bed excavator and other machinery that use fuel for power during the construction works. The negative impact to air quality would be due to the release of GHGs and any other air pollutants to the atmosphere. Release of GHGs into the atmosphere during the construction phase is very low when compared to the other sources of GHGs at the project location (the powerhouse of the resort). However, since the effects of the released GHGs concerns the entire Nation, the range of this impact was considered at National level. GHGs will be released for a short period of time, regardless this would contribute to the GHG emission of the nation; hence the cumulative nature of this impact. And since the released GHGs will stay in the atmosphere for a long period of time this impact was considered long-term. The rise in concentration of GHGs in the atmosphere has been a huge global environmental issue which is responsible for global warming, ocean acidification and many other irreversible environmental issues. Considering the aforementioned characteristics of the impact, the consequences from the impact is considered catastrophic as it is long term, irreversible, large sclae and detrimental to environment. The likelihood of this impact occurring is certain as GHGs would definitely be generated from the operation of machinery. Therefore, the significance score for this impact is significant.

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7.4.7 Air quality- Dust

Impacts on air quality during the construction phase also arise due to the release of dust during the demolition works and transfer of waste from the project site to the resorts waste management centre. The impact is of negative nature as it pollutes the air and cause nuisance to nearby resort staff or guests. However, the range of the impact would be limited to the project site and the waste transfer route. This impact would be intermittent as dust would be generated during operation of heavy machinery only. This impact is reversible as dust would not be generated once the construction works are completed. Therefore, the consequences from this impact are minimal. The likelihood of this impact occurring is certain as dust would definitely be generated from the operation of machinery. Therefore, the significance score for this impact is medium.

7.4.8 Noise Pollution

Similar to air quality, impacts on noise level during the constructional phase is a direct impact generally credited to operation of machinery, equipment and vehicles. The highest noise would most likely be generated from the excavator that would be used to load and unload the heavy machinery and equipment at the project site and operation of vehicles/machinery for excavation of seabed during the column installations. The impact is of negative nature as it has the tendency to disturb people and wildlife nearby. Additionally, the noise generated underwater may scare away the marine life in close proximity of the project site. The range of the impact will be localized to a small area surrounding the project site at irregular intervals as noise would be generated when heavy machinery is operational and would cease once operation of machinery stops, hence the consequences from this impact is deemed minimal. The likelihood of this impact occurring is certain and the final significance score for this impact is medium.

7.4.9 Groundwater quality- oil and chemical spills

Impacts to ground water quality during the constructional phase is a direct impact credited to the operation of land-based machinery that will be used to transfer waste from the project site to the resorts waste management center. The impact arises from the potential for occurrence of oils

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and chemical spills during the transfer of waste. During the transfer there is the possibility of oils and chemical spillage into the groundwater. Even though it could be minimized with regular maintenance, in the event that oils and chemicals do spill, the impacts could have moderate to major negative effects on the groundwater quality. However, since there are no construction works on land, all the machinery would be operated at the project site over water and the only potential chemical spills would occur during the transfer of waste from the project site to the waste management centre of the resort, the range of this impact was considered local. The impact itself is expected to be short-term as waste transfer works will be completed in a short period of time, however if a spill does occur, the effects would be irreversible as contaminated groundwater takes a long time to recover. Due to the localized range of the impact the consequences from this impact are considered minimal. The likelihood of this impact occurring is possible and as such this impact scored a significance rating of very low.

7.4.10 Impacts on marine environment

Impacts on the marine environment due to this project arises from four aspects; firstly, direct damage to sessile marine organisms. Secondly, from turbidity and sedimentation. Thirdly, changes in currents. Fourthly, indirect impacts arising from increasing GHGs. Direct damages to sessile marine organisms and benthic substrates can be caused from the operation of the excavator during the mobilization. Additionally direct damages to benthos would arise during the installation of the columns, where seabed would be excavated to install the pad footings.

Turbidity and sedimentation are caused due to the sediment plume that will be generated due to the operation of the excavator and due to excavation of seabed. The sediment plume will impact corals and other marine organisms. The negative impacts include stress on photosynthetic organisms due to increased turbidity as a result of re-suspension of excavated material. Increased turbidity levels of the water decrease intensity of light through the water column which reduces photosynthesis rates. In addition, sessile marine organisms maybe smothered due to sedimentation which could again hinder its metabolic processes increasing stress on them further.

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Seasonal currents will have a minor impact as the proposed project can trigger small change in the flow velocity near the project area as some additional pillars and other structures get placed. As the project isn't expected to bring about drastic changes to the reef flat, it is not anticipated that there would be a major change in the flow of currents.

While the contribution to GHGs from this project may be negligible, it is the cumulative nature of the impact that is concerning which arises from global warming and ocean acidification. The reason why there is so much concern about global warming is that it increases the temperature of the oceans as the ocean absorbs more heat. While many of the fishes may be able to tolerate the rise in temperature, the corals are less tolerant. Nonetheless many of the reef fish species depend on the coral reef as a home and few fish species even depend directly on the corals for food and shelter. In a recent paper published by (Strona, et al., 2021) states that in a hypothetical world where coral reefs are not present the local tropical fish richness across the globe would decline by half. Ocean acidification is the process by which the pH of the oceans decreases due to more dissolving of CO2 from the atmosphere into the oceans (Ferrero, 2018). Apart from impacts from temperature, the corals and other Calcium Carbonate skeleton based marine organisms are at great risk as lower pH would mean that these organisms would have a hard time maintaining their Carbonate skeletons. Therefore, just as higher temperatures threaten the marine organisms, ocean acidification also threatens marine life to a great extent.

Hence the range of this impact is considered at national level with long-term impacts which are irreversible, giving this impact a consequence rating of catastrophic. The likelihood of this impact occurring is certain and the final significance rating is significant.

7.4.11 Impacts on terrestrial environment – soil and ground

Impacts to soil and ground are envisaged due to direct activities of the project. Compaction of ground is anticipated due to operation of heavy machinery. The indirect impact from the compaction of ground maybe flooding due to reduced percolation of rainwater. The impact is of negative nature and with a range limited to the waste transfer route. The duration of the impact is intermittent as ground will be compacted every time vehicles are operational. Even though the

impact is irreversible due to the localized range of the impact the consequences from this impact are considered minor. The likelihood of this impact occurring is certain and as such the final significance score for this impact is high.

7.4.12 Risk of accidents and pollution on workers and resort staff/guests

As typical of any construction project, there lies the risk of accidents and pollution on workers as well on the resort staff/guests from this project as well due to the construction activities. There is always the inherent risk of health and safety due to workplace incidents. The impact is of negative nature as any accidents in work place will lead to health risks to workers or resort staff/guests. The range of the impact is limited to project site and small surrounding area, hence it is extremely important to monitor unauthorized access into the project site. The impact itself is short-term and reversible as once construction is finished the impact is alleviated, however is considered irreversible as injuries to people can be fatal. Due to the localized range of the impact, the consequences from this impact are considered minor.Since the likelihood of these impacts are possible given that proper mitigation measures would be followed, the final significance of this impact is low.

7.4.13 Landscape integrity and scenery

Negative impacts to the landscape integrity and scenery are anticipated from the direct activities of the project, where the mobilization of materials and vehicles to the project site could cause the scenery to be compromised. While the immediate range of this impact is limited to the project site and small surrounding area, considering that the project location is a luxury resort, the comprised landscape integrity of even one area of the resort would impact the entire resort and as such the range of this impact was considered at Island level. This impact is considered short-term and reversible as once construction is finished the impact is alleviated. The overall consequence from this is moderate with a likelihood of certain, giving it a final significance rating if very high.

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7.4.14 Socio-economic impacts

This impact arises due to the direct activities of the project requiring labour force to carry out the works under the project. It is of positive nature as people has the opportunity to get temporary jobs. Since a limited number of people could potentially get the job, it is of local level range. The impact is short-term and reversible as one the project is completed the jobs will be done. The final consequences rating for this impact is minimal. The likelihood of this impact occurring is remote as the proponent has indicated that internal staff will be used for this project. Hence, the final significance rating for this impact is negligible.

7.5 Operational Phase Impacts

This section describes the significance (Table 27) and impact characteristics for the operational phase impacts.

Table 27. Predicted impacts and anticipated significance of impacts during operation phase of the project

Potential Impacts	**Likelihood**	**Consequence**	**Significance**
Air Quality- GHGs	Certain	Catastrophic	Significant
Ground and marine water quality- negative	Unlikely	Moderate	Low
Impacts on marine environment	Unlikely	Major	Medium
Impacts on hydrodynamics	Unlikely	Minor	Very low
Impacts from waste	Unlikely	Minor	Very low
Health and safety of working staff and tourists	Certain	Major	Significant
Impacts on landscape integrity and scenery	Certain	Catastrophic	Significant
Socio-economic impacts	Certain	Catastrophic	Significant
Risk of hazards- storm surge	Unlikely	Major	Medium
Risk of hazards- sea level rise	Unlikely	Major	Medium
Risk of hazards- fire and other workplace accidents	Unlikely	Major	Medium

Unlike constructional impacts, operational impacts are anticipated to be more long-term but irreversible (Table 28). It should be noted that with the application of proper mitigation measures as outlined in section 9.1 of this report, almost every negative impact could be minimized.

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Table 28. Characteristics of the predicted impacts during the operation phase of the project

Potential Impacts	Type	Nature	Range	Duration	Reversibility
Air Quality- GHGs	Direct	Negative	Nation	Continuous	Irreversible
Ground and marine water quality- negative	Direct	Negative	Local	Long-term	Irreversible
Impacts on marine environment	Direct	Negative	Local	Long-term	Irreversible
Impacts on hydrodynamics	Direct	Negative	Local	Long-term	Reversible
Impacts from waste	Direct	Negative	Local	Long-term	Reversible
Health and safety of working staff and tourists	Direct	Positive	Island	Long-term	Reversible
Impacts on landscape integrity and scenery	Direct	Positive	Island	Long-term	Reversible
Socio-economic impacts	Direct	Positive	Island	Long-term	Reversible
Risk of hazards- storm surge	Direct	Negative	Island	Long-term	Irreversible
Risk of hazards- sea level rise	Direct	Negative	Island	Long-term	Irreversible
Risk of hazards- fire and other workplace accidents	Direct	Negative	Island	Long-term	Irreversible

7.5.1 Air Quality- GHGs

Impacts to air quality arises from the direct activities of the project from the operation of the newly construction water villas and restaurant. The negative impact to air quality would be due to the release of GHGs and any other air pollutants to the atmosphere. The newly constructed infrastructures and upgraded facilities would increase the electrical demand required to run the resort at full capacity during peak periods. This additional increase in power demand means that there would be an increase in the amount of GHGs released in to the atmosphere. Release of GHGs into the atmosphere during the operational phase is low when compared to the nations carbon budget, however it would still contribute to the nation's overall carbon budget and hence the range of this impact was considered at national level. The impact would be continuously occurring as long as the water villas or the resort is in operational condition but would cease if the water villa operations stops or the resort. However, the already released GHGs will stay in the atmosphere for a long period of time and would contribute to global warming, ocean acidification and other related cumulative environmental impacts, as such the impact was considered irreversible. Considering the aforementioned characteristics of the impact, the consequences from the impact is considered catastrophic as it is long term, irreversible, large scale and detrimental to environment. The

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likelihood of this impact occurring is certain, hence the significance score for this impact is significant.

7.5.2 Ground and marine water quality- negative

Negative impacts to ground and marine water quality arises due to the potential for leaks to occur in the utilities established for the water villas. The negative impact would be the contamination of water due to the leakage of sewerage. Depending on where the leakage occurs, the range of this impact maybe local or at Island level. If the leaks occur within the water villas itself, it can contaminate marine waters. However, if the leaks occur within the connecting pipes on land, then it may contaminate the groundwater. While the impact may occur for a short duration as the resort management would quickly rectify any leaks, any unnoticed or unidentified leaks would continue to detriment water quality. Furthermore, as contaminated groundwater from any leaks would take a long time to recover, this impact was considered as a long-term and irreversible impact. As such the consequences from this impact is considered moderate but it is unlikely to occur as proper systems would be installed at the utility systems, hence the final significance rating for this impact is low.

7.5.3 Impacts on marine environment

Impacts on marine environment is envisaged due to the direct activities at the water villas from the guests residing within them. The impact is direct damage from snorkellers to the coral reef where inexperienced snorkellers may unknowingly damage coral from their fins. Furthermore, negative impacts may arise due to waste littered from the guests residing within the water villas. The range of the impact will be localized to the marine environment surrounding the water villas. The impact will be long-term as damaged corals takes a long time to recover and depending on the type of waste littered, it may remain within the marine environment for a long time for example plastic. The impact is thus considered irreversible. Hence, the consequences envisaged are major but unlikely to occur as such the impact scored a significance rating of medium.

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7.5.4 Impacts on hydrodynamics

Impacts on hydrodynamics is envisaged due to the direct activities of the proposed project which requires additional columns to be installed due to the additional 4 water villas. The impact is of negative nature as the additional columns may slightly hinder the flow of water through the cluster of water villas. However, this slight change in currents if expected to be localized to the waters surrounding the water villas. The impact would be long-term but reversible as the currents would revert back to normal once the hindrance is removed. This slight impact to the currents is not expected to bring about any major changes to the overall hydrodynamics of the area. The only potential cause for concern would be scouring behind the columns, this is also very unlikely. As such the consequences from this impact are considered minor. The likelihood of this impact occurring is unlikely as such the impact scored a significance rating of very low.

7.5.5 Impacts from waste

This impact arises due to the direct operation of the water villa and the restaurant. The impact is of negative nature as if the waste water and organic waste generated is not managed properly it could lead to environmental issues. The range of the impact will be local as the waste from these newly constructed facilities would be taken to the waste management centre and STP of the resort. The impact will be long-term as waste would be generated as long as the water villas are operational and would cease once the operation of either the water villas or the resort stops. The consequences from this impact are minor as the resort is fully equipped to manage the waste. Hence, a scenario where the resort is unable to manage waste is unlikely to happen. Hence, the final significance score for this impact is very low.

7.5.6 Health and safety of working staff and tourists

Positive impacts are envisaged to the health and safety of the working staff as well as the tourists due to the direct implementation of this project as the old structures would be removed and new facilities that meet the current standards are established. The current water villa and jetty columns are very old and severely damaged due to wood boring organisms. Currently it is a hazard

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waiting to happen as the columns have loosen its structural integrity over the years and the water villas and walkways are very weak and could collapse at any moment. The range of this impact is at Island level and would occur for a long period of time. The impact is reversible as this impact would cease if the water villas does not operate at optimal condition. The consequences from this impact are major with a likelihood of certain, giving this impact a significance rating of significant.

7.5.7 Impacts on landscape integrity and scenery

This impact arises from the direct activities of the project from the operation of the new water villas and its associated facilities. The impact is of positive nature as the new facilities will be constructed to meet the current demand for luxury water villas. The range of this impact would be at Island level as the entire resort would benefit from the improved landscape and scenery of the new water villas. The resort will have marketing opportunities to showcase the newly built water villas. The impact will be long-term but can be considered reversible as the destruction of the new water villas can be brought about by an accident for example a fire very easily. Hence, the consequences envisaged are catastrophic positive and the likelihood of this impact occurring is certain, giving this impact a significance rating of significant.

7.5.8 Socio-economic impacts

Positive impacts are envisaged to the socioeconomics due to direct activities of the project. With the upgraded facilities the services provided to the guests would be significantly improved, thus it can be safe to assume that the guest arriving to the resort at the operational phase would most likely leave fully or significantly satisfied. As number of satisfied guests increases, eventually more guests would arrive to get the same or more services provided by the resort. Moreover, this will also lead to repeat guests and extended stay in the resort generating better economic growth for upcoming years given that the resort can maintain the high level of service provision. The consequences from this impact are catastrophic positive as this allows the resort to meet the current demand for luxury water villas and with a likelihood of certain, the significance of this impact is significant.

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7.5.9 Risk of hazards- storm surge

Angaga is located at a very low risk zone for local storm surges compared to the rest of Maldives. The impact is of negative nature as a storm surge event may cause elevated sea levels and with strong waves could damage the infrastructure or in worst case scenario flood the water villas. While the impact maybe localized to the water villas, any damages to the water villas could in turn impact the resort as they may lose customers. As such the impact range was considered to be at Island level. Any damages due to a storm surge event may be long-term and irreversible depending on the gravity of damages. The consequences from such an event are major but with the unlikely likelihood of occurrence, this impact significance is medium.

7.5.10 Risk of Hazards- sea level rise

With the accelerated sea level rise due to global warming, the risk of hazards due to an event like storm surge as described in the above section is more probable. While the impacts due to this hazard is evaluated for the proposed project, sea level rise could potentially impact the entire resort as such the range of this impact is considered at Island level. This hazard has long-term and irreversible environmental implications. The consequences from such an event are major but with the unlikely likelihood of occurrence as the water villas would be elevated adequately above the sea level (even with projected increase in sea level), this impact significance is medium.

7.5.11 Risk of hazards- fire and other workplace accidents

This impact arises due to the direct operations of the water villas and restaurant. Potential workplace accidents include electrocution during servicing of electrical equipment, chemical spills during servicing of utilities, drowning of a guest or being swept away by the currents, buggy or cart flipping into the sea from the walkway, fire in the restaurant or villas etc. All of these hazards are negative in nature as it poses health risk to workers and guests in addition to damages to the infrastructures. The impact is of Island level range, long-term and irreversible. The consequences from this impact are major but the likelihood of occurrence is unlikely as proper mitigation

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measures will be implemented in the resort operations, hence the significance of these hazards is medium.

7.6 Impact Boundary

As shown in Figure 41 primary impact area for the project is the construction site, mobilization route and the waste transfer route. The secondary impact is the extent of the sediment plume. The tertiary impact area will be areas that could have impact on air quality and noise disturbance during construction and operation. The whole resort can be considered as the fourth level of impact area as this project benefits the resort.

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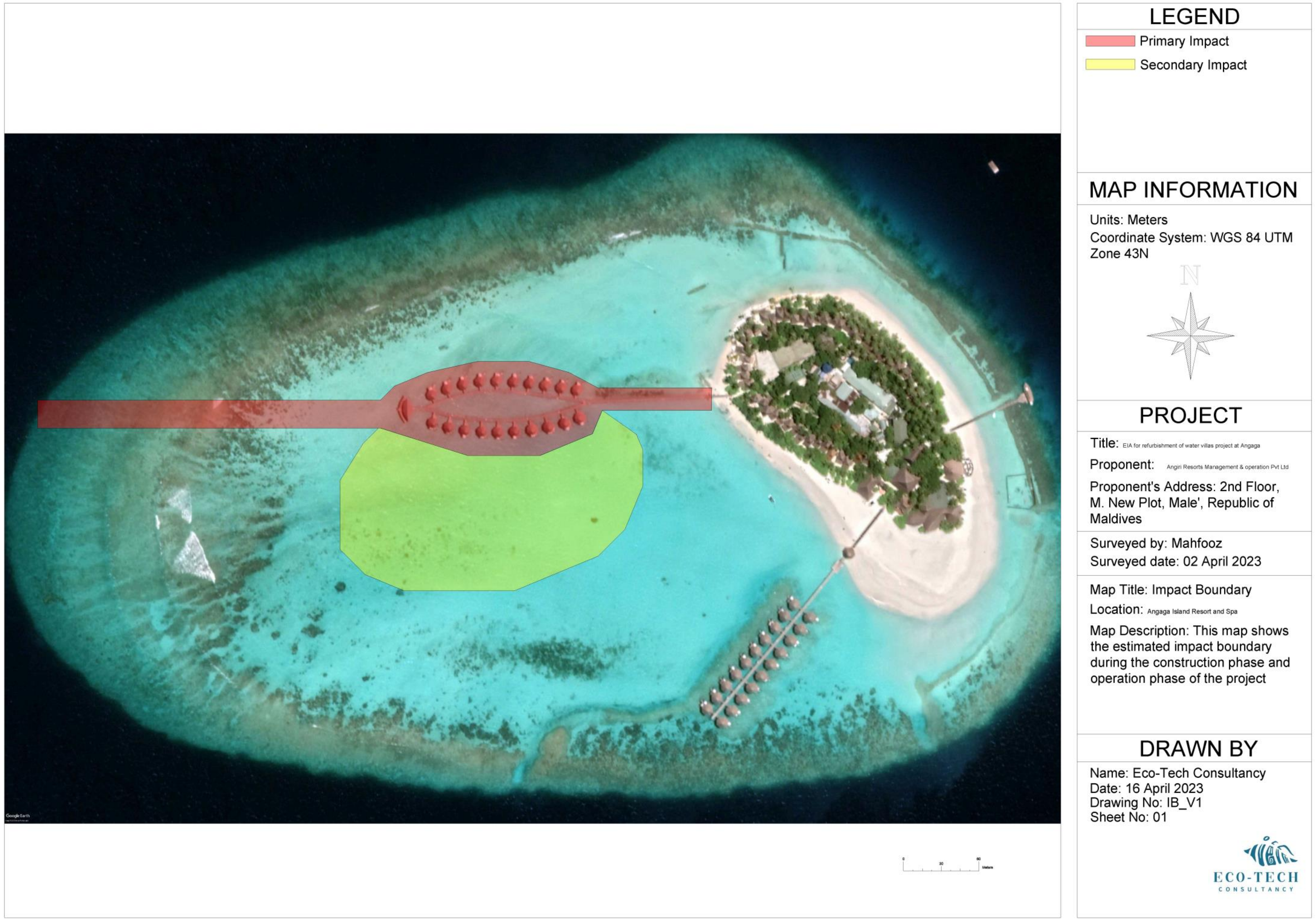
LEGEND
Primary Impact
Secondary Impact
MAP INFORMATION
Units: Meters
Coordinate System: WGS 84 UTM Zone 43N
N
PROJECT
Title: EIA for refurbishment of water villas project at Angaga
Proponent: Angiri Resorts Management & operation Pvt Ltd
Proponent's Address: 2nd Floor, M. New Plot, Male', Republic of Maldives
Surveyed by: Mahfooz
Surveyed date: 02 April 2023
Map Title: Impact Boundary
Location: Angaga Island Resort and Spa
Map Description: This map shows the estimated impact boundary during the construction phase and operation phase of the project
DRAWN BY
Name: Eco-Tech Consultancy
Date: 16 April 2023
Drawing No: IB_V1
Sheet No: 01
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Figure 41: estimated impact boundary for the proposed project

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8. OPTIONS ASSESSMENT

The possible causes of actions, in place of another that would meet the same purpose and need, otherwise known as alternatives, have been well considered in this study as alternatives are essential to a sound decision-making process and central to an effective EIA.

With due consideration to the purpose and need for the proposed project, there are four alternatives identified for this project. The “no project” option, ensuring the land reclamation project is implemented prior to the proposed project, elevating the civil component of the project as an effort to climate proofing the infrastructure, and inclusive design considerations. Details of which are further discussed below:-

8.1 Options

This section describes the alternatives that were considered for the proposed development under this EIA.

8.1.1 Option 1: Maintain status-quo

The “do-nothing” option would mean that the island would be left without a proper waste management facility. Although the negative impacts related to the construction of the project is avoided, due to the damage to the existing guest facilities, it would be operating at risk of an incident and the guest satisfaction would be lower. Furthermore, the resort would not obtain any benefits from the new four water villas proposed under the current project.

8.1.2 Option 2: Alternative Mobilization route

Given the depth at the mobilisation route and the tidal variations, it is envisaged that the proposed mobilisation route might not be the best approach to mobilise the material and machinery for the site. Furthermore, given that the proponent prefers not to have a temporary site location on land, the materials will be shipped through the mobilisation route multiple times as and when

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necessary. Therefore, an alternative mobilisation route is proposed with more depth and less wave action and reef in the pathway as shown in the figure below.

Figure 42: alternative mobilization route

8.1.3 Option 3: Green building option integration

As the major output of the project is the overwater villas, thus resulting increase demand of electricity in the resort, it is proposed to integrate green building options into the detailed designing phase. As such, natural lighting as much as possible shall be integrated into the design. Furthermore, it is also proposed to use less energy intensive appliances within the units, preferably appliances which have been graded good under the "*Hakathari*" certification program of the

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government. These actions is envisaged to reduce the increase of electricity demand on the resort and reduce the GHG emissions (even if in small amounts) of the overall resort operations.

8.2 Preferred Options

As per the rationales stated above, the preferred options are to proceed with the project, utilize the alternative route for mobilization and integrate green building options to the over water villas. There are no further mitigation measures associated with the proposed alternatives than the ones mentioned in the mitigation section of the report.

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9. ENVIRONMENTAL MANAGEMENT

This section describes the environmental and operational management systems and plans for the proposed development including practical mitigation measures for all identified impacts, a risk management plan, measures for sustainable development as well as environmental monitoring programs.

9.1 Proposed Mitigation Measures

The mitigation measures outlined in Table 29 and Table 30 below is proposed with due consideration to their cost effectiveness and feasibility to be implemented. The mitigation measures mainly relate to handling practices, design and quality of the proposed development and appropriate trainings which would ensure that environmental impacts would be minimized as effectively as possible.

It is the responsibility of the implementing agency to adhere to the proposed mitigation measures and bear any costs related to establishing them. If the proponent hires a contractor, then it is the responsibility of the proponent to include these mitigation measures in the project contract.

9.1.1 Construction Phase

The following table describes the preferred mitigation measures for the identified impacts during the construction phase of the proposed project.

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Table 29: proposed mitigation measures for the identified impacts during the construction phase of the proposed project

Impact	Mitigation Aspect	Proposed Mitigation Measures	Estimated Cost	Implementing Agency
Mobilization impacts- Noise	Reduce noise disturbance from mobilization of barge and vehicles	Restrict mobilization to daytime Well maintenance of vehicles and machinery Avoid unnecessary use of machinery Workers could wear noise cancelation headphones while handling loud machinery	Included within project cost	Proponent
Mobilization impacts- Oil spills at sea	Minimize likelihood of oil spills occurring during operation of barge and vehicles at sea	Ensure that there are no leakages from any of the vehicles	Included within project cost	Proponent
Mobilization impacts- covid episode due to workforce	minimize likelihood of a covid episode due to the mobilization of workforce	Laborers shall be supervised by the site supervisor to avoid any socially or culturally unacceptable behavior Illegal or undocumented labors shall not be allowed Screening as per HPA guidelines	Included within project cost	Proponent
Generation of site clearance, demolition and constructional waste	Prevent littering and pollution of surrounding environment	Careful planning of the work activities can also reduce the amount of waste generated Waste segregation on-site and reuse as much as possible All waste shall be managed in accordance to the existing waste management regulations	Included within project cost	Proponent

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		Health and safety materials should be made available to workers specifying instructions on how to handle hazardous wastes and how to act during a chemical spill		
		Reusing the waste at the resort as planned by the proponent which is 80% reuse or recycle		
		Discussing with the nearby Island Council to which the remaining 20% waste is to be transferred to as per proponent to ensure those Islands can manage this waste		
		Littering, accidental disposal and spillage of any construction wastes should be avoided by pre-planning ways of their transportation and unloading		
Vibration impacts	Minimize damage to buildings	Ensure the waste transfer route is short	Included within project cost	Proponent
Air Quality-GHGs	Minimize release of GHGs	Use of light fuel (low sulfur content)	Included within project cost	Proponent
		Avoid unnecessary use of machinery		
		Daily maintenance of vehicles and machinery		
Air Quality-Dust	Minimize release of dust	Cover the waste on the transfer vehicles	Included within project cost	Proponent
		Ensure waste transfer route is short		
Noise Pollution	Minimize noise generated and duration of noise generated. Limit the noise generation hours to times	Well maintenance of vehicles and machinery	Included within project cost	Proponent
		Avoid unnecessary use of machinery		
		Workers could wear noise cancelation headphones while handling loud machinery		

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	that will cause minimum disturbance to guests.	Usage of heavy machinery and equipment should be restricted to smaller areas (eg take the shortest route possible when accessing to work site)		
		Park the heavy machinery within the work site (if possible) to avoid unnecessary transfer		
		Ensure project is completed as soon as possible		
		Restrict working hours to daytime only		
Groundwater quality- oil and chemical spills	Minimize risk of oil and chemical spills	Oil / chemical handling procedures should be made known to all staff members	Included within project cost	Proponent
		Follow the corresponding chemical handling procedure when handling chemicals		
		Relevant staff members should be well trained about proper use of machinery and equipment		
		Have emergency oil spill cleanup crew on standby during construction		
		Proper care should be taken as not to spill any oils, wastewater or chemicals into the ground		
		All machinery and equipment should be well maintained to avoid accidental spillage		
Impacts on marine environment	Minimize sedimentation and control the sediment plume triggered during construction. Minimize direct damages to benthic substratum. Mitigate or avoid spillages	Limit access routes of vessels, excavators and heavy machinery to a small area	Included within project cost	Proponent
		Anchorage of barges and carrier vessels should be limited to a smaller area		
		Heavy machinery and equipment operators should be well trained		

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		Take shortest mobilization route with least coral cover			
		Take deepest route to the project construction site while mobilizing the barge			
		Ensure all work is carried out during low tide and in calm weather conditions			
		Use of sedimentation control measures such as silt screens during placement of pillars			
		Restrict movement of barges and excavators to a narrow area only			
		Avoid dragging of anchors over the sea bed and should be carefully placed at the exact location			
		Commence works at a slow pace to allow for vagile organisms to escape work site			
		Ensure all project activities remain within the project boundary			
		Take spill containment measures			
		Ensure that the staff are well informed of the mitigation measures and the significance of the matter			
		Avoid excavating deeper than necessary for the pillars			
		Give greater emphasis to place pillars during low tide			
		Wastewater shall be treated prior to disposal			

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Impacts on terrestrial environment- soil and ground	Minimize area of ground compaction	Ensure waste transfer route is short	Included within project cost	Proponent
		Ensure that the number of waste transfers are low by ensuring that each vessel is full and avoiding unnecessary transfers		
Risk of accidents and pollution on workers and resort staff/guests	Minimize risk of accidents to resort staff and guests	Construction site fenced off	Included within project cost	Proponent
		Unauthorized entry of unwanted people must be restricted		
		Sign boards at construction site		
	Minimize risk of accidents to workers	All working staff must be well trained on occupational health and safety		
		Ensure all workers are provided with PPE		
		In case of oil/chemical spills, clean up kits shall be available at all times		
		Emergency cleanup crew shall be on standby at all times		
		Firefighting equipment must be made available at work site		
		In case of accidents, workers should be taken to the nearest hospital immediately and if the need be		
Impacts on landscape integrity and scenery	Minimize aesthetically displeasing view for any people that walk by in the project area	Project area shall be fenced off	Included within project cost	Proponent

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Socio-economic impacts	Increase the chance of local contractors being hired	Give priority to local contractors	Included within project cost	Proponent

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9.1.2 Operational Phase

The following table describes the preferred mitigation measures for the identified impacts during the operational phase of the proposed project.

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Table 30: proposed mitigation measures for the identified impacts during the operation phase of the proposed project

Impact	Mitigation Aspect	Proposed Mitigation Measures	Estimated Cost	Implementing Agency
Air Quality- GHGs	Reduce volume of GHGs released	The generators at powerhouse of the resort are well maintained	Included in resort operational cost	Proponent
		Incorporate renewable energy		
Ground and marine water quality- negative	Minimize risk of leaks within the utility systems of the resort	Ensure that leak detection systems are working	Included in resort operational cost	Proponent
		Routine maintenance and monitoring of the utility system of the resort		
Impacts on marine environment	Minimize damage to reef from snorkelers and prevent littering to marine environment	Ensure that all guests are made aware not to litter into the marine environment	Included in resort operational cost	Proponent
		The resort could enforce strict rules against littering		
		Ensure that the snorkelers are made aware to be careful not to touch or damage corals		
Impacts on hydrodynamics	Ensure no scouring behind columns	Routine monitoring by a snorkeler to see if there is scouring and apply protection measures if necessary	Included in resort operational cost	Proponent
Impacts from waste	Ensure the resorts waste management is done properly	Ensure the resorts waste management center and STP is functioning as per the national standards	Included in resort operational cost	Proponent
Health and safety of working staff and tourists	Ensure that the new water villas and restaurant are operating at optimal conditions	Routine monitoring and maintenance of the infrastructures and associated utilities	Included in resort	Proponent

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			operational cost	
Impacts on landscape integrity and scenery	Ensure that the new water villas and restaurant are operating at optimal conditions	Routine maintenance such that the outlook of the new infrastructures is at optimal condition	Included in resort operational cost	Proponent
Socio-economic impacts	Ensure that the new water villas and restaurant are operating at optimal conditions	Ensure that the guests are provided with the best service	Included in resort operational cost	Proponent
Risk of hazards-storm surge	Minimize damages from storm surge event and sea level rise	Ensure that the structural integrity of the infrastructure holds	Included in resort operational cost	Proponent
Risk of hazards-sea level rise		Ensure that the water villas are adequately elevated above the mean sea level and anticipated increase in sea level due to a storm surge event/sea level rise		
Risk of hazards-fire and other workplace accidents	Minimize risk of fire and other workplace accidents	Ensure firefighting equipment's are operational	Included in resort operational cost	Proponent
		Ensure personal protective equipment is made available to all staff		
		Establish emergency response plans		
		Establish health and safety manuals		
		Ensure availability of firefighting equipment		
		Signs for emergency procedures will be in the vicinity		
		Wear essential personal protection attires at all times		

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		Follow resort's emergency response plan		
		Adequate fire safety systems shall be installed throughout in all the water villas and restaurant		
		Staff training on chemical handling, health and safety procedures		
		Prepare and follow fuel handling procedures, health and safety manuals, emergency preparedness and response plan		
		Lifeguard station established near the water villas		
		Rescue buoys with rope available on the walkway jetty to rescue any snorkelers		
		All personnel must strictly abide COVID 19 guidelines set by HPA – social distancing, wearing masks and regular hand washing or sanitization		
		Chemical handling procedures should be followed to avoid any spillage		
		All personnel must strictly abide currently best practiced occupational health and safety procedure		

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9.2 Justification for the selected mitigation measures

The abovementioned mitigation measures for the construction and operational phase of the project were selected as those mitigation measures requires the least additional manpower, expertise, equipment, technology, and costs. Additionally, because the mitigation measures fulfil the initial principle of avoidance followed by minimisation in the cases where the impact could not be avoided and lastly compensation in those cases where avoidance and minimisation were not possible.

9.3 Effectiveness of mitigation measures

The effectiveness of proposed mitigation measures in the Maldivian setting is very difficult to ascertain due to the lack of monitoring data that is available. As such the full effectiveness of the proposed mitigation measures will be determined by the follow-up surveillance of the performance indicators that is highlighted for each mitigation measure and by monitoring of the parameters that is highlighted in section 9.7.1 under the Table 31.

9.4 Risk Management and Incident Response

Risk management procedures in this project are strengthened by adopting a more systematic risk management approach to safety. This is achieved by identifying all foreseeable impacts (as stated in section 7 of this report), assessing the risk of each impact and providing a means to control the impacts (mitigation measures).

9.5 Sustainable Development Management Policy

The design and implementation of the project ensures that the proposed project is sustainable. As such, measures adopted to promote sustainable development include some guiding principles as well as components incorporated into the project design. These include:-

- Ensure environmental compliance with the Governmental policies and regulations;
- Protect people, property and the local environment;

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- Reduce ecological impacts of the services provided; and
- Increase customer satisfaction.

9.6 Managing Uncertainties in Impact Prediction

Uncertainty is an integral part of an EIA as EIA preparation involves prediction. The two types of uncertainties associated with the EIA process include those associated with the process and those associated with predictions. With the former, the question is whether the most important impacts have been identified and whether the recommendations will be acted upon. In order to reduce such uncertainties, a wide range of stakeholders have been consulted (Section 6) in the EIA process in order to minimize the risk of missing important impacts. For the latter, the uncertainty is in the accuracy of the findings. This can be improved by research and quality of the survey, and by follow-up monitoring.

It should also be noted that even though EIA cannot give a precise picture of the future, it enables uncertainties to be better managed and is an aid to better decision making.

9.7 Environmental Monitoring

Monitoring is an essential part of the EIA and project implementation and serves 3 purposes:-

- Ensures that the proposed mitigation measures are being implemented;
- Evaluates whether the proposed mitigation measures are working effectively; and
- Validates the accuracy of models or projections that were used during impact assessment process.

The purpose of monitoring is to compare the predicted impacts with that of the actual impacts, particularly if the impacts are either very important or the scale of the impact cannot be predicted accurately. The results of monitoring can then be used to manage the environment, particularly to highlight problems early on so an action can be taken.

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Monitoring should not be seen as an open-ended commitment to data collection and to minimize the expenses associated with collecting unnecessary data, the data collection should cease when the need for monitoring ceases. Therefore, it is important that a proper monitoring schedule is adhered to. Conversely, monitoring may also indicate the need for more intensive study. The information obtained from monitoring can be extremely useful for future EIAs in making them more accurate as well as more effective.

9.7.1 Monitoring Parameters

The baseline data collection for the proposed development was undertaken in April 2023. Baseline surveys were conducted to determine the reference range, so that comparisons can be made during the monitoring to determine the change.

All monitoring activities must be carried out under supervision of a registered EIA consultant. Details of the monitoring program are given in Table 31 below.

It is the responsibility of the implementing agency to adhere to the monitoring program and bear any costs related to reporting them.

Table 31. Environmental monitoring plan proposed for the proposed development

Parameter	**Locations**	**Method**	**Indicators**	**Frequency**	**Cost / MRF**	**Staff requirement**
CONSTRUCTION PHASE						
Marine environment	Construction sites and Control	Water quality test Benthic substrate Analysis Fish census	Compare with baseline	Every 3 months during construction	15000	2 surveyors
Turbidity	Construction sites and Control	Water quality test	Compare with baseline	Every 3 months during construction	500	1 surveyor
Waste	Construction sites	Visual inspection	Improper management of waste	Every 3 months during construction	500	1 surveyor

Noise	Project site and Control	Decibel meter or any other equipment that can measure sound levels	Compare with baseline	Every 3 months during construction	500	1 surveyor
OPERATIONAL PHASE						
Waste	Resorts waste management center	Visual	Management of waste at WMC	Every 3 months after construction for 1 year and annually for 5 years	1000	1 surveyor
Positive socio-economic impacts	Resort	Occupancy of the water villas	% occupancy	Every 3 months after construction for 1 year and annually for 5 years	500	1 surveyor
Marine environment	Construction sites and Control	Water quality test Benthic substrate Analysis Fish census	Compare with baseline	Every 3 months after construction for 1 year and annually for 5 years	15000	2 surveyors
Accidents	Project site	Workplace accidents	Number of incidents	Every 3 months after construction for 1 year and annually for 5 years	1000	1 surveyor

9.7.2 Environmental Monitoring Report Submission Schedule

Monitoring reports must be submitted to the EPA as specified under the monitoring schedule below:-

Table 32. Monitoring schedule recommended for the proposed development assuming that the project commences in May 2023 and completes on August 2023

Description	Date
EIA Decision statement issued	May-23

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Project commencement	May-23
Monitoring report during construction- 1	August-23
Monitoring report during operation – 1	September-23
Monitoring report during operation – 2	December-23
Monitoring report during operation – 3	March-24
Monitoring report during operation – 4	June-24
Monitoring report during operation – 5	September-24
Monitoring report during operation – 6	September-25
Monitoring report during operation – 7	September -26
Monitoring report during operation – 8	September -27
Monitoring report during operation – 9	September -28
Monitoring report during operation – 10	September -29

9.7.3 Environmental Monitoring Report Format

Following is the environmental monitoring report format expected for this project. The report will include the details of the methods used to collect data, sampling sites, sampling frequency, results and analysis. All data collected in the monitoring period shall be presented in the monitoring report without bias and data shall be compared with the baseline values presented in this EIA report. For the preparation of this monitoring report a surveyor and an environmental consultant will be required.

Introduction

Purpose of the monitoring report

Introduction of consultant and proponent

Methodology

Describe the methods used to collect data

Sampling sites

Geographic coordinates

Results

Present results for the monitoring period

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Comparison with baseline

Conclusion

Specify if environmental thresholds are being exceeded

Propose any additional mitigation measures

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10. JUSTIFICATION AND CONCLUSION

The purpose of this EIA is to critically analyze and assess the potential environmental impacts associated with the proposed refurbishment of existing water villas, construction of additional water villa, construction of service hut and associate works and propose the solutions and preferred alternatives as well as mitigation measures to minimize any negative impacts whilst trying to derive the maximum positive impacts from the project.

Angaga Resort is looking to improve their services by upgrading its existing facilities by refurbishment and expansion of current infrastructure. The current water villas are damaged and are overdue for replacement as continuing to using them as per the current situation might be prone to an incident of infrastructure failure. Furthermore, the upgrade is required in order to diversify the current facilities looking forward to meet the growing demand for exotic tourism ventures.

The major impacts of the proposed project during the construction phase are the impacts to the marine environment, majorly resulting from the construction works in the over water villas resulting from turbidity and sedimentation. Other impacts include impacts to air quality (increase of GHG emissions) and impacts to landscape integrity and scenery during the period of construction. The major negative impacts during operational phase is air pollution, impacts on the marine environment and risk of hazard from storm surges and fire induced hazards. The positive impacts during the operational phase is the socio-economic impact from service diversification and the increased health and safety of the staff and guests due to refurbishment works.

Major mitigation measures include, undertaking proper sedimentation controls and restricting the movement of barges and excavators to a narrow area. Care should also be also be given to ensure that the workforce will abide by the health and other regulatory measures to minimize the risk of the Covid-19 episode within the workforce.

Main alternatives that were studied were the no-project option, alternative mobilisation route and integrating green building concepts to the proposed project. On further observation, it was noted that it would be more beneficial to incorporate the aforementioned alternatives than the proposed project.

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In terms of environmental monitoring, it is recommended to monitor the water quality, benthic substrate, fish census and waste generation during the construction phase of the project. Furthermore, continuation of monitoring the marine environment is recommended in the operational phase with monitoring the waste generation, water quality, benthic substrate, fish census and occurrence of accidents.

The socioeconomic benefits during the operations far outweigh the negative impacts of the construction phase of the proposed project. Hence, with the mitigation measures outlined in the report, it is recommended to proceed with the project as planned.

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12. APPENDICES

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APPENDIX B. LIST OF ABBREVIATIONS

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Environmental Impact Assessment for the Proposed Refurbishment of Water Villas Project at Angaga Island Resort and Spa, South Ari Atoll

APPENDIX C. TERMS OF REFERENCE

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Website: www·ecotechconsultancy·com : ވެބްސައިޓް

No: 203-ECA/PRIV/2023/238

Terms of Reference for Environmental Impact Assessment for the Proposed Refurbishment of Water Villas Project at Angaga Island Resort and Spa, South Ari Atoll

The following is the Terms of Reference (ToR) for undertaking **EIA for the Proposed Refurbishment of Water Villas Project at Angaga Island Resort and Spa, South Ari Atoll.** The Proponent of the Project is **Angiri Resorts Management & Operation Pvt Ltd.** The Consultant of the Project is **Mahfooz Abdul Wahhab (License No: EIA P22/2016).**

While every attempt has been made to ensure that this ToR addresses all of the major issues associated with development proposal, they are not necessarily exhaustive. They should not be interpreted as excluding from consideration matters deemed to be significant but not incorporated in them, or matters currently unforeseen, that emerge as important or significant from environmental studies, or otherwise, during the course of preparation of the EIA report.

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

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

3. **Scope of work** – The report should be categorised into the following components:

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

- Project justification.
- Environmental monitoring during construction activities.
- Emergency plan during spillages.
- Measures to protect environmental values during construction and operation phase i.e. sedimentation control.

New Water Villa, House Keeping Hut and Associated Walkway Construction

- Details of structures to be demolished.
- Location and design of the water villas.
- Location and design of the house keeping hut.
- Location and design of the walkway.
- Justification of location and designs.

Health and Safety

- Availability of basic first aid facilities.
- Availability of safety gears.
- Proposed measures to be taken in case of oil spills in the marine environment.

Project Management

- Labour requirements and (local) labour availability.
- Housing of temporary labour.
- Waste management during construction and operation.
- Waste fuel and oil management details.
- Project management (include scheduling and duration of the project and life span of facilities; communication of construction details, progress, target dates, construction/operation/closure of labour camps, access to site, safety, equipment and material storage, fuel management and emergency plan in case of spills).

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. The report should outline detailed methodology of data collection utilized.

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

Climate

- Temperature, rainfall, wind, waves, evaporation rates (including extreme conditions).
- Risk of hurricanes and storm surges.

Geology and geomorphology

- Offshore/coastal geology and geomorphology (use maps).
- (Seasonal) patterns of coastal erosion and accretion.
- Characteristics of seabed sediments to assess direct habitat destruction and turbidity impacts during construction near the proposed construction site.
-

Hydrography/hydrodynamics (use maps)

- Tidal ranges and tidal currents.
- Wave climate and wave induced currents.
- Wind induced (seasonal) currents.
- Sea water quality measuring these parameters: temperature, pH, salinity, turbidity and TDS (from the construction sites and from at least one control site).

Ecology

- Identify marine protected areas (MPAs) and sensitive sites such as breeding or nursery grounds for protected or endangered species (e.g. coral reefs, spawning fish sites, nurseries for crustaceans or specific sites for marine mammals, sharks and turtles). Include description of commercial species, species with potential to become nuisances or vector.
- Quantitative marine assessment (coral cover and fish census survey) of the proposed construction sites and from at least one control site.
- Description of landscape integrity.

Hazard vulnerability:

- Vulnerability of area to flooding and storm surge.
- Risk of hurricanes and storm surges.

Absence of facilities in the country to carry out the water quality tests will not exempt the proponent from the obligation to provide the necessary data. The report should outline the detailed methodology of data collection utilized to describe the existing environment.

Task 3. Legislative and regulatory considerations – Identify the pertinent legislation, regulations and standards, and environmental policies that are relevant and applicable to the proposed project, and identify the appropriate authority jurisdictions that will specifically apply to the project. Include permits and approvals in the EIA document. Legal requirements:

- Concept Approval from Ministry of Tourism.

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

Impacts on the natural environment

- Changes in flow velocities/directions, resulting in changes in erosion/sedimentation patterns, which may impact shore zone configuration/coastal morphology.
- Loss of marine bottom habitat at the construction sites.
- Impacts on unique or threatened habitats or species (coral reefs, sea turtles etc.), and
- Sediment dispersal in water column, possibly resulting in changes in visibility, smothering of coral reefs and benthic communities and affecting fish and shellfish etc.
- Impacts of noise, vibration and disturbance.
- Impacts on landscape integrity/scenery.

Impacts on the socio-economic environment

- Impacts of the construction works on the tourists residing within the resort.
- Impacts on employment and income, potential for local people to have (temporary) job opportunities (and what kind) in the execution of the works.
- Health impacts; Including COVID-19 related safety measures that will be in place.
- Level of protection against hazards like sea level rise, storm surges, etc.

Construction related hazards and risks

- Pollution of the natural environment (e.g. oil spills, discharge of untreated wastewater and solid waste, including construction waste).
- Risk of accidents and pollution on workers.

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

Task 5. Alternatives to proposed project – Describe alternatives including the *"no action option"* should be presented. Determine the best practical environmental options. Alternatives examined for the proposed project that would achieve the same objective including the "no action alternative". This should include alternative designs, alternative materials, alternative locations. The report

should highlight how the best location was determined. All alternatives must be compared according to international standards and commonly accepted standards as much as possible. The comparison should yield the preferred alternative for implementation. Mitigation options should be specified for each component of the proposed project.

Task 6. Mitigation and management of negative impacts – Identify possible measures to prevent or reduce significant negative impacts to acceptable levels. These will include both environmental and socio-economic mitigation measures with particular attention paid to sedimentation control and future changes in coastal processes. 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. An Environmental management plan for the proposed project, identifying responsible persons, their duties and commitments shall also be given. In cases where impacts are unavoidable arrangements to compensate for the environmental effect shall be given.

Task 7. Development of monitoring plan (see appendix)– Identify the critical issues requiring monitoring to ensure compliance to mitigation measures and present impact management and monitoring plan for coastal modification, beach morphology, sediment movement around the island. Ecological monitoring will be submitted to the EPA to evaluate the damages during construction, after project completion and every three months thereafter, up to one year and then on a yearly basis for five years after. The baseline study described in task 2 of section 2 of this document is required for data comparison. Detail of the monitoring program including the physical and biological parameters for monitoring, cost commitment from responsible person to conduct monitoring in the form of a commitment letter, detailed reporting scheduling, costs and methods of undertaking the monitoring program must be provided.

- Water quality, especially turbidity.
- Impacts from sedimentation on nearby coral reefs, benthic system, seagrass beds and fish and invertebrates communities.
- Condition of the sensitive ecosystems and marine resources.
- Environmentally sound site clearance.

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

- Ministry of Tourism.
- South Ari Atoll Council.

Summarize the issues identified during the consultation process, include responses by the proponent to the issues raised and discuss the stakeholder input that has been incorporated or addressed in the

EIA. Concerns that were raised by the stakeholders but not considered in the EIA must be justified by the proponent.

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

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.

……

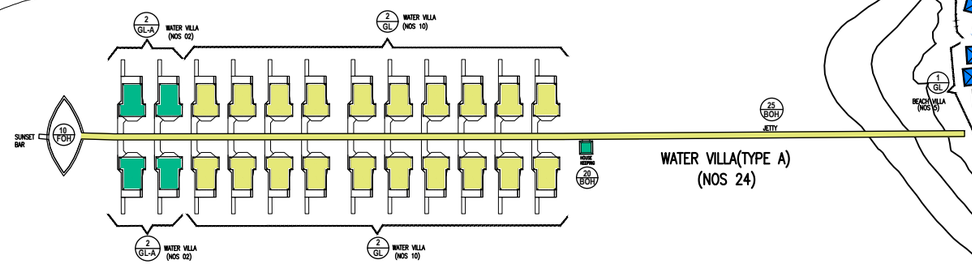
05th April 2023

ENVIRONMENTAL PROTECTION AGENCY
Male', Rep of Maldives

APPENDIX D. APPROVED SITE PLAN

Eco-Tech Consultancy Private Limited
M· Husnoovilaa, Unigas Magu,
Male', 20296, Kaafu Atoll,
Republic of Maldives
Tel: +960-9994467 : ފޯނު

ތިލާ-ދޭވ ކައުންސަލްޓަންސީ ޕްރައިވެޓް ލިމިޓެޑް
ވ. ހުސްނޫވިލާ، ޔުނިގަސް މާގު،
ދަގު، 20296، ކ. ކޮޅުފު، ދިވެހިރާއްޖެ
E-mail: secretariat@ecotechconsultancy·com : ޕޮސްޓް
Website: www·ecotechconsultancy·com : ވެބްސައިޓް



88-DS/PRIV/2023/391
29th March 2023

BUILT UP AREA FOR PROPOSED NEW STRUCTURES/RENOVATION/UPGRADING

Name of the establishment: **ANGAGA, ISLAND RESORT & SPA, ALIF ATOLL**

Last approved concept reference number:

UPDATED: 2nd March 2023

APPROVED STRUCTURES

No. Seq.	Building / Structure	No. of Rooms	No. of Units	Area per units (SqM)	Total area (SqM)	Remarks
GUEST LODGING						
1-GL	Beach Villa	1	50	51.00	2,550.00	
3-GL	Water Villa- Type B	1	20	46.26	925.20	
PUBLIC AREAS						
5-FOH	Reception & Office		1	413.53	413.53	
6-FOH	Restaurant, Bar and Kitchen		1	831.12	831.12	
7-FOH	Coffee Shop		1	116.90	116.90	
8-FOH	Dive Centre/Water Sports Center		1	208.20	208.20	
9-FOH	Game ,Shops and Library		1	192.31	192.31	
10-FOH	Sunset Bar		1	162.45	162.45	
11-FOH	Clinic		1	121.50	121.50	
12-FOH	Gym		1	37.81	37.81	
13-FOH	Spa		1	199.86	199.86	
BACK OF HOUSE						
14-FOH	Executive Building		1	115.97	115.97	
15-BOH	Staff Building		1	93.60	93.60	
16-BOH	Staff Room,Mess and Kitchen		1	596.00	596.00	
17-BOH	Two Story Staff room		1	190.63	190.63	
18-BOH	RO / Laundry & HouseKeeping Workshop/Store		1	729.74	729.74	
19-BOH	Power House		1	120.00	120.00	
21-BOH	Incinerator		1	30.86	30.86	
22-BOH	Water Tank 1		2	1.44	2.88	
22A-BOH	Water Tank 2		2	4.62	9.24	
23-BOH	Fuel Shed 1		1	12.13	12.13	
23A-BOH	Fuel Shed 2		1	10.00	10.00	
24-BOH	Mosque		1	67.24	67.24	
25-BOH	Jetty		1	0.00	0.00	
26-BOH	Volleyball Court		1	0.00	0.00	
27-BOH	Tennis Court		1	0.00	0.00	
28-BOH	Badminton Court		1	0.00	0.00	
				Total Buit-up Area (SqM)	**7,737.17 SqM**	
				Total Buit-up Area Pecentage(%)	**19.64%**	
				Total Land Area (SqM)	**39,388.00 SqM**	
				Total Beach Length (M)	**663.22**	

PROPOSED REVISIONS AND NEW STRUCTURES

No. Seq.	Building / Structure	No. of Rooms	No. of Units	Area per units (SqM)	Total area (SqM)	
GUEST VILLAS						
2-GL-A	Water Villa-Water Villa Bungalow Type A	1	4	55.78	223.12	New structure
2-GL	Water Villa-Water Villa Bungalow Type A	1	20	55.78	1,115.60	Revision
BACK OF HOUSE						
20-BOH	Housekeeping- Over Water		1	10.89	10.89	New struture
25-BOH	Jetty		1	0.00	0.00	Revision
				New StructuresTotal Buit-up Area (SqM)	**1,349.61 SqM**	
				New Structures Total Buit-up Area Pecentage(%)	**3.43%**	
				Total Land Area (SqM)	**39,388.00 SqM**	
				Total Beach Length (M)	**663.22**	
				Total Buit-up Area (New + Approved)	**9,086.78 SqM**	
				Total Buit-up Area Percentage(New + Approved)	**23.07%**	

L E G E N D S :

- ADDITIONAL STRUCTURES
- EXISTING STRUCTURE (ROOM) REDESIGNED
- EXISTING BUILDINGS(AS PER DESIGN APPROVAL)
- VEGETATION LINE
- HIGHTIDE LINE
- LOWTIDE LINE

NORTH

ANGAGA REDEVELOPMENT SITE PLAN

0 10 20 30 40 50 100 meter

Print scale 1 : 2500 on A3 paper size
On other print sizes refer to scale bar
Dimensions on drawing precede scaled readings
All dimensions in meter

TOTAL LAND AREA = 39,388.00 SQM

TOTAL BEACH LENGTH = 663.22 METRES

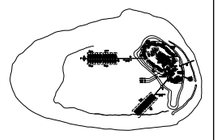
CLIENT:

MR. NAEEM

CONSULTANT:

SIARCH PRIVATE LIMITED
LONUZIYAARAY MAGU,MALE',20075,MALDIVES
EMAIL: INFO@SIARCH.DESIGN
HTTP//:WWW.SIARCH.DESIGN

KEY PLAN:



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REVISIONS

NO	DESCRIPTION	DATE
01	HK HUT MOVED	05.02.23
02	4 VILLA ADDED	05.02.23
03	20 EXST. VILLAS REDESIGNED	05.02.23

PROJECT:

ANGAGA ISLAND RESORT & SPA REDEVELOPMENT

PHASE:

- (●) CONCEPT DESIGN
- ( ) DESIGN DEVELOPMENT
- ( ) TENDER DOCUMENT
- ( ) FOR CONSTRUCTION
- ( ) AS BUILD DRAWINGS

DESIGNATION	NAME
PROJECT MANAGER	SIARCH PVT.LTD
STR. ENGINEER	MOHAMED SHAMIN
DESIGNED BY	ALI NISHAM
CHECKED BY	MOHAMED SIRAJ
DRAWN BY	GERRY

DISCIPLINE:

ANGAGA ISLAND RESORT & SPA A Dh ATOLL

MASTER PLAN

CODE	DATE			DWG. NO:
RST:01	16-03-23			AR01
FORMAT	A1	A2	A3	
SCALE	-	-	1:2000	ISSUE A

FILE NAME: RST-01_AR01_A

APPENDIX E. CONCEPT APPROVAL

Eco-Tech Consultancy Private Limited
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ތިލާ-ދޭކ ކައުންސަލްޓަންސީ ޕްރައިވެޓް ލިމިޓެޑް
ހ. ހުސްނޫވިލާ، ޔުނިގަސް މާގު،
ދަގު، 20296، ކ. ކާފޫ، ތިލުވާ ކަރަންޓުގެ
E-mail: secretariat@ecotechconsultancy·com : ޕޮސްޓް
Website: www·ecotechconsultancy·com : ވެބްސައިޓް

بسم الله الرحمن الرحيم

MINISTRY OF TOURISM
REPUBLIC OF MALDIVES

Ref no: 88-DS/PRIV/2023/391 Wednesday, 29th March 2023

Mr. Mohamed Naeem,
Managing Director,
Angiri Resorts Management & Operation Pvt Ltd,
2nd Floor, M. New Plot,
Male',
Republic of Maldives.

Dear Mr. Naeem,

Re: Conditional Master Plan Approval for Angaga in Alif Dhaalu Atoll.

We refer to your application received on 26th February 2023, the revised documents received 20th March 2023 and 22nd March 2023 requesting for approval of the revised master plan of Angaga in Alif Dhaalu Atoll.

A conditional approval is hereby granted to the revised master and attached please find the list of structures approved. This approval is subjected to the fulfillment of the following requirements and procedures;

- Submission and approval of the Environmental clearance.
- Notify the Ministry in writing, upon submission of the EIA application to the Environment Protection Agency.
- Submission and approval of the detail design report for the proposed project.
- Built up area percentage and carrying capacity of the facility shall comply with the existing regulations.
- Development shall comply with all conditions specified in the lease agreement.
- To submit a scaled and clearly labeled demolition plan within 7 days.

In addition, please note that this permit will be void if the submission is not made within given duration.

We make note that upon completion of the project, the bed capacity of resort would be 94 guest rooms (188 beds) and the built-up area of the island is 23.07% (9,086.78 sqm) of the total land area 39,388.00 sqm.

Yours Sincerely,

MINISTRY OF TOURISM Male', Republic of Maldives

Ibrahim Fikree
Director

MN/DS

Ref no: 88-DS/PRIV/2023/391

Angaga in Alif Dhaalu Atoll
Proposed upgrading & new structures

Legend No.	Building Name	No. Unit	Status
2-GL-A	Water Villa-Water Villa Bungalow Type A	24	New
20-BOH	Housekeeping Hut	1	New

Structure to be demolished

Legend No.	Building Name	No. Unit
2-GL	Water Villa- Type A	20

MINISTRY OF TOURISM
Republic of Maldives

Ministry of Tourism, Velaanage, Fifth Floor, Ameer Ahmed Magu, Male', Maldives
Tel: +(960)3022200, +(960)3022207, Fax: +(960)332 2512
E-mail: info@maldivestourism.gov.mv,website:www.tourism.gov.mv

APPENDIX F. DETAILED (AND/OR ARCHITECTURAL) DRAWINGS

Eco-Tech Consultancy Private Limited
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Male', 20296, Kaafu Atoll,
Republic of Maldives
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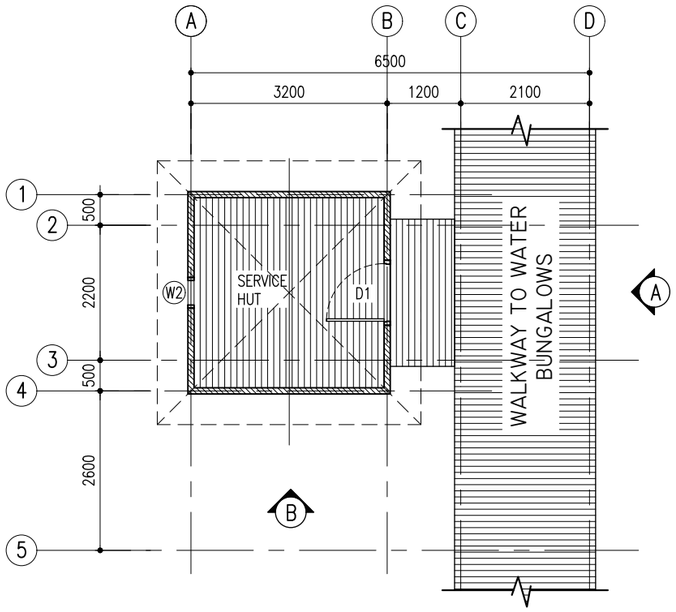
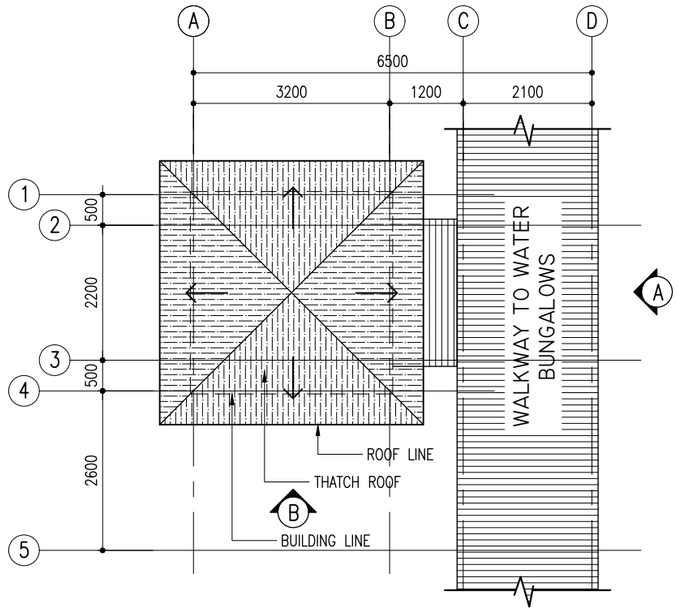
ތިލާ-ދޭވެ ކައުންސަލްޓަންސީ ޕްރައިވެޓް ލިމިޓެޑް
ވ. ހުސްނޫވިލާ، ޔުނިގަސް މަގު،
ދަގު، 20296، ކ. ގެއްލުން، ތިލުވަރަންފަށ
E-mail: secretariat@ecotechconsultancy·com : ޕޮސްޓް
Website: www·ecotechconsultancy·com : ވެބްސައިޓް



FLOOR PLAN

SCALE 1:100

0m 5m



ROOF PLAN

SCALE 1:100

0m 5m

NOTE:

ALL INTERIOR AND EXTERIOR WALLS ARE 100 THK STRUCTURAL DRYWALL PANELS WITH SMOOTH PUTTY & EMULSION PAINT ON THE INTERIOR AND PUTTY TEXTURED PAINT FINISH ON THE EXTERIOR

GRID LINE C,D,2,3 AND 5 ARE WALKWAY COLUMN LINE GRIDS

CLIENT:
MR. NAEEM

CONSULTANCY:

SIARCH
PRIVATE LIMITED
LONUZIYAARAY MAGU,MALE',20075,MALDIVES
EMAIL: INFO@SIARCH.DESIGN
HTTP://:WWW.SIARCH.DESIGN

KEY PLAN:

REVISIONS		
NO	DESCRIPTION	DATE

PROJECT:

ANGAGA REDEVELOPMENT

PHASE:

- ○ CONCEPT DESIGN
- ◉ DESIGN DEVELOPMENT
- ○ TENDER DOCUMENT
- ○ FOR CONSTRUCTION
- ○ AS BUILD DRAWINGS

DESIGNATION	NAME	SIGNATURE
DESIGN BY:	.....	
ARCHITECT	.....	
STRUC. ENGINEER	.....	
CHECKED	MOHAMED SIRAJ	
DRAWN	MS	

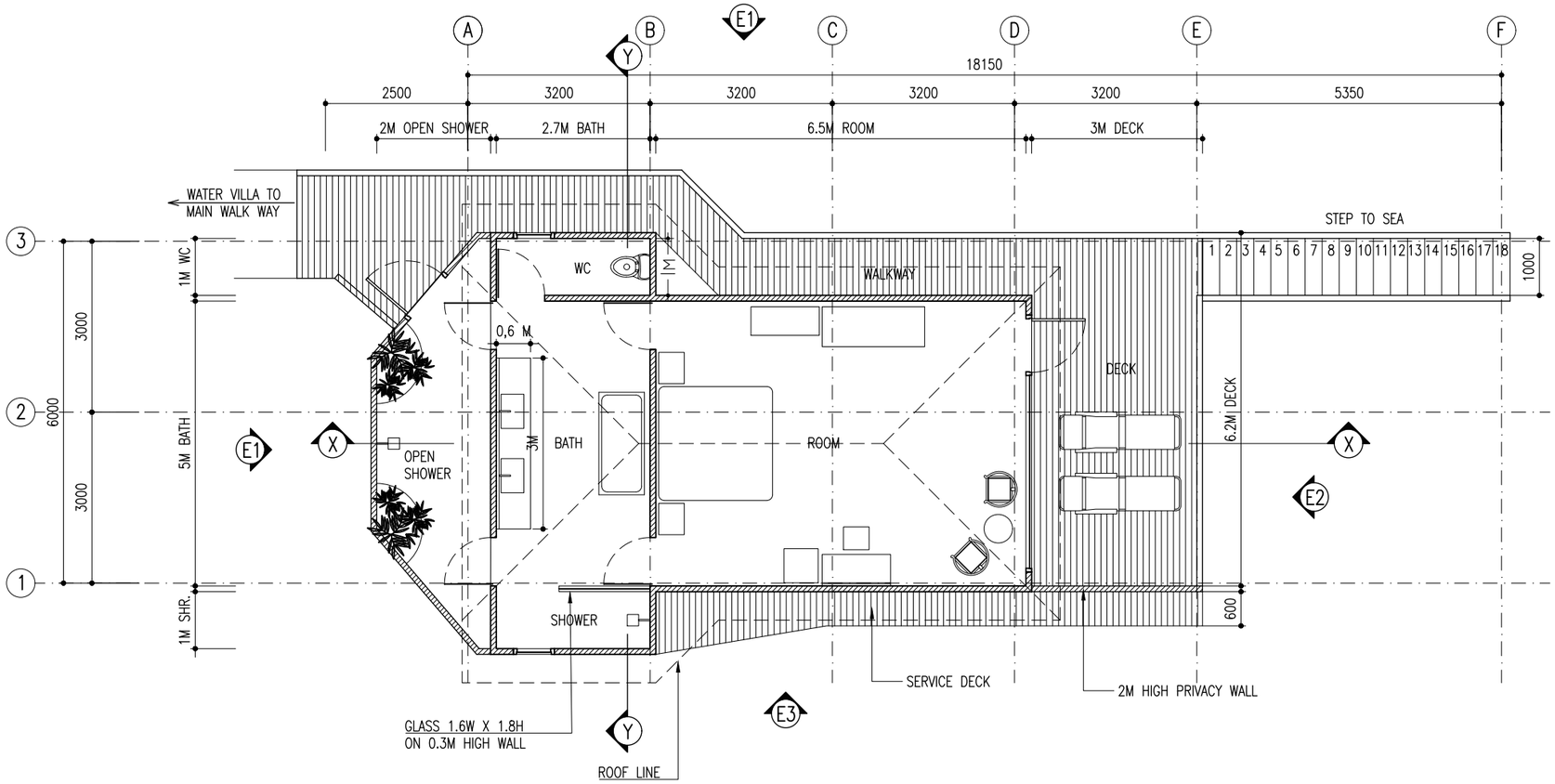
DWG. NAME:

HOUSE KEEPING HUT

FLOOR PLAN AND ROOF PLAN

CODE	DATE			DWG. NO:
RST-16	20-07-19			AR01
FORMAT	A1	A2	A3	
SCALE	-	-	1:100	ISSUE A

PDF FILE NAME: AGG-BOH-HK_ AR01_A



FLOOR PLAN

SCALE 1:100

0m 5m

NOTE:

ALL INTERIOR AND EXTERIOR WALLS ARE 100 THK STRUCTURAL DRYWALL PANELS WITH SMOOTH PUTTY & EMULSION PAINT ON THE INTERIOR AND PUTTY TEXTURED PAINT FINISH ON THE EXTERIOR

CLIENT:
MR. NAEEM

CONSULTANCY:
SIARCH
PRIVATE LIMITED
LONUZIYAARAY MAGU,MALE',20075,MALDIVES
EMAIL: INFO@SIARCH.DESIGN
HTTP://:WWW.SIARCH.DESIGN

KEY PLAN:

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	REVISIONS	
NO	DESCRIPTION	DATE

PROJECT:
ANGAGA
REDEVELOPMENT

PHASE:
- ○ CONCEPT DESIGN
- ◉ DESIGN DEVELOPMENT
- ○ TENDER DOCUMENT
- ○ FOR CONSTRUCTION
- ○ AS BUILD DRAWINGS

DESIGNATION	NAME	SIGNATURE
DESIGN BY:	.....	
ARCHITECT	.....	
STRUC. ENGINEER	.....	
CHECKED	MOHAMED SIRAJ	
DRAWN	MS	

DWG. NAME:
WATER VILLA

FLOOR PLAN

CODE	DATE			DWG. NO:
RST-16	20-07-19			AR01
FORMAT	A1	A2	A3	
SCALE	-	-	1:100	ISSUE A
PDF FILE NAME: AGG-GL-WVTA_AR01_A				

APPENDIX G. DETAILED WORK SCHEDULE

Eco-Tech Consultancy Private Limited
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ވ. ހުސްނޫވިލާ، ހުނިގަސްމަގު،
މާލެ، 20296، ކާފޫ ތެރޭގެ،
ދިވެހިރާއްޖެ
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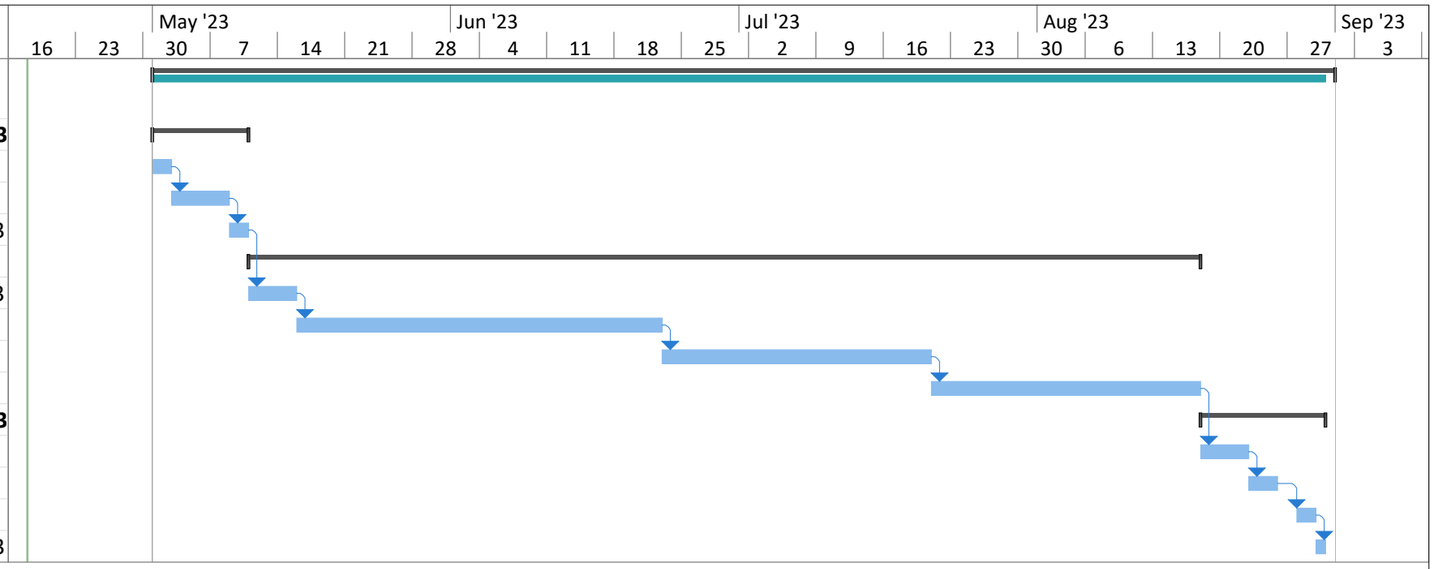
Website: www·ecotechconsultancy·com : ވެބްސައިޓް

ID	Task Mode	Task Name	Duration	Start	Finish
1		**Refurbishment of water villas project at Angaga**	**89 days**	**Mon 5/1/23**	**Thu 8/31/23**
2		**Mobilization and site preparation**	**8 days**	**Mon 5/1/23**	**Wed 5/10/23**
3		Mobilization	2 days	Mon 5/1/23	Tue 5/2/23
4		In-survery and setting out	4 days	Wed 5/3/23	Mon 5/8/23
5		Commencement	2 days	Tue 5/9/23	Wed 5/10/23
6		**Demolition and columns installation**	**71 days**	**Thu 5/11/23**	**Thu 8/17/23**
7		Material Delivery	3 days	Thu 5/11/23	Mon 5/15/23
8		Demolition and columns installation	28 days	Tue 5/16/23	Thu 6/22/23
9		Concrete works	20 days	Fri 6/23/23	Thu 7/20/23
10		Finishing works	20 days	Fri 7/21/23	Thu 8/17/23
11		**Demobilization**	**9 days**	**Fri 8/18/23**	**Wed 8/30/23**
12		Site clearance	3 days	Fri 8/18/23	Tue 8/22/23
13		Out-survey	3 days	Wed 8/23/2	Fri 8/25/23
14		Final Demobilization	2 days	Mon 8/28/2	Tue 8/29/23
15		Final inspection and handover	1 day	Wed 8/30/2	Wed 8/30/23



Project: Refurbishment of water v

Date: Tue 4/18/23

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only	Manual Progress
Summary	Inactive Task	Duration-only	Finish-only	

APPENDIX H. WATER QUALITY ASSESSMENT RESULTS

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ވެބްސައިޓް : Website: www·ecotechconsultancy·com

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Tel: +9603323209, Fax: +9603324306, Email: wqa@mwsc.com.mv

LB-TEST-090

WATER QUALITY TEST REPORT

Report No: 500195593

Customer Information:
Eco-Tech Consultancy Pvt Ltd
M. Husnoo villa, Unigas Magu,

Report date: **10/04/2023**
Test Requisition Form No: **900197224**
Sample(s) Recieved Date: **04/04/2023**
Date of Analysis: **04/04/2023 - 05/04/2023**

Sample Description ~	Angaga D1	D2	D3	**TEST METHOD**	**UNIT**
Sample Type ~	Sea Water	Sea Water	Sea Water		
Sample No	83237635	83237636	83237637		
Sampled Date ~	02/04/2023 09:30	02/04/2023 09:30	02/04/2023 09:30		
PARAMETER	**ANALYSIS RESULT**				
Physical Appearance	Clear with particles	Clear with particles	Clear		
pH *	8.2	8.2	8.2	Method 4500-H+ B. (adapted from Standard methods for the examination of water and waste water, 23rd edition)	-
Salinity	34.10	33.85	33.61	Method 2520 B. (adapted from Standard methods for the examination of water and waste water, 23rd edition)	‰
Temperature	24.3	24.1	24.2	Electrometry	°C
Turbidity *	0.122	0.135	0.102	HACH Nephelometric Method (adapted from HACH 2100N Turbidimeter User Manual)	NTU
Total Petroleum Hydrocarbon (TPH)	<0.036 (LoQ 0.036 mg/L)	<0.036 (LoQ 0.036 mg/L)	<0.036 (LoQ 0.036 mg/L)	UV Fluorescence	mg/L

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

Checked by

Nashath Ali
Laboratory Executive

Approved by

Nihaz A. Zahir
Assistant Quality Manager

Notes:
Sampling Authority: Sampling was not done by MWSC Laboratory.
This report shall not be reproduced except in full, without written approval of MWSC.
This test report is ONLY FOR THE SAMPLES TESTED.
~ Information provided by the customer. This information may affect the validity of the test results.
*Parameters accredited by EIAC under ISO/IEC 17025:2017

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LB-TEST-090

WATER QUALITY TEST REPORT

Report No: 500195593

Customer Information:
Eco-Tech Consultancy Pvt Ltd
M. Husnoo villa, Unigas Magu,

Report date: **10/04/2023**
Test Requisition Form No: **900197224**
Sample(s) Recieved Date: **04/04/2023**
Date of Analysis: **04/04/2023 - 05/04/2023**

Sample Description ~	C	**TEST METHOD**	**UNIT**
Sample Type ~	Sea Water		
Sample No	83237638		
Sampled Date ~	02/04/2023 09:30		
PARAMETER	**ANALYSIS RESULT**		
Physical Appearance	Clear		
pH *	8.2	Method 4500-H+ B. (adapted from Standard methods for the examination of water and waste water, 23rd edition)	-
Salinity	33.69	Method 2520 B. (adapted from Standard methods for the examination of water and waste water, 23rd edition)	‰
Temperature	24.0	Electrometry	°C
Turbidity *	0.110	HACH Nephelometric Method (adapted from HACH 2100N Turbidimeter User Manual)	NTU
Total Petroleum Hydrocarbon (TPH)	<0.036 (LoQ 0.036 mg/L)	UV Fluorescence	mg/L

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

Checked by

Nashath Ali
Laboratory Executive

Approved by

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

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WATER QUALITY TEST REPORT

Report No: 500195618

Customer Information:
Eco-Tech Consultancy Pvt Ltd
M. Husnoo villa, Unigas Magu,

Report date: **11/04/2023**
Test Requisition Form No: **900197271**
Sample(s) Recieved Date: **09/04/2023**
Date of Analysis: **09/04/2023 - 09/04/2023**

Sample Description ~	Angaga D1	D2	D3	**TEST METHOD**	**UNIT**
Sample Type ~	Sea Water	Sea Water	Sea Water		
Sample No	83237837	83237838	83237839		
Sampled Date ~	02/04/2023 09:30	02/04/2023 09:30	02/04/2023 09:30		
PARAMETER	**ANALYSIS RESULT**				
Physical Appearance	Clear with particles	Clear with particles	Clear with particles		
Total Dissolved Solids	25800	25800	25600	Electrometry	mg/L

Keys: mg/L : Milligram Per Liter

Checked by

Aminath Shahidha
Laboratory Executive

Approved by

Nihaz A. Zahir
Assistant Quality Manager

Notes:
Sampling Authority: Sampling was not done by MWSC Laboratory.
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WATER QUALITY TEST REPORT

Report No: 500195618

Customer Information:
Eco-Tech Consultancy Pvt Ltd
M. Husnoo villa, Unigas Magu,

Report date: **11/04/2023**
Test Requisition Form No: **900197271**
Sample(s) Recieved Date: **09/04/2023**
Date of Analysis: **09/04/2023 - 09/04/2023**

Sample Description ~	C		
Sample Type ~	Sea Water		
Sample No	83237840		
Sampled Date ~	02/04/2023 09:30	**TEST METHOD**	**UNIT**
PARAMETER	**ANALYSIS RESULT**		
Physical Appearance	Clear with particles		
Total Dissolved Solids	25900	Electrometry	mg/L

Keys: mg/L : Milligram Per Liter

Checked by

Aminath Shahidha
Laboratory Executive

Approved by

Nihaz A. Zahir
Assistant Quality Manager

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Sampling Authority: Sampling was not done by MWSC Laboratory.
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********** END OF REPORT **********

APPENDIX I. FORMAT FOR FUEL HANDLING PROCEDURE

Following is the fuel handling procedure format expected for this project. The procedure shall include the following;

Introduction
- Name and contacts of the applicable facility
- Major aims and objectives

Applicability and scope

Proposed fuel delivering and dispensing procedure for construction phase

Proposed fuel delivering and dispensing procedure for operational phase

Emergency Protocols
- In case of spills

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ދަގު، 20296، ކ. ކާފޫ، ތަކުރުރިއާސާ
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Website: www·ecotechconsultancy·com : ވެބްސައިޓް

APPENDIX J. FORMAT FOR HEALTH AND SAFETY MANUAL

Following is the health and safety manual format expected for this project. The manual shall include the health and safety policy of the proponent, roles and responsibilities of key personnel, detailed health and safety procedures.

Introduction
- Name and contacts of the applicable facility
- Major aims and objectives

Applicability and scope
Health and safety policy
Roles and responsibilities
- Organizational chart
- Describe in detail the responsibilities of each personnel

Health and safety procedures
- Describe in detail the health and safety procedures for all key works at the applicable facility for instance procedure for;

handling electrical appliances
chemical handling
preventive procedures
employee behavior and attitude
handling accidents
training
waste disposal
latest first aid procedure

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APPENDIX K. FORMAT FOR EMERGENCY PREPAREDENESS AND RESPONSE PLAN

Following is the emergency preparedness and response plan format expected for this project. The plan shall include the following;

Introduction
- Name and contacts of the applicable facility
- Major aims and objectives

Applicability and scope

Roles and responsibilities
- Organizational chart
- Describe in detail the responsibilities of each personnel

Emergency reporting procedures
- Communications hierarchy for reporting incidents
- Emergency communications methods

Emergency contact directory

Locations of important items
- Procedures for media inquiries
- Test, training and exercises

Emergency Protocols
- Identify and describe in detail how to tackle all the possible emergency scenarios for example;
- If someone is injured or ill
- Electrocution
- Failure or significant interruption in key system processes
- Chemical spill

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APPENDIX L. EVIDENCE OF EIA REPORT SUBMISSION TO ATOLL COUNCIL

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ދަގު، 20296، ކ. ކާފަށ، ހިލުވަރަންފަށ
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Gmail Mahfooz AbdullWahhab <mahfoozabdullwahhab@gmail.com>

Environmental Impact Assessment for the Proposed Refurbishment of Water Villas Project at Angaga Island Resort and Spa, South Ari Atoll

1 message

Mahfooz Abdul Wahhab <mahfooz@ecotechconsultancy.com> Tue, Apr 18, 2023 at 8:36 PM
To: admin@adh.gov.mv
Cc: secretariat@ecotechconsultancy.com, "Ibrahim R. Adam" <rashihu@ecotechconsultancy.com>

Dear Sir,

Please follow the link below for the captioned EIA report.

https://drive.google.com/drive/folders/1YF6JtsgbKkiF4dJjLE4cokkM8z0PwhBn?usp=share_link

Best Regards,

ECO-TECH
CONSULTANCY

Mahfooz Abdul Wahhab
Managing Director
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