



Supplementary ESIA for Gulhifalhu Dredging, Land Reclamation and Revetment Works

Final Report

24 September 2021

Project No.: 0595934

Document details	This report presents the Supplementary Environmental and Social Impact Assessment (ESIA) for the Dredging, Land Reclamation and Revetment Works at Gulhifalhu in Maldives. The Supplementary ESIA is an update to the Environmental Impact Assessment (EIA) previously undertaken and summarizes the outcomes of all additional studies undertaken for the project
Document title	Supplementary ESIA for Gulhifalhu Dredging, Land Reclamation and Revetment Works
Document subtitle	Final Report
Project No.	0595934
Date	24 September 2021
Version	3.0
Author	ERM
Client Name	Boskalis Westminster Contracting Ltd., Maldives Branch

Document history

Version	Revision	Author	Reviewed by	ERM approval to issue		Comments
				Name	Date	
Draft	01	Abhishek, G., Anupreet A., Mayanka S., Samiksha B. and Saumabha B.	Arun V., Dhritiman, R., Minlei, D. Rutuja T.	-	30.07.2021	Draft report issued to Boskalis for review
Draft Final	02	Anupreet A. and Samiksha B.	-	-	16.09.2021	Draft Final Report issued to Boskalis after addressing comments
Final	03	Abhishek G., Anupreet A., Duo, M., Mayanka S., Samiksha B. and Saumabha B.	Arun V., Dhritiman R., Minlei D. and Rutuja T.	Piers T.	23.09.2021	Final Report after addressing all comments.

Signature Page

24 September 2021

Supplementary ESIA for Gulhifalhu Dredging, Land Reclamation and Revetment Works

Final Report

ERM (Shanghai) Limited
Suite 2005, Shanghai Litong PLAZA
No.1350 Sichuan North Road
Shanghai, China

© Copyright 2021 by ERM Worldwide Group Ltd and/or its affiliates ("ERM").
All rights reserved. No part of this work may be reproduced or transmitted in any form or by any means, without the prior written permission of ERM.

CONTENTS

1. INTRODUCTION	1
1.1 Project Context	2
1.1.1 Development of the Greater Male Region.....	6
1.2 Supplementary ESIA Requirement.....	7
1.2.1 ERM Gap Analysis.....	7
1.3 Approach and Methodology	10
1.3.1 Document Review.....	10
1.3.2 Stakeholder Consultations	11
1.3.3 Secondary Data Review	13
1.4 Limitations to the Methodology	13
1.5 Structure of the Supplementary ESIA	14
2. PROJECT BACKGROUND	16
2.1 Project Location	16
2.1.1 Gulhifalhu Lagoon.....	16
2.1.2 Borrow Areas	17
2.1.3 Environmental and Social Sensitivities around Gulhifalhu Lagoon and Borrow Areas	17
2.2 Summary of Project Activities	20
2.2.1 Pre-Project Scenario.....	20
2.2.2 Preparatory Works	20
2.2.3 Dredging and Reclamation	20
2.2.4 Construction of Shore Protection Works and Demobilization.....	25
2.3 Project Planning and Monitoring for Stage I of the Dredging and Reclamation	25
2.3.1 Coral Reef Relocation.....	25
2.3.2 Plume Dispersion Modelling	25
2.3.3 Embedded Controls and Prevention Measures for Stage I	27
2.4 Project Planning and Monitoring for Stage II of the Dredging and Reclamation	30
2.4.1 Sediment Dispersion Modelling for Stage-II.....	31
2.4.2 Embedded Controls and Prevention Measures for Stage II	38
3. SUMMARY OF E&S STUDIES	39
3.1 Area of Influence.....	39
3.2 Summary Outcomes of the Individual Technical Studies	40
3.2.1 Human Rights Impact Assessment.....	40
3.2.2 Critical Habitat Assessment and Biodiversity Action Plan.....	42
3.2.3 Economic Displacement Assessment.....	48
3.2.4 Rapid Cumulative Impact Assessment	49
3.2.5 Climate Change Risk Considerations	55
4. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)	57
4.1 Document Control.....	83

APPENDIX A	ENVIRONMENTAL IMPACT ASSESSMENT
APPENDIX B	APPLICABLE REGULATIONS
APPENDIX C	HUMAN RIGHTS IMPACT ASSESSMENT
APPENDIX D	CRITICAL HABITAT ASSESSMENT AND BIODIVERSITY ACTION PLAN
APPENDIX E	ECONOMIC DISPLACEMENT ASSESSMENT
APPENDIX F	RAPID CUMULATIVE IMPACT ASSESSMENT
APPENDIX G	CLIMATE CHANGE RISK CONSIDERATIONS
APPENDIX H	STAKEHOLDER CONSULTATION RECORDS – AVAILABLE UPON REQUEST
APPENDIX I	SEDIMENT PLUME MODELLING RESULTS

List of Tables

Table 1.1 Timeline for Gulhifalhu Project.....	2
Table 1.2 Stakeholder Consultation Summary	11
Table 1.3 Structure of the ESIA	14
Table 2.1 Preliminary estimates of suitable sand volumes.....	17
Table 2.2 Environmental and Social Sensitivities around the Project site	17
Table 2.3 Reclamation Scope	21
Table 2.4 Scenarios considered for Stage I Turbidity Modelling	26
Table 2.5 Preliminary Project Schedule for Stage II	30
Table 2.6 Scenarios considered for Stage II Turbidity Modelling	32
Table 2.7 Summary of maximum (2% exceedance) SSC at Sensitive Locations for all scenarios ("means <1 mg/L)	33
Table 2.8 Sediment Dispersion Modelling Results for Stage I and Stage II SSC.....	36
Table 4.1 Environmental and Social Management Plan.....	59

1. INTRODUCTION

ERM (Shanghai) Limited (“ERM”) has been commissioned to conduct a Supplementary Environmental and Social Impact Assessment (ESIA) for the Dredging, Reclamation and Revetment Works (“the Project”) for the Gulhifalhu Port Development in Maldives. The Supplementary ESIA has been commissioned by Boskalis Westminster Contracting Ltd., Maldives Branch (“the Contractor”), on behalf of the Project Proponent i.e. Ministry of National Planning, Housing and Infrastructure (MNPHI, “the Proponent”), which is the government authority responsible for planning and development of public infrastructure on the islands of the Maldives. MNPHI has contracted the Contractor to undertake dredging, reclamation and revetment works for the Gulhifalhu Island lagoon as the first phase of activity for a larger port development.

An Environmental Impact Assessment (EIA 2020) for the Project was developed by the CDE (the “Local Consultant”) to national standards for the Project scope of work, i.e. dredging, land reclamation and revetment using 24 million m³ of sand. The scope of the Supplementary ESIA focus on undertaken for the previously conducted EIA report. The studies that have been identified include:

- **EIA Addendum¹:** The EIA Addendum updates the previously completed EIA with details of a second alternative borrow area to dredge sand for the project
- **Human Rights Impact Assessment (HRIA):** The HRIA has been identified to conform to the United Nations Guiding Principles on Business and Human Rights (UNGPs), Equator Principles 4 and International Labour Organization (ILO) conventions ratified by Maldives Government.
- **Natural and Critical Habitat Assessment (CHA):** The CHA has been designed to evaluate natural and critical habitat in accordance to the International Finance Corporation (IFC) Performance Standard 6² to determine any significant risk to biodiversity values and incorporate biodiversity conservation into the land reclamation and revetment process.
- **Economic Displacement Assessment (EDA):** During the gap analysis, the EIA consultant, CDE (the “Local Consultant”), had identified minor impacts to livelihoods of local fishermen, owners of tourist facilities and dive schools from the Gulhifalhu reclamation and associated dredging. However, due to the absence of data in the EIA to conclude livelihood impacts as minor, an EDA was proposed. The EDA has been proposed to review available socio-economic background information on the use of Gulhifalhu and the islets surrounding the borrow areas to identify potential impact on livelihood and suggest appropriate compensation measures in accordance to *International Finance Corporation (IFC) Performance Standard (PS) 5: Land Acquisition and Involuntary Resettlement (2012)*.
- **Rapid Cumulative Impact Assessment (RCIA):** The Gulhifalhu land reclamation project will have a schedule overlap with other major development projects in the surrounding areas including the Thilafushi-Male Link Bridge and construction of a tourism resort near the dredging site. The combined effect of these development projects on water quality, livelihood and biodiversity needs to be evaluated in the form of a RCIA.
- **Climate Change Risk Consideration (CCRC):** Equator Principles 4 requires a physical climate change risk assessment for all Category A projects, where major infrastructural projects such as port developments fall under. However, as the scope of the ESIA is limited to the land reclamation and revetment works spanning a 9-14 month period, the climate change risk assessment has been limited to mitigations to prevent localized climate regulation risk and preliminary design elements for long-term climate risk mitigation. The climate change risk considerations have therefore been evaluated in this Supplementary ESIA document.

¹ The EIA (2020) has been undertaken by a third party consultant i.e. CDE Consulting. The EIA Addendum capturing the details of the second alternative borrow area, is at the time of writing this report, still being developed. It will be included as an update to Appendix A once finalized.

² IFC PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

1.1 Project Context

The Government of Maldives (GoM) has proposed the development of a port and associated infrastructure in Gulhifalhu Lagoon to alleviate the traffic load and congestion at the existing Male Commercial Harbour (MCH) due to insufficient storage, freight capacity, berth capacity and quay depth³. The Ministry of National Planning, Housing and Infrastructure (MNPHI) has been identified as the nodal authority for planning of the port and coordinating the construction of the port with other development projects in the surrounding region. The further development of the port after the reclamation is completed will be undertaken by the Ministry of Economic Development (MED). The port development will be completed in four phases, Phases I-IV below, and the Supplementary ESIA refers to the Project context as follows:

- **Phase 0:** The existing industrial hub⁴;
- **Phase I:** Dredging, land reclamation and revetment work;
- **Phase II:** Construction of port infrastructure;
- **Phase III:** Construction of warehousing and ancillary facilities; and
- **Phase IV:** Construction of connecting bridge from Thilafushi and Male⁵.

2.2.1 The Supplementary ESIA (*this report*) is focused only on Phase I of the port development i.e. dredging, land reclamation and revetment works.

The Project Proponent has awarded the Phase 1 of the Project to the Contractor with the work to be undertaken over two stages:

- **Stage I:** Dredging of 6 Mm³ of sand, reclamation of part of Gulhifalhu island and revetment works initiated by Boskalis in June 2020 and completed by March 2021; and
- **Stage II:** Dredging of 18 Mm³ of sand and completion of reclamation activities planned to be initiated in October 2021.

The overall timelines for the dredging, land reclamation and revetment works (*hereinafter referred to as 'Project'*) has been summarized in **Table 1.1**

Table 1.1 Timeline for Gulhifalhu Project

Month and Year	Activities
October 2019	<ul style="list-style-type: none">■ MNPHI has awarded the contract for dredging, land reclamation and revetment works to Boskalis Westminster Contracting Limited for Stage1.■ The location chosen for the port development i.e. Gulhifalhu lagoon is an atoll ecosystem⁶ with a coral reef ring completely surrounding the internal lagoon (See Figure 1-1). Prior to any work on the Project, the Gulhifalhu lagoon had already been partially reclaimed in 2010 and 2013 with 26 Ha of the island along the western side housing the Maldives Sewerage and Water Company (MSWC). MSWC has developed housing and light industrial facilities in this area.

³ EIA for Gulhifalhu Port Development (April 2020)

⁴ Part of the the Gulhifalhu land reclamation for the Project totalling 26 Ha had been previously undertaken by Maldives Sewerage and Water Company (MSWC) until 2016 in the western part of the island. The details of the pre-Project land reclamation have been provided in Section 2.2.1. The pre-Project land reclamation has been referred to as "Phase 0" for the remainder of the ESIA.

⁵ Note: The Thilafushi-Male connection bridge has been identified as a cumulative activity and last phase for the Gulhifalhu port development because the bridge connection starting from Male will be initiated simultaneous to Phase I of the Gulhifalhu project i.e. dredging, land reclamation and revetment but the final connection to Gulhifalhu and then Thilafushi will be undertaken after the port construction works are complete.

⁶ An atoll is a ring shaped coral reef island partially or completely surrounding a body of water ("lagoon"). Maldives Government also uses the term "atoll" as an administrative unit to create distinct sub-sections of the country. To prevent confusion the term "atoll ecosystem" has been used to refer to the coral reef island structure and "Atoll" has been used to differentiate the administrative unit being used by the Maldives Government.

Month and Year	Activities
	<ul style="list-style-type: none"> ■ The contract awarded by MNPHI will therefore focus on the southern and eastern end of the Gulhifalhu atoll ecosystem
December 2019	<ul style="list-style-type: none"> ■ An Environmental Impact Assessment (EIA) study was commissioned starting with scoping consultations with key government stakeholders including MNPHI, environmental regulator (“Environmental Protection Agency” [EPA]), Ministry of Environment, Ministry of Economic Development and EIA consultant i.e. CDE Consulting. The EIA report has been provided in Appendix A. ■ Sediment turbidity plume modelling was undertaken for the work to understand the scale and magnitude of impact from dredging and land reclamation on the water turbidity levels. The focus of the turbidity modelling was also to determine an Area of Influence (AoI)⁷ by understanding spatial extent of the impact. ■ EIA primary studies and stakeholder consultations were undertaken between December 2019 and May 2020 to obtain regulatory clearance for the Project. ■ The EIA study was undertaken for both stages of the Project with a total sand dredged capacity of 20 Mm³.
May 2020	<ul style="list-style-type: none"> ■ EIA report was approved and dredging permit was obtained for the work. ■ Reefsiders⁸ was commissioned to undertake coral translocation and a total of 7,349 colonies of corals were translocated from Gulhifalhu Reef to Sheraton Resort lagoon in the island of Funranafushi. The coral translocation was undertaken over a period from late May 2020 to mid-June 2020. ■ Construction of the primary turbidity mitigating measure, a sand bund, was commenced in late May 2020
June 2020	<ul style="list-style-type: none"> ■ Dredging of sand (6Mm³) along the primary borrow area commenced in June 2020 and was undertaken for a three-month period. Dredged sand was transferred to Gulhifalhu lagoon using a pipeline where a land-based team was used to fill/reclaim the eastern end of the atoll ecosystem. ■ Silt screens were placed to complement the bund and big bags were placed along the southern and eastern end of the island to reduce sediment input into the surrounding marine water area.
August 2020	<ul style="list-style-type: none"> ■ Dredging of sand was completed and the revetment works along the eastern end of Gulhifalhu lagoon was commenced. ■ Revetment works along the southern and eastern end of the island was undertaken over a seven-month period.
December 2020	<ul style="list-style-type: none"> ■ ERM (Shanghai) Limited was commissioned by Boskalis to undertake a supply chain risk assessment for the Project and develop a gap analysis for the EIA with respect to international standards (primarily International Finance Corporation [IFC] Performance Standards). The details of the gap analysis has been provided in Section 1.2.1.2 and applicable reference framework is detailed in Appendix B.
March 2021	<ul style="list-style-type: none"> ■ Revetment works were completed, thereby concluding the Stage I of the Project.
May 2021	<ul style="list-style-type: none"> ■ An EIA Addendum was commissioned for the Stage II of the Project to be undertaken by the Local Consultant to update the original design and understand impacts associated with an increased sand dredging requirement from 20 Mm³ to 24 Mm³ ($\Delta 4\text{Mm}^3$) and incorporate changes in the design. The EIA Addendum also captured impacts associated with an extension of the primary borrow area and two alternative borrow areas that would be used if insufficient sand is available in the primary borrow area that was used for Stage I. ■ Deltares⁹ was commissioned to undertake additional sediment turbidity plume modelling for Stage II of the Project focused on understanding plume scenarios across the primary and new alternative borrow areas, including scenarios for two

⁷ An AoI identifies the spatial extent/magnitude of impacts for the Project and therefore can be used to determine any affected environmental, social and biodiversity receptors/resources for the purpose of the ESIA study.

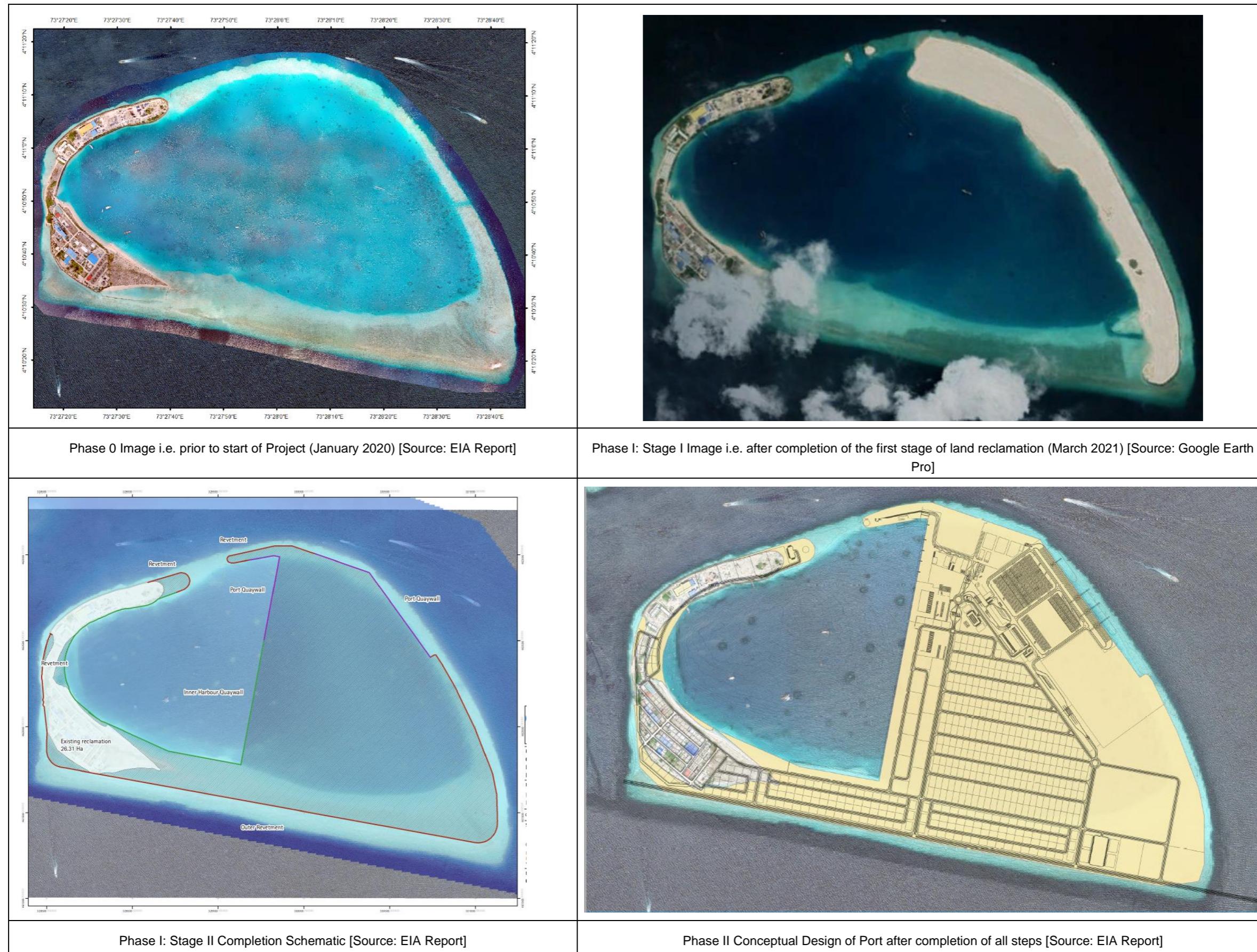
⁸ Reefsiders is an independent marine consultation company with a focus on coral reef restoration in Maldives. Reefsiders is very active in the country and has partnered and propagated several coral translocation, restoration and support programs in-country.

⁹ Deltares is a Non-profit organization based out of Netherlands that provides expertise and advice in the field of water and subsurface management.

Month and Year	Activities
	<p>types of dredging equipment and the two monsoon seasons, and to determine an updated AoI for the Project.</p> <ul style="list-style-type: none">■ ERM (Shanghai) Limited was commissioned to undertake five technical studies as part of the Supplementary ESIA consisting of the HRIA, CCRC, EDA, CHA and CIA.
September 2021	<ul style="list-style-type: none">■ Proposed date for completion of all technical studies and application for a dredging permit for Stage II of the Project
October 2021	<ul style="list-style-type: none">■ Proposed start date for Stage II construction activities
December 2022	<ul style="list-style-type: none">■ Proposed completion date for Stage II of the dredging, land reclamation and revetment works.

The time-lapse imagery of Phase 0 (before start of the Project), Phase I: Stage I (after completion of dredging and revetment), Phase I: Stage II (schematic for completed works for the Project) and Phase II i.e. Port development (conceptual design) after MNPHI completion of construction works has been presented in **Figure 1-1**.

Figure 1-1 Time-lapse Imagery of the Project Site



1.1.1 Development of the Greater Male Region

The Greater Malé Region has been earmarked for infrastructure development and the other activities that will take place in the area extending from tourism development and expansion north of the capital - Male to Thilafushi industrial development east of Male (shown in **Figure 1-2**). The development follows a reverse 'L' pattern as shown in the figure and the Gulhifalhu project is part of this development belt in the Greater Male Region.

Part of the development of the Greater Male Region is completed including the airport terminus at Hulhumalé, MSWC works in Gulhifalhu, waste management facility at Thilafushi and housing development across the islets surrounding Malé. Development works that are still pending or ongoing are described below¹⁰:

- **The Malé Thilafushi Link (MTL) Project** a 6.7 km bridge and causeway network connecting Male, Villingli, Gulhifalhu and Thilafushi. The project aims to connect Hulhumalé, Hulhulé and Male with the proposed Gulhifalhu Port and Thilafushi Industrial Zone. The Project is composed of three (3) navigation bridges of 140 m main span across the deep channel between each island, marine viaducts in deep water, shallow water and/or land, and 2.96 km of at-grade roads. The land interchanges on Male' and Villingili will be signalised junctions, while there will be roundabouts at Gulhifalhu and Thilafushi. Bus terminals are also planned on each island near the junctions with the mainline. The MTL project will be constructed simultaneous to the Project and will be connected to the Project as part of Phase IV¹¹.
- **Establishment of a Regional Waste Management Facility at Thilafushi:** To address the issue of solid waste management in the Maldives, the Ministry of Environment (MoE) has proposed for the development of a disaster and climate-resilient Regional Waste Management Facility, which is expected to generate 8MW of electricity as well as account for increase in demand.
- **Construction of a sewage outfall pipeline at Hulhumalé Stage I:** The Male Water and Sewerage Company (MWSC) which is the licensed sewer network operator for Hulhumalé Stage-1 is constructing a sewage outfall pipeline in Hulhumalé Stage I, for the purpose of increasing the efficiency of the sewerage network, reduce the cost and maintenance and solve issues related to flow.
- **Gulhifalhu Port Development:** the current dredging, land reclamation and revetment will eventually be upgraded and developed to create an international port (See **Section 1.1**) by the Ministry of Economic Development (MED). The port will consist of five main areas – (i) container terminal with 610m quay length and 10 ha backup area, (ii) general cargo terminal with 325m quay length, (iii) port service area housing service vessels and crew buildings, (iv) bonded warehouse for loading of restricted cargo and (v) domestic cargo quay to alleviate traffic loads from the existing MCH.¹²

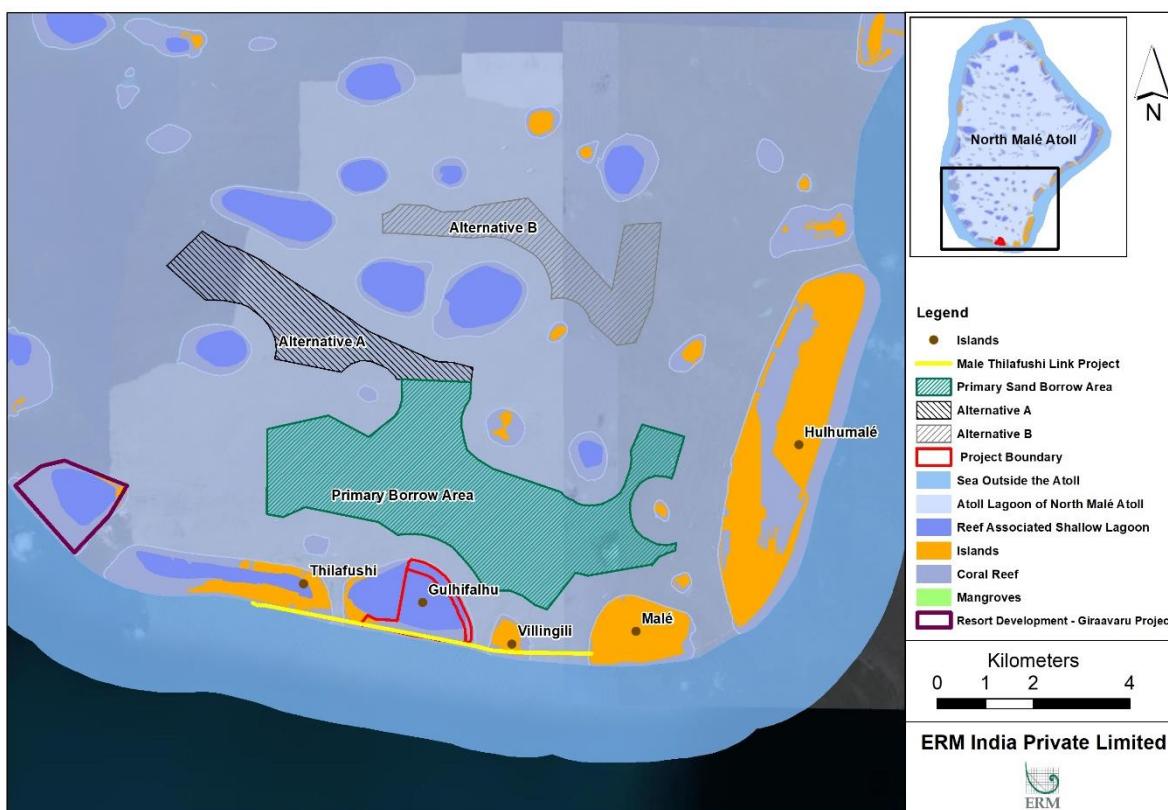
Additionally, several smaller development projects have been identified in the southern half of North Male Atoll including shoreline protection, resort development (including the Giraavaru project) and berth construction in addition to multiple transport networks for connectivity. The dates and schedules for the several of these activities are not known but have been classified as Reasonably Foreseeable Future Actions (RFFAs), as further discussed in the RCIA report.

¹⁰ Information on the completed, ongoing and proposed activities has been obtained from stakeholder consultations and the individual EIA reports available in the public domain on the development activities.

¹¹ Environmental and Social Impact Assessment Report For the proposed Greater Malé' Connectivity - Malé' to Thilafushi Link Project, Malé' Urban Region. 2021

¹² Environmental Impact Assessment Report (December 2020) for Development of an International Port at Gulhifalhu, North Male Atoll.

Figure 1-2 Project location Map



1.2 Supplementary ESIA Requirement

The initial financing for the Gulhifalhu dredging, land reclamation and revetment works was done by the Government of Maldives, as part of the Public Sector Investment Programme (PSIP) budget. The funding however, covered costs only associated with Stage I for the Project and therefore subsequent monetary support was needed from international financiers. As a pre-requisite to Stage I, the Project had developed an EIA and conformance to Maldives regulations. For the subsequent financing by international lenders however, the Project needed to comply with international lender standards namely, IFC Performance Standards (2012) and Equator Principles 4 (EP 4). ERM Shanghai was commissioned in December 2020 to undertake a gap analysis of the Project against the IFC Performance Standards and other international lender requirements. The results of the gap analysis have been provided in the subsequent section.

1.2.1 ERM Gap Analysis

1.2.1.1 Applicable Reference Framework

Environmental Impact Assessment (EIA) 2020

The EIA Report was undertaken in accordance to the Environment Protection and Preservation Act, 1993 and Environmental Impact Assessment Regulation 2012. The EIA 2020 has been developed to comply with environmental, social and biodiversity regulations that have been declared in Maldives and conform to national policies and international conventions ratified by the Government of Maldives. A detailed policy and legal framework that has been developed in the EIA can be reviewed in **Section 4** of the EIA report.

The EIA 2020 has been provided as **Appendix A** of this Supplementary ESIA.

Supplementary Environmental and Social Impact Assessment (ESIA)

The Supplementary ESIA will evaluate environmental, biodiversity and social aspects of the Project against the policy and legal framework defined in the EIA, as well as the following international lender standards. An updated policy and legal framework indicating those national policies and regulations not covered in the EIA but relevant for the ESIA has been provided in **Appendix B**.

- Equator Principles 4 (2020);
- International Finance Corporation (IFC) Performance Standards 1-8 (2012); and
- Organization for Economic Cooperation and Development (OECD) Guidelines for Multinational Enterprises (2011).

Environmental and Biodiversity-specific Lender Standards

- World Bank Group (WBG) General Environmental, Health and Safety (EHS) Guidelines (2007);
- Business and Biodiversity Offsets Programme (BBOP) (2013); and
- IFC Good Practice Handbook – Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (2013).

Human Rights and Economic Displacement-specific Lender Standards

- IFC Good Practice Handbook on Baseline Assessment and Development of a Fisheries Livelihood Restoration Plan (2015);
- European Bank for Reconstruction and Development (EBRD), CDC Group Plc. and IFC Addressing Gender-based Violence and Harassment: Emerging Good Practice for the Private Sector (2020);
- United Nations Guiding Principles (UNGPs) on Business and Human Rights (2011);
- Voluntary Principles on Security and Human Rights (2020);
- International Labour Organization (ILO) Fundamental Conventions ratified by the Maldives Government;
- IFC Good Practice Handbook: Use of Security Forces (2017); and
- IFC Good Practice Note: Managing Risks Associated with Modern Slavery (2018).

1.2.1.2 Gap Analysis Exercise

As part of the international lender financing, ERM (Shanghai) Limited was commissioned to undertake a review of the EIA update document to evaluate the coverage of the applicable reference framework and identify any additional gaps that require further assessment. The gap analysis of the EIA report was undertaken in December 2019-January 2020 where the following key findings were determined:

- The Cumulative Impacts arising from multiple development projects being undertaken in the southern half of North Male Atoll (See **Section 1.1.1**) had not been identified in the EIA. The incremental impact that the Gulhifalhu Project will have on environmental, social and biodiversity receptors and resources therefore needed to be evaluated. The necessity to undertake a detailed study was highlighted in stakeholder concerns raised on the impacts to diving, changing currents and tides and shoreline erosion during the EIA baseline consultations. To meet the timelines, considering limitations in the data availability and inability to travel to site due to COVID-19 restrictions, a Rapid Cumulative Impact Assessment (RCIA) was implemented for the Project.
- The addition of the second alternative borrow area for the dredging activities in Stage II needed to be identified in the EIA report and therefore an addendum to the EIA report¹³ had to be

¹³ The EIA Addendum is being developed simultaneous to the ESIA and the outcome of the addendum i.e. Environmental Management Plan and monitoring requirements have been incorporated into the ESMP provided in Section 4 of this report.

developed capturing the baseline water quality and potential impacts from dredging in the second alternative borrow area.

- The Environmental Management Plan (EMP) from the EIA needed to be updated into an Environmental and Social Management Plan (ESMP) incorporating recommendations across multiple studies being undertaken for the Gulhifalhu Project.
- The EIA 2020 report and subsequent monitoring undertaken in and around the dredging areas indicated presence of Endangered Humphead Wrasse (*Cheilinus undulates*), Critically Endangered Hawksbill Turtle (*Eretochelys imbricata*) and Endangered Green Turtle (*Chelonia mydas*). The above species could potentially meet the critical habitat criteria defined in IFC PS 6 namely, criterion (i) habitat of significant importance to Critically Endangered and/or Endangered species and criterion (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species. A Critical Habitat Assessment (CHA) was therefore required to evaluate presence of these species and whether they would be meeting the quantitative threshold criteria for critical habitat. If critical habitat was triggered, then a corresponding Biodiversity Action Plan (BAP) to mitigate impacts to these species needed to be developed for the Project.
- Limited quantitative socio-economic data was obtained with respect to potential livelihood losses from the Project as part of the stakeholder consultations and secondary data review in the EIA by the Local Consultant. However, minutes of meetings from stakeholder consultations especially with dive communities, resorts and fishing communities did indicate these groups to have been potentially impacted by the Project from changes in water quality and loss of coral reef cover. The EDA was commissioned to evaluate and verify the extent of impact to these stakeholder groups and determine appropriate compensation measures that could be integrated into the mitigation design, in the form of Livelihood Restoration (LR) measures, for Phase I: Stage II of the Project.
- An assessment of the Project design needed to be undertaken with respect to incorporation of climate change factors as a result of the Project being classified as part of a Category 'A' Project¹⁴. Considering the scope of the ESIA is limited to the Phase I of the Project, nature of the contracted activities (i.e. land reclamation) and short period of activities (i.e. 9-14 months), a physical climate change risk assessment was not required for the Phase I of the Project. The focus of the CCRC is therefore to identify climate change risks and recommend actions that can be incorporated into the Project design and planning.
- A Project-specific human rights impact assessment was required to conform to EP 4 or adequately scope out with proper justification for why human rights risks are not considered significant for the Project. The focus on the HRIA was compliance to ILO conventions and national laws; assessment of civil and political rights; evaluation of economic, social and cultural rights; and identification of heightened risks of vulnerability¹⁵.

As a result of the gap analysis, several studies were commissioned including the CHA, BAP, CIA, EDA (including LR measures), CCRC and HRIA to close specific gaps identified with respect to international standards. Additionally, an EIA Addendum was undertaken to update the EIA report with details of the second alternate borrow area

The EIA 2020 has been provided in **Appendix A** of this report. The EIA Addendum, capturing details of the second alternative borrow area, is at the time of writing of this report still being developed. It will be included in **Appendix A** once finalized.

The HRIA has been attached as **Appendix C** of this report.

¹⁴ The requirement for climate change considerations into the design is mandated under Equator Principles 4 for the port project (i.e. Phase I-IV) development, as the port would fall under Category A in accordance to the Equator Principles

¹⁵ Examples include children's rights, disability rights, indigenous peoples, migrants' rights, women's rights, etc.

The CHA update document along with the BAP as an outcome has been attached as **Appendix D** of this report.

The EDA has been attached as **Appendix E** of this report.

The RCIA has been attached as **Appendix F** of this report.

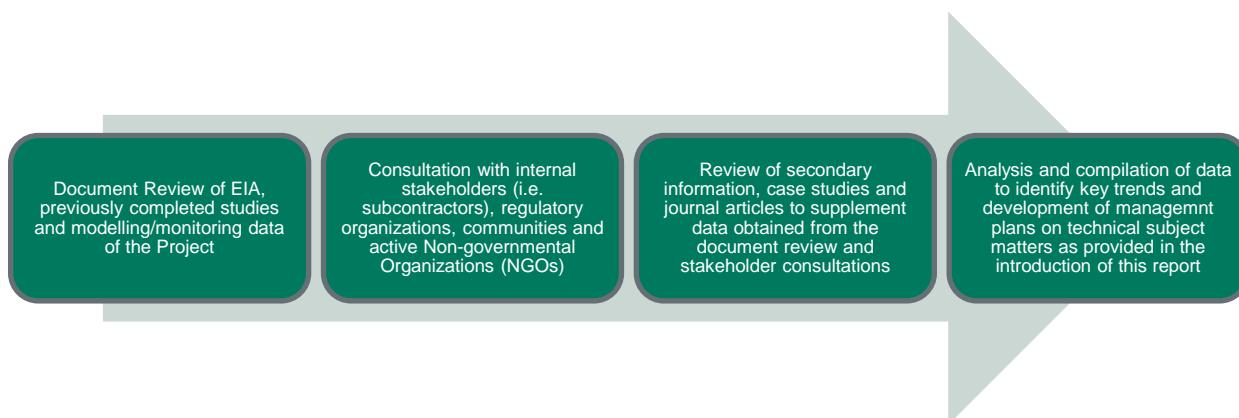
The CCRC has been attached as **Appendix G** of this report.

The recommendations and action plans across all of the above documents have been collated and incorporated into an Environmental and Social Management and Monitoring Plan (ESMP) provided as **Section 4** of this Supplementary ESIA.

1.3 Approach and Methodology

The Supplementary ESIA was developed largely through existing primary information from the EIA 2020, secondary data available¹⁶ on the technical studies, the modelling studies, Stage 1 monitoring reports and stakeholder consultations. The prevailing restrictions and localized lockdowns in place to prevent the spread of COVID-19 disallowed a site assessment to collect primary data. The approach followed for the Supplementary ESIA has been presented in **Figure 1-3**

Figure 1-3 Approach to the Supplementary ESIA



1.3.1 Document Review

A detailed document review was undertaken to understand the Project context, outcomes of previously completed E&S studies and determine specific issues that needed further analysis. The key documents that were reviewed have been provided below.

- Turbidity Plume Modelling Report for Stage I (Hydronamic, June 2020) and Stage II (Deltares, June 2021)
- Gulhifalhu Coral Relocation – Project and Monitoring Report (ReefScapers, April 2021)
- EIA Report for Dredging, Land Reclamation and Revetment Works (CDE, April 2020)
- EIA Report for the International Port at Gulhifalhu (LAMER, December 2020)
- Coral Reef Assessment Monitoring Reports (CDE, August 2020, November 2020, February 2021, April 2021)
- Environmental Monitoring Reports (Boskalis, October 2020, February 2021, May 2021)
- Gap Analysis Report (ERM, 2020)

¹⁶ Specifically sources of information provided by stakeholders and Local Consultant to better evaluate environmental and social aspects of the Project.

- Contractor's Construction Management Plan, Health, Safety and Environment (HSE) Plan and Human Resource Management Plan
- Contractor's Code of Conduct [Last Revision 01 March 2021] and relevant policies: Environmental and Social Policy [Last Revision 24 February 2021] and Human Rights and Labour Policy [Last Revision 24 February 2021]

1.3.2 Stakeholder Consultations

The list of stakeholders consulted over the course of the Supplementary ESIA and the justification for identifying these stakeholders as part of the consultation process has been presented in **Table 1.2**. The discussion points for each of the stakeholder consultations has been presented as part of **Appendix H** of this Supplementary ESIA report.

Table 1.2 Stakeholder Consultation Summary

S.N.	Name of Stakeholder	Purpose for consulting stakeholder during ESIA
1.	Ministry of National Planning, Housing and Infrastructure	<ul style="list-style-type: none"> ■ Plan for the Gulhifalhu and Malé-Thilafushi link project ■ Other development projects planned in North Malé atoll
2.	Fisherfolk	<ul style="list-style-type: none"> ■ To obtain an understanding on the following: fishing grounds; nature of fishing (recreational, sustenance, commercial etc.); type and seasonality of fishing; income and expenditure; species harvested and trends in fishing activities over the last 2 years; ■ Any concerns or grievances from Stage I.
3.	Independent Dive Centres	<ul style="list-style-type: none"> ■ Dive sites used ■ Information of coral reef health and associated fish species ■ To obtain an understanding on the nature of economic activities of the independent dive centres; ■ Any concerns or grievances from Stage I.
4.	Tourist Resorts	<ul style="list-style-type: none"> ■ To obtain an understanding of the regulations linked to tourist resorts and dive centres; ■ Any concerns or grievances from Stage I. ■ Any coral reef surveys conducted ■ Citing of any threatened marine fish, turtles in the area
5.	Non-governmental Organisations (NGOs- Save the Beach, Villijoali)	<ul style="list-style-type: none"> ■ Obtain an understanding of any residual impacts from Stage I ■ Discuss potential LR measures and their implementation
6.	Human Rights NGOs <ul style="list-style-type: none"> ■ Mission for Migrant Workers Maldives (MMWM); ■ Transparency Maldives ■ Maldives Red Crescent (MRC) ■ Advocating the Rights of Children (ARC) ■ Public Interest Law Centre (PILC) 	Discussed on the key human rights issues in the Maldives. Main issues raised were on: <ul style="list-style-type: none"> ■ Exploitation of migrant labour with regard to recruitment, labour and working conditions in the construction and service sector; ■ Human trafficking, including forced labour, sex and child trafficking; ■ Access to remedy for migrant/undocumented labourers; ■ Key regulatory bodies and their effectiveness.
7.	Human Rights Commission of Maldives (HRCM)	Discussed on the key human rights issues in the Maldives. Main issues raised were on: <ul style="list-style-type: none"> ■ Exploitation of migrant labour with regard to recruitment, labour and working conditions in the construction and service sector; ■ Human trafficking, including forced labour, sex and child trafficking;

S.N.	Name of Stakeholder	Purpose for consulting stakeholder during ESIA
		<ul style="list-style-type: none"> ■ Access to remedy for migrant/undocumented labourers; ■ Key regulatory bodies and their effectiveness.
8.	Ministry of Fisheries, Marine Resources and Agriculture	<ul style="list-style-type: none"> ■ Fisheries data collected ■ Threatened fish species in the area ■ Discuss potential LR measures and their implementation
9.	Maldives Marine Research Institute	<ul style="list-style-type: none"> ■ Ongoing projects regarding reef fishing ■ Feasibility of LR measures
10.	Maldives Fishermen's Association (MFA)	<ul style="list-style-type: none"> ■ To obtain an understanding of : nature of activities of the MFA, details on fishing areas, fishing seasons, vessel movement routes, trends in fishing, fish catch, overarching concerns and challenges of fisherfolk.
11.	Ministry of Economic Development	Other development projects planned in North Malé atoll
12.	Ministry of Environment, Climate Change & Technology	<p>Any plan for development of new Marine Protected Area (MPA) of Ecosensitive Areas (ESA) in North Malé atoll</p> <p>Other development projects planned in North Malé atoll</p>
13.	Ministry of Tourism	Resort islands planned in near future in the area
14.	Environmental Protection Agency (EPA)	<ul style="list-style-type: none"> ■ Developmental projects planned in the North Malé atoll; projects obtaining environmental clearance ■ Any plan for development of new Marine Protected Area (MPA) of Ecosensitive Areas (ESA) in North Malé atoll
15.	Maldives Marine Research Institute (MRI)	<ul style="list-style-type: none"> ■ Threatened marine species obtained in the area ■ Research activities conducted by MRI in the area ■ Turtle nesting sites, migratory bird congregation areas
16.	IUCN Maldives	<ul style="list-style-type: none"> ■ Threatened marine species obtained in the area ■ Turtle nesting sites, migratory bird congregation areas ■ Research activities conducted by IUCN in the area
17.	Reef scapers	<ul style="list-style-type: none"> ■ Threatened marine species obtained in the area ■ Turtle nesting sites, migratory bird congregation areas ■ Obtain an understanding of any residual impacts from Stage I
18.	Fuel Supply Maldives	<ul style="list-style-type: none"> ■ Activities in fuel supply; ■ Labour and recruitment aspects; ■ Health and safety policies and plans; ■ Grievance mechanism.
19.	Capital Investment and Finance Ltd. (CIFL)- Project Sub-Contractor	<ul style="list-style-type: none"> ■ Project activities; ■ Details of workforce; ■ Policies and procedures including monitoring of suppliers in India, especially on H&S aspects; ■ Grievance mechanisms for workers and external community;
20.	Sri Venkateswara Construction Materials & Industries- Rock Supplier (Quarry)- Contracted by CIFL	<ul style="list-style-type: none"> ■ Activities at the quarry; ■ Details of workforce engaged at the quarry; ■ Recruitment and compensation of workforce at the quarry; ■ Health and safety policies and any accidents/injuries; ■ Engagement with sub-contractors; ■ Grievance mechanisms
21.	Hari & Co. International LLP- Transportation of Rocks- Contracted by CIFL	<ul style="list-style-type: none"> ■ Details of workforce engaged for transportation of rocks, at the barges; ■ Recruitment and compensation policies/procedures of workforce; ■ Health and safety mechanisms;

S.N.	Name of Stakeholder	Purpose for consulting stakeholder during ESIA
		■ Grievance mechanisms.

1.3.3 Secondary Data Review

The information obtained from the document review and stakeholder consultations was supplemented through a review of information available in the public domain including:

- EIA reports for the individual projects described in **Section 1.1.1**, as available in the public domain;
- Integrated Biodiversity Assessment Tool (IBAT) reports for biodiversity significance of the North Male Atoll;
- Statistical Yearbook of Maldives 2018, 2019 and 2020¹⁷;
- Journal articles discussing environmental, social and biodiversity aspects of North Male Atoll as referenced in the individual studies provided in the appendices;
- Publications by reputed organizations including Down to Earth (DTE), United Nations (UN) and International Union for the Conservation of Nature (IUCN) as referenced in the individual studies provided in the appendices; and
- Newspaper or media articles providing any reference to the Gulhifalhu Project or any key assessment topic (e.g. coral reef health, livelihood loss, human rights issues, etc.).

The secondary data has been sourced across the document and appendices where the reference has been used in the analysis

1.4 Limitations to the Methodology

The limitations to the methodology for the Supplementary ESIA have been provided below:

- The Supplementary ESIA report has focused on only capturing impacts and risks associated with Phase I: Stage I and II of the Gulhifalhu Port Development i.e. dredging, land reclamation and revetment works. The process for developing the Gulhifalhu port, associated facilities and induced third party development that might occur in the surrounding regions has not been captured in this ESIA.
- ERM has not undertaken any site assessment or primary data collection for the development of the Supplementary ESIA due to the ongoing restrictions on movement from COVID-19 prevention protocol. The analysis has relied on information previously collected by the Local Consultant for the purpose of the EIA and subsequent monitoring reports. In several cases, the data collection does not directly correlate with the analysis that was required for the Supplementary ESIA. For example, coral monitoring was undertaken before and after Stage I but the monitoring locations have not been determined based on the critical habitat, natural habitat or livelihood loss analysis defined in the Supplementary ESIA. As a result, there are gaps in information that have been indicated where identified across the document.
- The Supplementary ESIA has focused on closing gaps identified in the gap analysis undertaken in December 2020 by ERM Shanghai Limited. The ESIA does not include an update of the baseline or impact assessment exercise undertaken for the EIA and has only focused on specific topics highlighted in **Section 1.2.1.2**, as the gap analysis did not identify this to be necessary.
- The critical habitat assessment update has determined the applicability of natural habitat as defined in IFC PS 6. As an outcome of the natural habitat determination, the extent of impacts needs to be evaluated prior to developing a Biodiversity Action Plan (BAP) for the study. Taking

¹⁷ <https://statisticsmaldives.gov.mv/yearbook/2020/fisheries-agriculture/>

into account the COVID-19 context and inability to travel to site, the BAP has relied on the impact assessment exercise undertaken during the EIA and updated the information with details from the EIA monitoring reports. The biodiversity impact assessment is high-level, focused on comparing the coral reef cover and reef-associated species data from the EIA baseline and post Stage I monitoring reports. An assessment of the current coral reef cover and reef associated species with the exact locations identified as ‘natural habitat’ in this ESIA has not been undertaken through primary surveys.

- The CIA has been undertaken using a rapid assessment approach that determines Valued Environmental and Social Components (VECs) and scopes in/out these VECs based on the existing primary data collection from the EIA and subsequent monitoring reports. The Rapid CIA provides an indicative understanding of the incremental impact that will occur due to the Project activities on the VECs. The rapid assessment approach has been selected considering the constrained timelines in completion of the study (~ 2 months), data gaps on the actual impact values from the individual projects being considered under the Rapid CIA, limited data on the subsequent phases of the Gulhifalhu port development and inability to travel to the site due to COVID-19 protocol to undertake primary monitoring of the identified VECs.
- The Area of Influence (AoI) for the Project has been determined through a sediment plume modelling exercise that determines the spatial extent of a plume if dredging is undertaken in different locations within the borrow areas (shown in **Figure 1-2**). The sediment plume simulations consider dredging activities to take place at specific fixed locations in the different borrow areas, whereas in reality, activities will occur spread out over a larger area, as dredging is done while sailing a transect rather than at a fixed point. The sediment plume modelling does consider the worst case scenario for the fixed locations but the inability to model a moving plume from the sailing transects does indicate a limitation in the modelled data and therefore extrapolation of the data to evaluate impacts for the Supplementary ESIA. Additionally, no simulation was undertaken where two dredgers operate simultaneously in a borrow area. The use of two dredgers working simultaneously has been assumed to not occur by the Client over the course of the Project.
- No socio-economic monitoring data from Phase 0 of the Gulhifalhu Port Development and Stage I of Phase 1 of the Project to ascertain any specific Project affected entities linked to economic activities (i.e. any enterprises, community groups/collectives and individual households) that access the footprint for the proposed land reclamation and sand borrow areas for livelihoods and income generation has been collected or compiled. The assessment of any residual Stage I impacts has therefore relied on a qualitative assessment of potential implications of resources that may have been stressed based on a review of environmental and coral health data, modelling studies and monitoring results, the outcomes of the related Supplementary ESIA studies and a review of the Project’s grievance register maintained by the Local Consultant as well as feedback from stakeholder consultations undertaken for the EDA.

Specific limitations associated with the individual studies have been captured in the individual reports provided as appendices.

1.5 Structure of the Supplementary ESIA

The structure of the Supplementary ESIA has been provided below.

Table 1.3 Structure of the ESIA

Section No.	Name of Section
1	Introduction
2	Project Context

3	Summary of Individual Studies
4	Environmental and Social Management and Monitoring Plan
Appendices	
A	Environmental Impact Assessment (EIA) Report
B	Legal and Policy Framework
C	Human Rights Impact Assessment
D	Natural and Critical Habitat Assessment + Biodiversity Action Plan
E	Economic Displacement Assessment
F	Rapid Cumulative Impact Assessment
G	Climate Change Risk Assessment
H	Stakeholder Consultation Records
I	Boskalis Stage I Turbidity Plume Modelling Report Deltares Stage II Turbidity Plume Modelling Report

2. PROJECT BACKGROUND

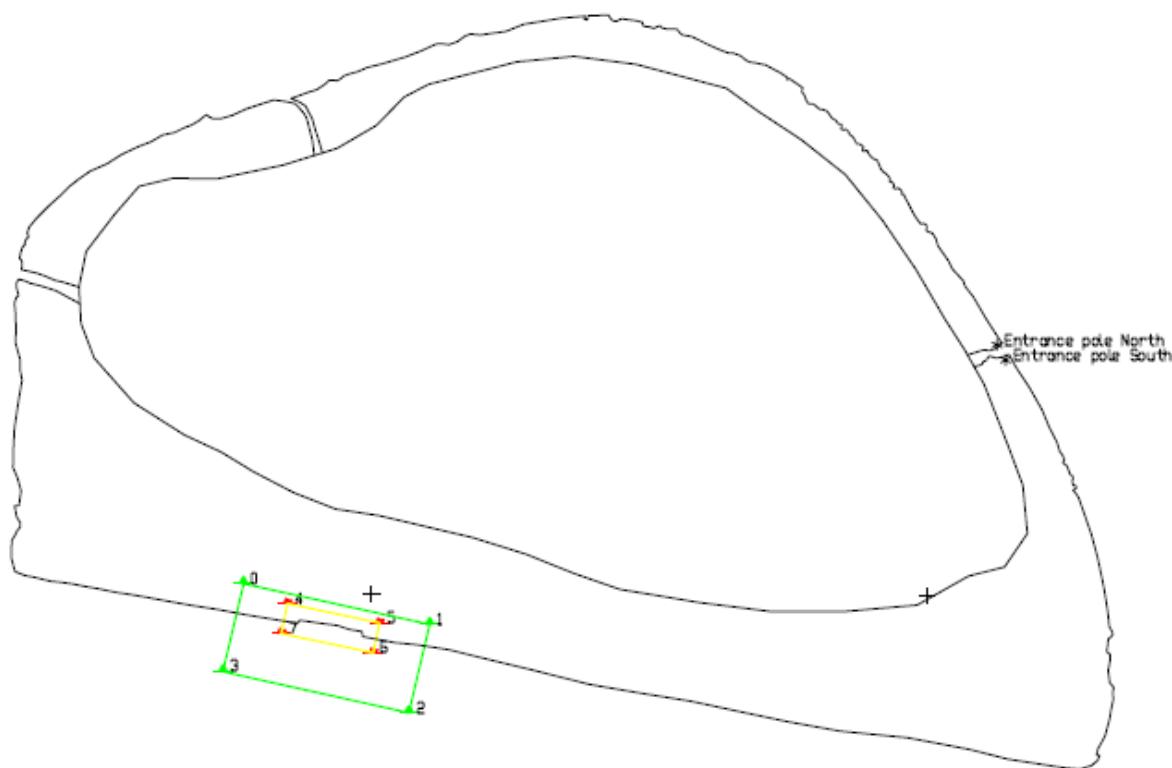
The Gulhifalhu Dredging, Reclamation and Revetment works is being undertaken in Gulhifalhu Lagoon located ~ 2 km east of the capital, Malé and is the island immediately adjacent to Thilafushi, an industrial development hub in Maldives. The eventually developed international port is therefore strategically located to capture commercial and industrial traffic by setting the port in Gulhifalhu lagoon. The detailed 'Project Description' including port infrastructure requirements, master planning, description of the dredging process, turbidity containment measures, reclamation activities, shoreline protection works, resource requirements, project schedule, utilities, waste management and emergency preparedness has been described in the EIA (Appendix A). The focus of this section is to provide a summarized version as a reference setting for the individual studies in the ESIA.

2.1 Project Location

2.1.1 Gulhifalhu Lagoon

The Gulhifalhu Lagoon is a shallow reef flat and lagoon with a depth range of ~3 to ~20m and a total reef area of 3.63 km². The lagoon has three inlet/outlet points into the surrounding marine water as shown in Figure 2-1. Additionally, a marine protected area (MPA) i.e. Hans Hass Place is located at the southern end of the lagoon (shown in green in **Figure 2-1**).

Figure 2-1 Gulhifalhu Lagoon



Source: Draft Schematic for Pre-Phase 0 Survey of Borrow Area

As indicated in the EIA Report (2020), the boundaries of the Hans Hass Place MPA was confirmed with the Ministry of Environment (MoE) of Maldives. The consultation was to understand how much of the buffer (shown in green in the figure above) and the actual MPA (shown in yellow in the figure above) falls within the proposed land reclamation works. The clarification confirmed that MoE has revised the boundaries based on previous monitoring reports during the EIA process and the new boundaries do not lie within the Gulhifalhu lagoon. The revised boundaries are reportedly being

drafted into a *Gazette Notification* that will clearly indicate the updated boundaries and show no overlap with the land reclamation footprint.

2.1.2 Borrow Areas

The Project has a primary borrow area and two alternative borrow areas (A and B) (depicted in **Figure 1-2**). It should also be noted that part of the primary borrow area has been dredged during Phase I: Stage I, and during 2017-18 as part of an unrelated project.

The preliminary estimates of sand volumes for each borrow area is provided in the table below.

Table 2.1 Preliminary estimates of suitable sand volumes

Borrow Area	Area (m ²)	Est Volume (m ³)
Primary Site	18,277,000	12,000,000 - 18,000,000
Alternative A	6,007,000	3,000,000 - 5,000,000
Alternative B	5,788,000	3,000,000 - 5,000,000

Source: EIA Addendum, CDE.

These borrow areas have been chosen based on the following considerations:

- The use of a Trailing Hopper Suction Dredger (THSD) which can operate in deeper inner lagoon;
- Regulatory requirements of no dredging buffer zone of 500 m from any reef;
- Regulatory requirements of no dredging within 200 m buffer zone of a protected area;
- Availability of required quantity of sand;
- As far away from tourist resorts, sensitive coral reefs and dive sites as practically possible;
- Availability of suitable sand containing low fines percentages to reduce turbidity;
- Water depth not exceeding 60 m depth, as the THSD cannot dredge deeper; and
- Proximity to the reclamation area, preferably within 5 km.

2.1.3 Environmental and Social Sensitivities around Gulhifalhu Lagoon and Borrow Areas

As shown in **Figure 1-2**, the combined area of the Gulhifalhu Lagoon and borrow areas is significant, covering a total of ~ 6,730 Hectares of area based on a rough estimation using Google Earth Pro. The location of these borrow areas and lagoon is also near Malé and is therefore the more developed area in Maldives. Several environmental, social and ecological receptors and resources are located in or adjacent to the borrow areas and Gulhifalhu lagoon as described in the table below.

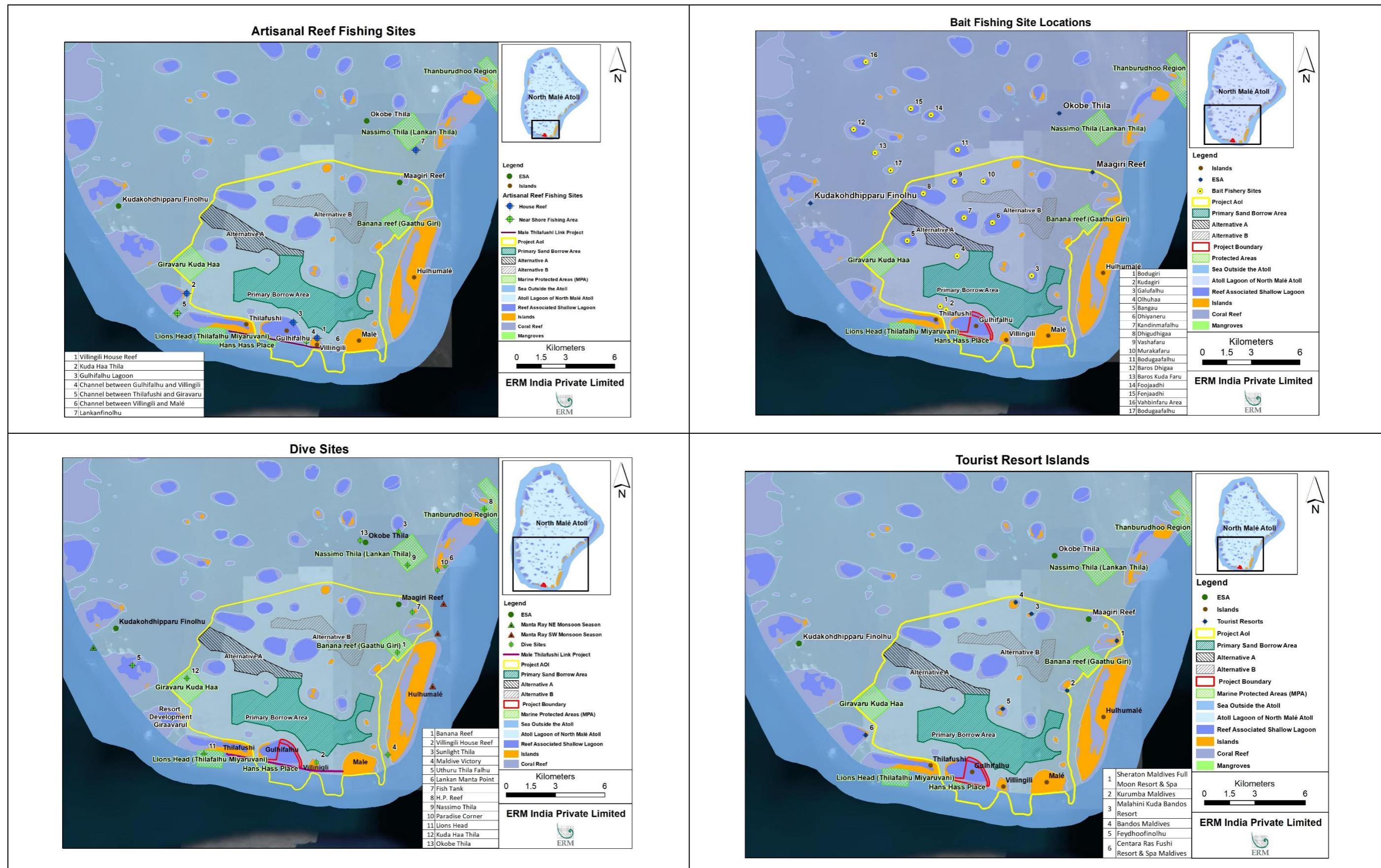
Table 2.2 Environmental and Social Sensitivities around the Project site

Aspect	Sensitivities
Atolls/Islands	<ul style="list-style-type: none"> ■ Gulhifalhu Lagoon – fully reclaimed for the purpose of the Project; ■ Thilafushi – industrial island located ~ 300m west of Gulhifalhu; ■ Villingli Island – residential and tourist hub located ~ 500m east of Gulhifalhu ■ Malé - located ~ 2.5 km east of Gulhifalhu and therefore unlikely to be impacted by the Project; ■ Hulhumalé – located ~ 1.2 km east of the primary borrow area and therefore unlikely to be impacted by the Project

Tourist Resorts	Several tourist resorts including Sheraton Maldives Full Moon Resort & Spa, Kurumba Maldives, Malahini Kuda Bandos, Bandos Maldives, Feydhoo Finolhu and Centara Ras Fushi Resort & Spa are located within 1 km of the primary or alternative borrow areas. For these resorts, the likely risk is sediment plume extending to these resort lagoons and impact to any preferred tourist dive sites.
Dive Sites	Maldives does not have any fixed/designated dive sites with the exception of environmentally sensitive areas (ESAs) or Marine Protected Areas (MPAs) declared in conjunction with the government. As the above process of designating sites is long and not clearly defined, most of the atolls/lagoons/coral reefs around Maldives are openly used by diving associations, tourist resorts and residents. An estimate of frequently used dive sites across the above stakeholder groups (to the extent possible) was obtained through consultations and has been summarized in Figure 2-2 and the EDA (Appendix E)
Fishing Grounds	As described for diving, fishing is also an open source resource for Maldivians. The majority of the fishing undertaken in and around the borrow areas is bait fishing wherein bait fishes are caught and used for fishing of tuna in deeper waters. Additionally, some artisanal reef fishing is also undertaken in coral reefs in and around the borrow areas as shown in Figure 2-2 and summarized in the EDA (Appendix E).
Marine Protected Areas	Marine Protected Areas are protected by the Ministry of Environment and such areas have been identified in or adjacent to the lagoon/borrow areas. The MPAs include Hans Hass Place (adjacent to Gulhifalhu Lagoon), Lion's Head (adjacent to Thilafushi), Giravaru Kuda Haa (located ~1.5 km west of primary borrow area) and Banana Reef (located ~ 1.3 km east of alternative borrow area B)

The above sensitivities have been provided in individual maps and collectively presented in **Figure 2-2**. The maps have been described and sensitivities analysed in the technical studies provided as appendices to this ESIA.

Figure 2-2 Environmental, Social and Ecological Sensitivities around the Project site



2.2 Summary of Project Activities

The Gulhifalhu Project Dredging, Reclamation and Revetment Works has been broken down into the following activities:

- **Preparatory Works:** Mobilize equipment to survey the potential sand sources within North Malé Atoll and identify the sand borrow sites; mobilize the Back-Hoe Dredger (BHD) and excavators to site and prepare containment sand bunds; and dredge new entrance on the northern side of the Project (concluded during Stage I).
- **Dredging and Reclamation:** Mobilize the Trailing Suction Hopper Dredger (TSHD) and support equipment for reclamation works and undertake dredging and reclamation works. Bunding or containment measures are taken to enclose the reclamation area to minimise sediment plumes leaving the project footprint during filling. Meanwhile, the level of turbidity and sedimentation rate at selected locations are monitored to verify that the sediment containment measures are effective.
- **Construction of shore protection works:** Mobilize excavators and rock required for shore protection; construct revetments to protect all ocean facing sides of the reclamation works and all inner lagoon facing areas will be protected as part of port and harbour construction works.
- **Demobilization:** Dismantle and demobilize equipment and personnel from Gulhifalhu and handover to the MNPHI.

2.2.1 Pre-Project Scenario

As shown in **Figure 1-1**, Phase 0 where no work has started on the Gulhifalhu port development, Gulhifalhu has already been impacted due to land reclamation works totalling 26 Ha that has already been undertaken by Maldives Sewerage and Water Company (MWSC). The reclaimed area consists of a water production facility, warehouses and light industrial facilities. . The sand for the reclamation has reportedly been obtained from the same primary borrow areas as the Project.

2.2.2 Preparatory Works

A summary of the preparatory works has been provided in the EIA (Appendix A). The preparatory works includes the following activities:

- Issuance of the dredging permit and intimation from the Project Proponent to commence dredging works at the borrow areas and reclamation at the Gulhifalhu Lagoon;
- Mobilization of the Contractor and any subcontractors and workers to the site including supplies, equipment and materials needed for the duration of the dredging/reclamation;
- Mobilization of the equipment and temporary utilities at the site to initiate the dredging process;
- Initiation of a stakeholder engagement process to inform key parties of the start of dredging works and to establish a grievance register process to obtain stakeholder feedback; and
- Implementation of pollution control measures including silt screens and big bags at Gulhifalhu lagoon to control the sediment plume and reduce water quality impacts in surrounding areas.

2.2.3 Dredging and Reclamation

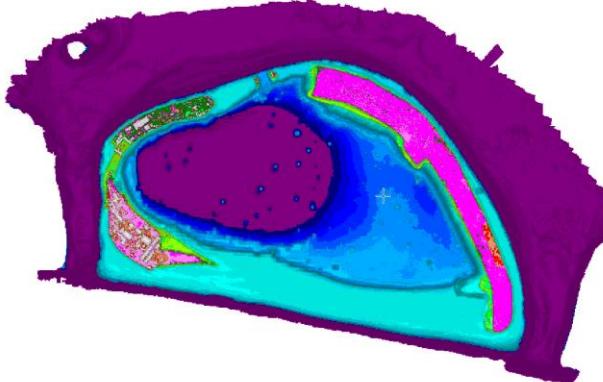
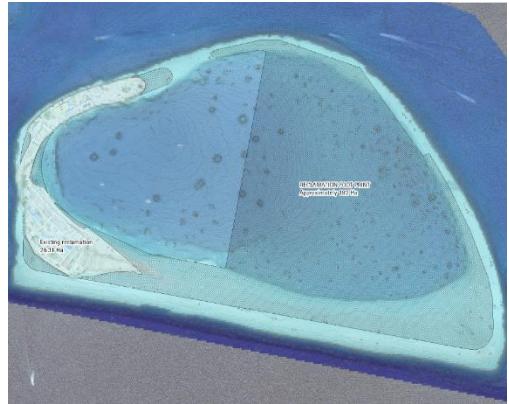
2.2.3.1 Reclamation Location

Gulhifalhu lagoon, approximately 2.5 km away from Male city, has been earmarked by the Project Proponent as the main port and a location for manufacturing, warehousing and distribution facilities. The aim of the Project is to extend the land mass at Gulhifalhu (30 hectares after Phase 0), as part of the master plan for the international port development in Greater Malé Area. The total area of

additional land to be reclaimed is approximately 190 ha which will be achieved through dredging with a Trailing Suction Hopper Dredger (TSHD) and protected with revetment.

The following table provides details of Stage I and II of the reclamation:

Table 2.3 Reclamation Scope

Boskalis' Activities for Dredging, Land Reclamation and Revetment	Overview	Schematic
Stage 1	<ul style="list-style-type: none"> ■ 6 million m³ of sand, which were sourced from inside North Malé Atoll; ■ The reclamation was made to a height of +2.0 m MSL; ■ The revetment of this stage has a length of approximately 1.3 km of permanent rock revetment and approximately 1.1 km of temporary revetment made with geobags 	
Stage II	<ul style="list-style-type: none"> ■ 18 million m³ of sand, which will be sourced from inside North Malé Atoll; ■ The reclaimed land will be brought to +2.6 m MSL at the Port area and +2.0 m MSL at the remaining areas. ■ The total reclamation area is approximately 192 ha. 	

2.2.3.2 Dredging Activities

Stage I

During Stage I, two main dredgers were used for the project, i.e. BHD Colbart and TSHD Fairway. The Colbart was used to construct a sand bund before starting reclamation works, to contain the sediment and any sediment plumes and to dredge the new entrance channel. The Fairway was used for the dredging and reclamation and movement between the borrow areas up to Gulhifalhu. It is understood that the dredging activities lasted from June-August 2020.

Stage II

During Stage II, it is understood that only one dredger will be used at any given point during the Project activities, i.e. a BHD for the construction of a perimeter sand bund on the southern edge of the reef flat, following which the TSHD Gateway (or a similar sized vessel) will be used to undertake dredging and reclamation activities. It is understood that the dredging activities with the TSHD will be carried out for a longer timeframe, approximately 9 months.

2.2.3.3 TSHD Movement

The **Figure 2-3** shows the schematic of TSHD (Fairway) movement from the borrow areas up to the reclamation area. Once the Fairway reaches the reclamation area, the hopper is connected to a floating pipeline (approximately 150 m). Once connected, the other end of the pipeline pumps material ashore and also has equipment to profile the sand that is coming out of the pipeline. The pipeline without the Fairway connected to it, can move around the lagoon with the tug that assists with coupling and decoupling the TSHD to the pipeline.

The sand dredged in the borrow area will be stored on the TSHD and once the vessel reaches its maximum carrying capacity¹⁸ of ~22,000 t (hopper capacity of 12,000 m³) the dredger will move to the reclamation site, i.e. Gulhifalhu, where the sand will be unloaded. The dredger is expected to operate 24 hours per day throughout all seven (07) days a week. The TSHD pump will be used to empty the hopper by using a pipeline (as can be seen in **Figure 2-3** and **Figure 2-4**). The pipelines will otherwise be floating units that will be connected between the discharge point on Gulhifalhu and the TSHD (as can be seen in Photo 4 in **Figure 2-4**). It is likely that the TSHD for Stage II will be a smaller vessel as compared to Stage I, which means the carrying capacity will also be reduced. This indicates that there are likely to be more trips per day between the dredging areas and the Gulhifalhu lagoon and that the dredging period will last for a longer time as compared to Stage I.

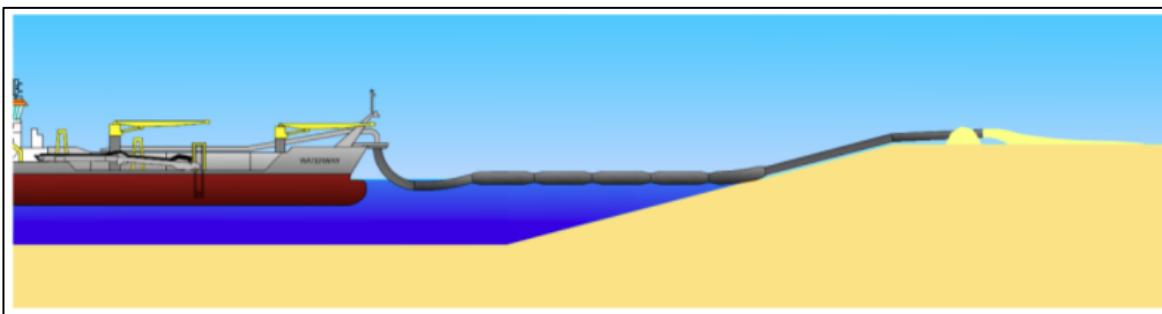
2.2.3.4 Reclamation Activities

Once dredging is complete, the Project undertakes the following:

- Installation of permanent revetment on the reclaimed area;
- Sand slope, profiling works continue with assisting the revetment works; and
- Preparation of dry equipment for demobilization.

¹⁸ Boskalis Equipment Sheet. Trailing Suction Hopper Dredger- Gateway. <https://boskalis.com/download-center/download/eJmaWxIvVWIklio1NjkwLCJyZWZlcmVuY2VvVaWQiOjl5OTh9f3597d951f07272e037bce7d0abfd7da5daae083.html>

Figure 2-3 Schematic of Reclamation Activities

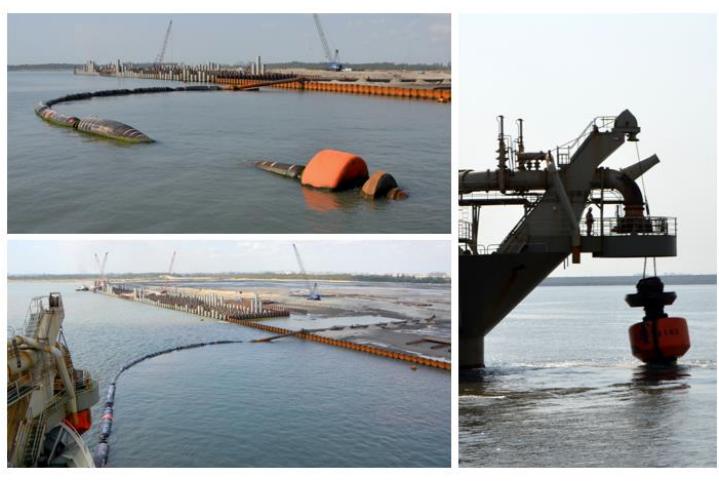


TSHD pumping the dredged sand



Reclamation works

Figure 2-4 View of Stage I TSHD Movement and Interconnection at Gulhifalhu

	
Floating Line moored at one of many discharge points in the reclamation area	TSHD arriving post dredging towards the floating line
	
TSHD arriving towards reclamation area for interconnection with the floating line	Interconnection of the floating line from the discharge point up to the TSHD

2.2.4 Construction of Shore Protection Works and Demobilization

The construction of shore protection works and demobilization has been covered in the EIA (2020) report.

2.3 Project Planning and Monitoring for Stage I of the Dredging and Reclamation

Stage I of the Dredging and Reclamation consisted of dredging of 6 Mm³ of sand, reclamation to height of + 2.0 MSL and 1.3 km length permanent revetment structure. The Stage I of the dredging and reclamation was undertaken over a nine-month period as shown in the approximate timelines provided below:

- Stage I dredging permit was obtained in May 2020 and dredging began in June 2020;
- The interim period between obtaining the permit and start of dredging was used to translocate corals in Gulhifalhu Lagoon to an alternate site (See **Section 2.3.1**);
- Dredging and reclamation works for Stage I were completed in August 2020; and
- Revetment works for Stage I were completed in March 2021.

The entire list of activities undertaken as part of Stage I including any planning, mitigation actions and preparatory works have been discussed in the EIA Report (Appendix A). Key activities undertaken from Stage I that are relevant to the technical studies discussed in this Supplementary ESIA are presented below.

2.3.1 Coral Reef Relocation

In order to minimize the adverse environmental impact for the Project, the Contractor voluntarily undertook to fund a coral relocation activity and contracted Reefscapers. The relevant details of the coral reef relocation are provided in the Coral Relocation Project and Monitoring Report (2020), and are further described in *Section 3.2.2.3*.

2.3.2 Plume Dispersion Modelling

Plume dispersion modelling was undertaken to determine spatial extent and residence time¹⁹ of the sediment plume in the primary and alternate borrow areas in Stage I of the Project. The modelling was undertaken in-house by the Contractor and results were used in developing mitigation strategies for reducing sediment plumes in the areas surrounding the primary borrow area and Gulhifalhu Lagoon. The details of the modelling has been provided below.

2.3.2.1 Modelling of Suspended Sediment Concentration (SSC)²⁰

Sediment dispersal modelling for Stage-I considered dredging inside the North Malé atoll system and reclamation activities at the Gulhifalhu. Modelling was conducted to forecast the potential plume dispersal at the Gulhifalhu project and surrounding areas. A turbidity level of 10 mg/L (corresponds to approximately 5 NTU) was considered as threshold value, although it only applies as a Limit Level at monitoring locations defined in the Statutory EIA at sensitive receptors (e.g. coral reefs around the borrow area).

¹⁹ Amount of time the suspended sediment remains in the water layer before it is naturally diluted.

²⁰ Hydrodynamic.2020.Turbidity dispersion Gulhifalhu. DT1901198-JMUL-1-MME-M-001

2.3.2.2 Modelling Details

Model Used

The modelling studies involved assessing the plume dispersal through the estimation of the amount of fines ($<63\text{ }\mu\text{m}$) released during dredging and reclamation and a dispersal model. The local hydrodynamics at Gulhifalhu were simulated using the Delft 3D-Flow numerical model, developed by Deltares. A multi-nested approach was chosen. The local Gulhifalhu Detail Model (GFDM) was nested 'offline' in a Maldives Overall Model (MOM), covering large section of the northern part of the Maldives. The MOM is subsequently driven by an Indian Ocean Regional Model (IORM), containing the whole of the Maldives. The deep ocean boundaries of this regional model were prescribed with water levels, driven by large-scale oceanic tides.

Scenarios considered

A set of five representative scenarios were considered as mentioned in **Table 2.4**.

Table 2.4 Scenarios considered for Stage I Turbidity Modelling

Scenario	Description
Scenario 1	Start of reclamation in Stage I at the southeast corner of the finished bund by TSHD Fairway. Dredging by the TSHD Fairway at 3 different locations in the primary borrow area and 1 location in an alternative borrow area, to the west of the primary area. Dredging cycle, including dredging, sailing time and discharging was taken into account.
Scenario 2	Reclamation towards north west corner of bund by TSHD Fairway. Dredging by TSHD-Fairway at the eastern side of the primary borrow area with corresponding material for reclamation.
Scenario 3	Reclamation progressed towards the inner lagoon of Gulhifalhu. Dredging by the TSHD Fairway at the eastern side of the primary borrow area with corresponding material for reclaiming.
Scenario 4	Creation of the bund by side casting local material along the east side of the Gulhifalhu reef by the BHD Colbart. As a mitigation measure, big bags were placed at the waterline at the east side of the reef. To model the most conservative case, it was assumed these big bags have no containing effect and turbidity plume can disperse into the channel between Gulhifalhu and Villingili.
Scenario 5	To contain the turbidity dispersal at the reclamation, an alternative initial configurations proposed, including a work island and an initial section of the bund at the southeast end of Gulhifalhu. Dredging by the TSHD Fairway at the eastern side of the primary borrow area with corresponding material for reclaiming.

Results

The modelling results are presented below;

- Modelled results showed elevated turbidity values for all TSHD dredging and discharging scenarios, spread over a wide area. For the TSHD dredging an increase of 10-20mg/L in surface turbidity values can be expected for distances up to 4 to 7 km from the TSHD. For the TSHD discharging, the impact appears mostly confined to the reclamation area, although the nearby island Villingili is forecasted to largely experience increases of up to 7 mg/L.
- Northwest beach of Villingili is mostly affected with increase in turbidity by dredging and reclamation related turbidity. This is especially the case when dredging takes place at the south side of borrow area C in combination with discharging at Gulhifalhu.
- Kurumba Resort is affected by increase in turbidity when dredging activity takes place in the eastern side of the primary borrow area.
- Plume dispersal originating from dredging and overflowing in the western side of the primary borrow area follows a diagonal pattern from Gulhifalhu/Villingili passage towards northwest

direction. When dredging and overflowing takes place in the eastern side of the primary borrow area, resulting plume diverges towards the north along Hulhumalé Airport.

- The bund on the east side of the Gulhifalhu reef has a positive effect on containing the discharge-related turbidity plume inside the Gulhifalhu lagoon. Shortening of the bund showed larger plume dispersion into the Gulhifalhu/Villingili passage.

Sediment dispersion in Stage-1 based on the modelling conducted is presented in **Figure 2-6**.

2.3.3 *Embedded Controls and Prevention Measures for Stage I*

The following key embedded controls and prevention measures were implemented as part of Stage I to reduce the overall impact from the Project:

- **Perimeter bund construction:** Before the start of reclamation works with the TSHD, a perimeter bund was constructed using local sandy material from the reef flat. This bund was created to contain the reclamation material itself, and the turbidity plume generated by the pumping ashore of the reclamation material. In order to be able to construct this bund within the required timeframe, a Backhoe Dredger was mobilized. To contain the bund material during bund construction, a row of 1 m³ bags were placed on the reef flat at the toe line of the future revetment to reduce spread of sediments and a second row of big bags of sand were placed on the bund slope at mean sea level (msl) to minimise washing out of sand from the bund slope by waves.
- **Silt Screens:** Silt screens were installed within the Gulhifalhu lagoon at the end of the perimeter bund to reduce the spreading of the sediment in the water column, generated by pumping reclamation material ashore with the TSHD, towards the outside of the reef.
- **Green Valve:** A green valve was used on the dredger in order to reduce the sediment spreading in the water during dredging;
- **Managing Construction Activities:** Monitoring of water quality was undertaken on a daily basis. The parameters monitored were turbidity, temperature, pH and conductivity. Further, monitoring of sedimentation was undertaken on a fortnightly basis during the dredging and reclamation activities.

When turbidity and/or sedimentation limit was exceeded at a monitoring location the cause was investigated and construction activities were adjusted to reduce turbidity and/or sedimentation levels to below the limits. However, no exceedance of the limits occurred during Stage I, therefore no adjustment of construction activities was necessary.

Additionally, as a response to complaints received from stakeholders via the Project Grievance Redressal Mechanism (GRM), related to the spreading of a low-density yet well-visible turbidity plume generated by bund construction towards Villingili, the Contractor put the following additional mitigating measures in place:

- **Temporary construction stoppages:** The Contractor implemented stricter processes in managing sediment plumes moving towards Villingili. During bund construction, if plume was observed to reach halfway across the channel to Villingili, the bund construction activities were stopped, even when water quality limits set in the EIA were within the prescribed limits at the monitoring location on Villingili;
- **Additional silt screens:** A test was done with installing additional silt screens on the reef flat, on the outside of the bund, to try to reduce the spreading of turbidity generated by bund construction. However, because this test proved that these silt screens were ineffective in containing turbidity, not durable in the prevailing hydrodynamic conditions and not installable in the necessary timeframe, these silt screens were not installed over the entire length of the bund.
- **Big bags:** Boskalis placed a row of 1 m³ big bags between the bund and the outer reef edge to contain the near-bottom part of the turbidity plume generated by bund construction.

Figure 2-5 Mitigation Measures

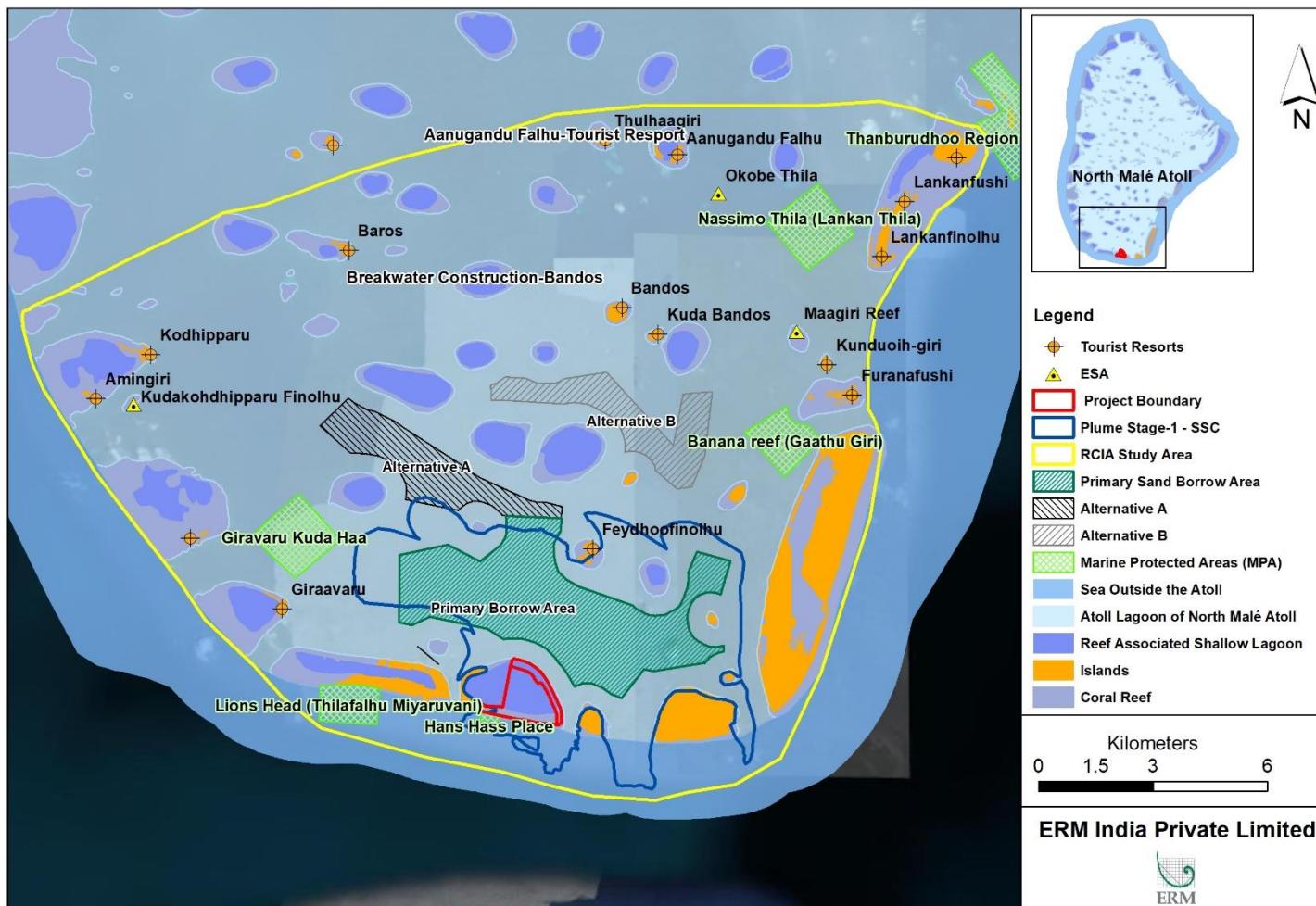


Source: Boskalis

Note: Figure depicting some of the mitigation measures- West of the sand bund: inner Gulhifalhu lagoon, to be reclaimed in Stage II; East of the sand bund: North Malé Atoll. Figure orientation: taken from SE, facing NW.

Shown gap in the bund could not be closed at first, due to this being the only access to the inner Gulhifalhu lagoon. Gap was closed on 23-06-2020, as soon as the new access channel had been created.

Figure 2-6 : Plume dispersion for Stage -1



Note: The boundaries of plumes were drawn taking the outer boundaries of 5 modelled scenarios considered for Stage-1. The boundary of the plume consists of the envelope of the area where, during the 15-day simulation periods of all 5 scenarios combined, occasional increases in turbidity compared to natural levels are expected.

2.4 Project Planning and Monitoring for Stage II of the Dredging and Reclamation

Stage II of the Project will consist of dredging 18 Mm³ of sand, reclamation of port to be brought up to + 2.6 MSL (port) and +2.0 MSL (non-port areas) and total reclamation of the ~ 192 Ha area. It is estimated that the dredging will take place over a period of 14 months (from Month 6 – Month 20 of construction and revetment works are expected to take place from later in Month 6 – Month 13) for the 18 million m³, using the TSHD type Gateway. Prior to the dredging, a BHD will be used to construct the perimeter bund, which is expected to take ~ 40 days. Table 2.5 shows the preliminary schedule for the Project, however commencement date depends on the Project's permitting and financing process.

Table 2.5 Preliminary Project Schedule for Stage II

Preliminary Schedule	Year 2021				Year 2022											
	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
Activities																
Mobilization of temporary facilities																
Mobilization of dry equipment																
Mobilization of auxiliary equipment (Backhoe Dredger and Multicat)																
Mobilization of main equipment (Trailing Suction Hopper Dredger)																
Preparation works																
Coral relocation																
Filling big bags for outer bund																
Installation of big bags for outer bund																
Construction of outer bund – South																
Dredging and reclamation works																
Rock delivery																
Construction of revetment Stage II																
Out survey																
Demobilization of main equipment																
Demobilization of auxiliary equipment																
Demobilization of construction equipment																
Demobilization of temporary facilities																
Decommissioning																

The Project planning and monitoring for Stage II has similarly been delineated in the EIA report, which considered risk mitigation across both stages of the Project. Key activities undertaken as part of Stage II have been described below.

2.4.1 Sediment Dispersion Modelling for Stage-II²¹

The objective of the modelling study was to assess the plume dispersal of SSC and sedimentation rates expected due to the dredging and reclamation works under the various additional scenarios considered for the construction of Stage-II. The model included the following:

2.4.1.1 Model Used

The modelling scenarios include different dredging equipment, the two monsoon conditions, and multiple borrow area locations. The combination of these variables results in 23 modelling scenarios. The model results of each scenario are analysed to quantify the potential risk of exceeding a prescribed concentration (10 mg/L) at sensitive receivers during the work.

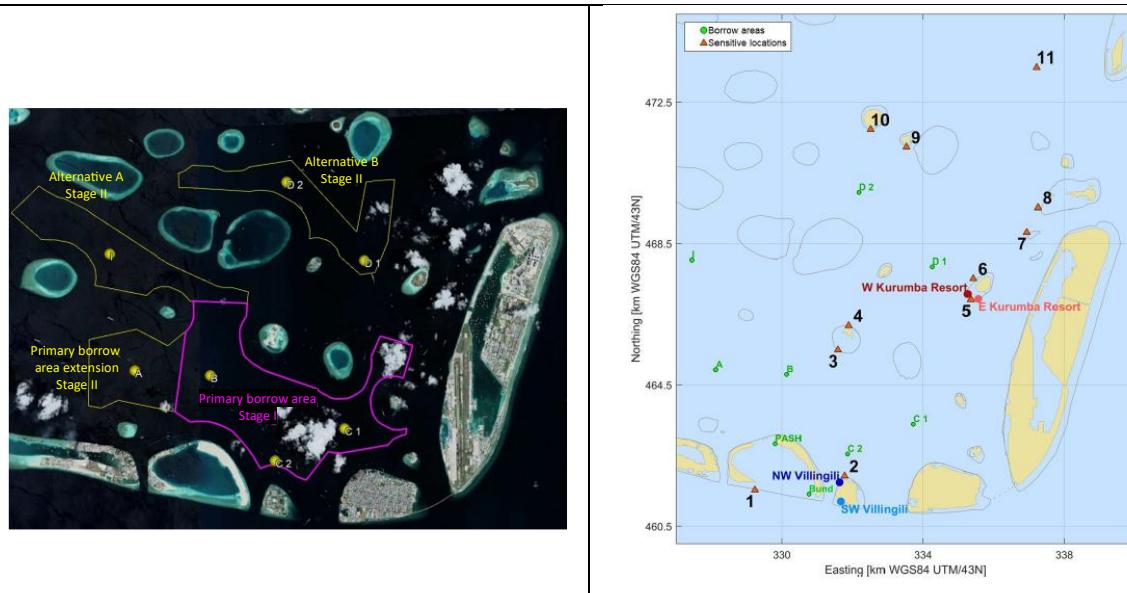
The expected plume dispersal during dredging work was assessed by means of numerical modelling of an estimated amount of fines (sediment particles < 63 µm) released during various stages of the work (i.e. source terms) and dispersal by currents (i.e. hydrodynamic and transport model). As part of the Stage I study a dedicated hydrodynamic model of the project area, the GFDM was developed.

Deltares developed turbidity modelling for Stage II dredging and reclamation activities. The dredging locations considered by Deltares for Stage II include points A, B, C1 and C2 which are located in the **Primary Borrow area**; point I which is located in **Alternative A**, and points D1 and D2 which are located in **Alternative B**.

During Phase I, dredging only took place in the middle and eastern section of the Primary Borrow Area. The map of the borrow areas are presented in **Figure 2-7 (left side)**

The sensitivities considered for the model includes MPAs –Hans Hass Place, Banana Reef, Lankan Thila; Tourist Islands- Feydhoo Finolhu, Kurumba Resort, Sheraton Resort, Kuda Bandos, Bandos and the island of Villingili. The sensitivities considered in the model are shown in **Figure 2-7 (right side)**

Figure 2-7 Borrow Areas and Sensitivity Mapping used in Stage II Model



Sensitive Locations 1=MPA Hans Hans Place; 2= Villingili Island, 3&4= Feydoofinolhu; 5&6=Kurumba Resort, 7=MPA Banana Reef, 8=Sheraton Resort, 9=Kuda Bandos; 10=Bandos; 11=MPA Lankan Thila

²¹ Deltares.2021.Gulhifalhu Turbidity Modelling: Phase II 1I206967-000-HYE-0003.

Based on laboratory analysis of water samples, a turbidity threshold of 10 mg/L corresponds to the turbidity value of 5 NTU, which corresponds to the Maldivian standards for turbidity. Therefore, a threshold of 10 mg/L is proposed for this exercise to determine the turbidity-related impact at the various sensitive receivers. Maximum SSC levels during the simulation (2%-exceedance), clipped for concentrations smaller than 5 mg/L.

Scenarios considered

The dispersal of fine sediments is assessed for 23 model scenarios. These scenarios include different dredging equipment, two different monsoon conditions (Northeast and Southwest monsoon), and multiple borrow area locations.

Bund construction: Scenarios 1 and 2

Scenarios 1 and 2 correspond to the bund construction using the Backhoe Dredger Colbart under Northeast and Southwest monsoon conditions. These scenarios are simulated using the existing bathymetry and consider the start of the bund construction in the east-end of Gulhifalhu (Figure 13). The simulations do not take into account the placement of mitigating measures (e.g., placement of big bags). The source terms are constant over time at a fixed location, and uniform over the water depth (i.e., shallow water depth so likely to mix over the vertical).

Dredging and pumping ashore: Scenarios 3 to 23

The remaining 21 scenarios are summarized in **Table 2.6**. The source terms are located at the borrow area (near-bed resuspension and near-surface overflow release) and at the reclamation site (pumping ashore – PASH). The scenarios account for the borrow areas, dredging equipment, and the two monsoon periods. The dredging and pumping ashore scenarios are simulated using the bathymetry layout which potentially represents the most conservative scenario, with the closed bund on the south side and fluxes concentrated in the north entrance, nearby the PASH location.

Table 2.6 Scenarios considered for Stage II Turbidity Modelling

Borrow Area	Northwest Monsoon		Southwest Monsoon	
	Fairway	Gateway	Fairway	Gateway
Primary Borrow Area (Point A)	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Primary Borrow Area (Point B)	Scenario 7	Scenario 8	Scenario 9	Scenario 10
Primary Borrow Area (Point C1)	Scenario 11	Scenario 12	Scenario 13	Scenario 14
Primary Borrow Area (Point C2)	Scenario 15	Scenario 16	Scenario 17	Scenario 18
Alternative Borrow Area B (Point D1)	Scenario 19		Scenario 20	
Alternative Borrow Area B (Point D2)			Scenario 21	
Alternative Borrow Area A (Point I)	Scenario 22		Scenario 23	

Model Assumptions

- The overall goal of this assessment is to determine the area affected by dredging related turbidity. Based on laboratory analysis of water samples, a turbidity threshold of 10 mg/L corresponds to the turbidity value of 5 NTU, which is included in local guidelines as a transition at which water quality becomes less than optimal. Therefore, a threshold of 10 mg/L is proposed for this exercise to determine the turbidity-related impact at the various sensitive receivers.
- In the scenarios considered for dredging and reclamation, the source terms are located at the borrow area (near-bed resuspension and near-surface overflow release) and at the reclamation site (pumping ashore – PASH).
- The scenarios account for the borrow areas (affecting source locations, sediment composition, traveling times), dredging equipment (affecting dredging rate and the time of dredging cycle), and the two monsoon periods.

- The dredging and pumping ashore scenarios are simulated using the bathymetry layout. This layout potentially represents the most conservative scenario, with the closed bund on the south side and fluxes concentrated in the north entrance, nearby the PASH location.
- Maximum SSC levels during the simulation (2%-exceedance), clipped for concentrations smaller than 5 mg/L. Contour lines indicate time-exceedance of the SSC of 10mg/L: 2%, 5%, 10%, 20% and 50% of the time, corresponding to 7 hours, 18 hours, 1.5 day, 3 days and 7.5 days during the 15-day simulation (not in a consecutive period of time).

Results

- 4 sensitive locations, where marine tourism related activities take place, are at risk of turbidity increases, i.e. northwest and southwest beach of Villingili and west and east end of Kurumba Resort Reef.
- TSHD discharging effects of SSC appear mostly confined to the reclamation area, although Villingili is expected to experience regular temporary increases in the order of 5 mg/L. This is especially the case when dredging takes place at the southern side of the primary borrow area (point C1) in combination with discharging at Gulhifalhu.
- Scenario 19 (dredging at eastern side of borrow area Alternative B (point D1, adjacent to Kurumba Resort at 1.5 km), during NE monsoon) shows expected SSC increases during NE monsoon may be in the order of 12 mg/L in areas surrounding the resort.
- Scenario 20 (dredging at eastern side of borrow area Alternative B (point D1, during SW Monsoon) shows expected SSC increases at K. Banana Reef (Gathu Giri) MPA, although 10 mg/L threshold value is not expected to be exceeded during >2% of the time.

Summary of maximum SSC (during 2% of time) at sensitive location is presented in **Table 2.7**

Table 2.7 Summary of maximum (2% exceedance) SSC at Sensitive Locations for all scenarios ("--"means <1 mg/L)

Scenario	Area	Monsoon	Equip.	2%-Exceedance SSC at Sensitive locations [mg/l]											
				1	2	3	4	5	6	7	8	9	10	11	
1	A	Bund	Colbart	-	-	-	-	-	-	-	-	-	-	-	
2				-	-	-	-	-	-	-	-	-	-	-	
3		NE	Fairway	-	4.3	-	-	-	-	-	-	-	-	-	
4			Gateway	-	2.8	-	-	-	-	-	-	-	-	-	
5			Fairway	-	4.4	1.1	1.4	-	-	-	-	-	-	-	
6			Gateway	-	2.9	-	-	-	-	-	-	-	-	-	
7		B	NE	Fairway	-	4.2	-	-	-	-	-	-	-	-	
8			Gateway	-	2.5	-	-	-	-	-	-	-	-	-	
9			SW	Fairway	-	3.0	3.5	3.9	-	-	-	-	-	-	
10			Gateway	-	1.9	1.9	2.1	-	-	-	-	-	-	-	
11	C1	NE	Fairway	-	2.2	-	-	-	-	-	-	-	-	-	
12			Gateway	-	1.4	-	-	-	-	-	-	-	-	-	
13		SW	Fairway	-	2.4	1.0	-	1.1	-	-	-	-	-	-	
14			Gateway	-	1.5	-	-	-	-	-	-	-	-	-	
15		C2	NE	Fairway	1.3	8.5	-	-	-	-	-	-	-	-	
16			Gateway	-	4.7	-	-	-	-	-	-	-	-	-	
17			SW	Fairway	-	8.0	1.3	1.3	-	-	-	-	-	-	
18			Gateway	-	4.1	-	-	-	-	-	-	-	-	-	
19	D1	NE	Fairway	-	2.9	1.4	1.9	7.9	12.1	2.7	-	-	-	-	
20				-	2.9	-	-	-	4.6	5.2	5.9	-	-	-	
21		SW		-	2.9	-	-	-	-	-	-	3.8	3.0	-	
22				-	3.4	-	-	-	-	-	-	-	-	-	
23		I		-	3.4	-	-	-	-	-	-	-	-	-	

Source: Deltares.2021.Gulhifalhu Turbidity Modelling: Phase 2

Blue colour=2-5 mg/L; yellow colour =5-10 mg/L; red colour= >10 mg/L

Areas A=west-side primary borrow area; B=center primary borrow area, C1=east-side primary borrow area, C2=south-side primary borrow area, D1=east-side of Alternative B, D2=west-side of Alternative B, I=Alternative A

Sensitive Locations 1=MPA Hans Hass Place; 2= Villingili, 3&4= Feydhoo Finolhu; 5&6=Kurumba Resort, 7=MPA Banana Reef, 8=Sheraton Resort, 9=Kuda Bandos; 10=Bandos; 11=MPA Lankan Thila

Simulation of SSC movement in Stage II based on the modelling conducted is presented in **Figure 2-8**

2.4.1.2 Modelling of Sedimentation Rate

Sedimentation Rate Modelling for Stage II²²

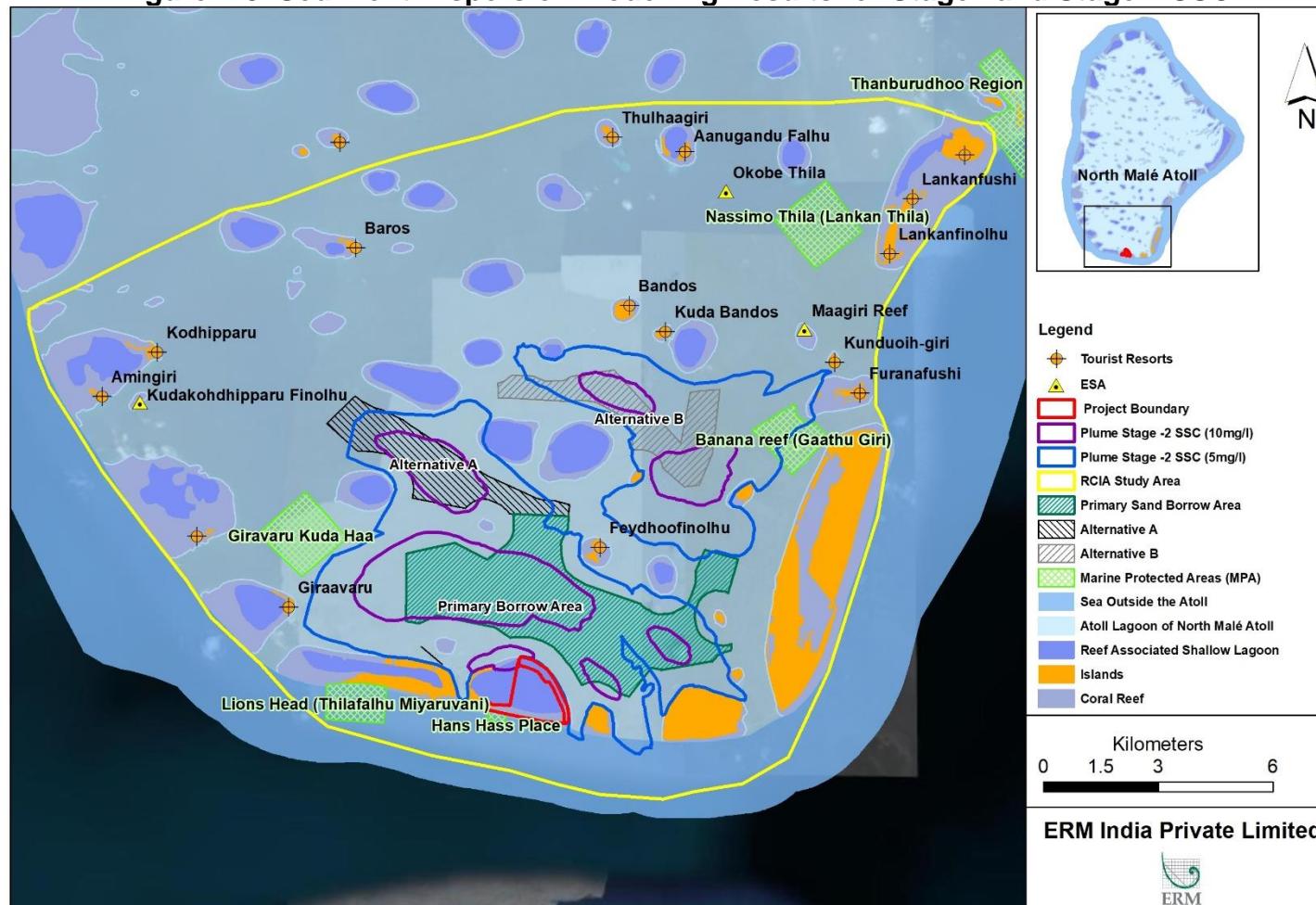
The present study was conducted to assess the plume dispersal at the dredging locations and Gulhifalhu project area under the various scenarios considered for the Stage II. These scenarios include different dredging equipment, the two monsoon conditions, and multiple borrow area locations. The combination of these variables results in 23 modelling scenarios. The model results of each scenario are analysed to quantify the potential risk of exceeding a prescribed concentration (10 mg/L) at sensitive receivers during the work. Results are also analysed in terms of sedimentation rates, considering a reference criterion of 15 mg/cm²/day at sensitive areas.

The same modelling design including the location of sensitive receptors and oceanic conditions were considered for the development of model for sedimentation rates as that of SSC.

The sedimentation rate modelling results indicate values significantly lower than the threshold (15 mg/cm²/day) at the sensitive locations (**Table 2.8**), suggesting that the material disperses sufficiently before reaching and setting on the bed. At Gulhifalhu most of the material settles within the inner atoll area adjacent to the construction site.

²² Deltares. 2021. Gulhifalhu Turbidity Modelling: Phase II 1I206967-000-HYE-0003.

Figure 2-8 Sediment Dispersion Modelling Results for Stage I and Stage II SSC



Note: The boundaries of plumes for 10 mg/L and 5 mg/L SSC were drawn taking the outer boundaries of 23 modelled scenarios considered for Stage II. Based on the model, this is the outer boundary up to which the plume may travel considering the envelope of all scenarios together. It is to be noted that the boundary is used to define the areas that are expected to exceed the threshold values (10 and 5 mg/L) during $\geq 2\%$ of time during the simulated period

Table 2.8 Summary of maximum (2% exceedance) Sedimentation Rate at Sensitive Locations for all scenarios (“-“ means <1 mg/cm²/day)

Scenario	Area	Monsoon	Equip.	Average deposition rate at Sensitive locations [mg/cm ² /day]										
				1	2	3	4	5	6	7	8	9	10	11
1	Bund	NE	Colbart	-	-	-	-	-	-	-	-	-	-	-
2				-	-	-	-	-	-	-	-	-	-	-
3	A	NE	Fairway	-	1	-	-	-	-	-	-	-	-	-
4			Gateway	-	-	-	-	-	-	-	-	-	-	-
5		SW	Fairway	-	1	-	-	-	-	-	-	-	-	-
6			Gateway	-	-	-	-	-	-	-	-	-	-	-
7	B	NE	Fairway	-	2	-	-	-	-	-	-	-	-	-
8			Gateway	-	1	-	-	-	-	-	-	-	-	-
9		SW	Fairway	-	-	1	2	-	-	-	-	-	-	-
10			Gateway	-	-	-	1	-	-	-	-	-	-	-
11	C1	NE	Fairway	-	-	-	-	-	-	-	-	-	-	-
12			Gateway	-	-	-	-	-	-	-	-	-	-	-
13		SW	Fairway	-	-	-	-	-	-	-	-	-	-	-
14			Gateway	-	-	-	-	-	-	-	-	-	-	-
15	C2	NE	Fairway	-	6	-	-	-	-	-	-	-	-	-
16			Gateway	-	3	-	-	-	-	-	-	-	-	-
17		SW	Fairway	-	4	-	-	-	-	-	-	-	-	-
18			Gateway	-	2	-	-	-	-	-	-	-	-	-
19	D1	NE	Fairway	-	-	-	-	2	5	-	-	-	-	-
20		SW		-	-	-	-	-	2	2	3	-	-	-
21	D2	SW		-	-	-	-	-	-	-	-	2	-	-
22	I	NE		-	-	-	-	-	-	-	-	-	-	-
23		SW		-	1	-	-	-	-	-	-	-	-	-

Source: Deltares.2021.Gulhifalhu Turbidity Modelling: Stage II

Blue colour = 2-4 mg/cm²/day; yellow colour = 5-6 mg/cm²/day

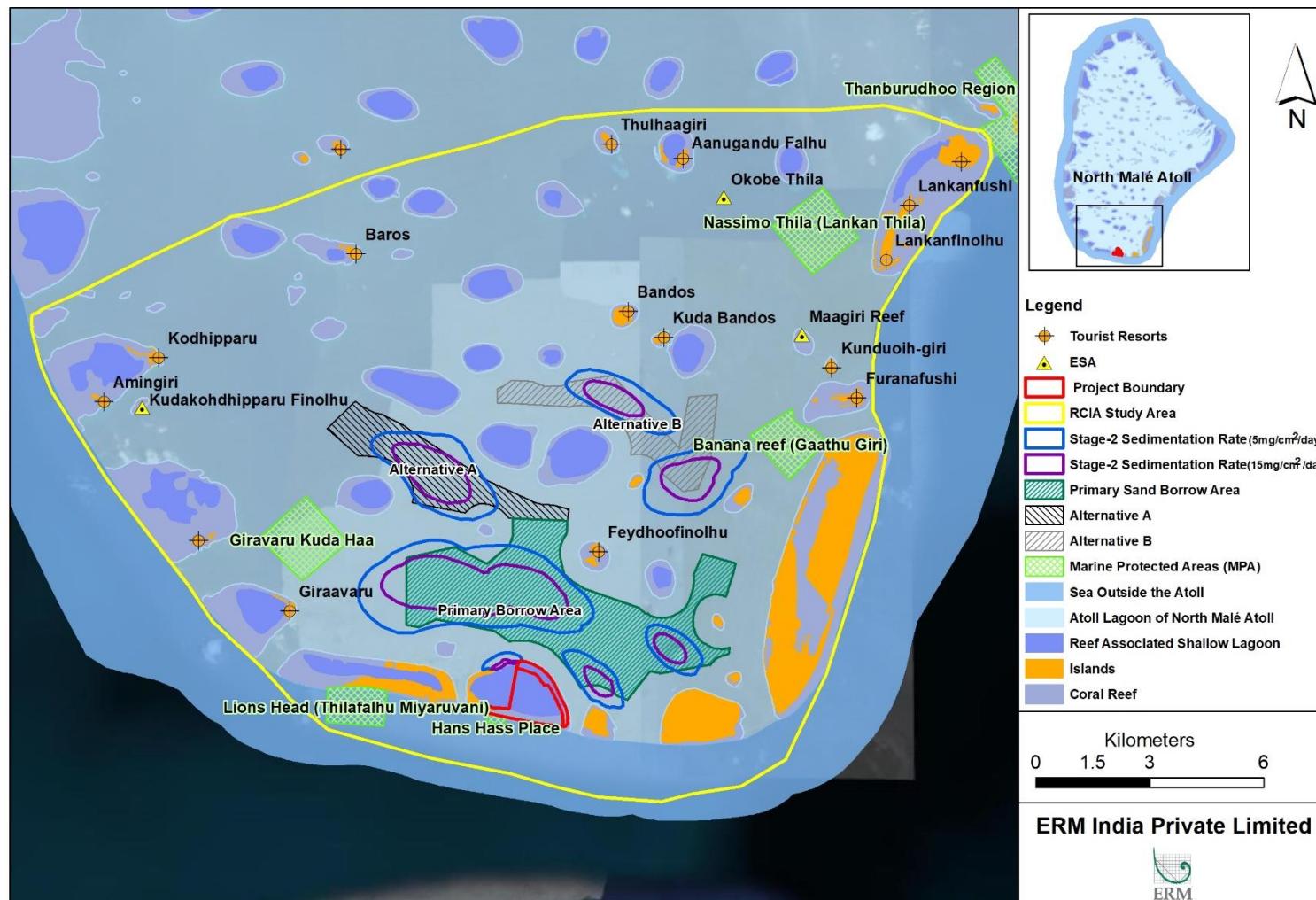
Areas A=west-side primary borrow area; B=center primary borrow area, C1=east-side primary borrow area, C2=south-side primary borrow area, D1=east-side of Alternative B, D2=west-side of Alternative B, I=Alternative A

Sensitive Locations 1=MPA Hans Hass Place; 2= Villingili Island, 3&4= Feydhoo Finolhu; 5&6=Kurumba Resort, 7=MPA Banana Reef, 8=Sheraton Resort, 9=Kuda Bandos; 10=Bandos; 11=MPA Lankan Thila

Sedimentation rate simulation mapping for Stage II presented in **Figure 2-9**.

According to Deltares residence time for suspended sediments at water column due to disturbance may vary on the basis of ambient conditions (e.g. tidal phases), moment of release (which is not continuous), merging of plumes from different dredge cycle release etc. However, settling velocity of the sediment particles could be considered as an indication for residence times. The settling velocities give an indication of the time that the sediment remains in the water column, if vertical mixing due to turbulence and resuspension are not considered. For a general idea on time scales associated with the suspended sediment plumes, the coarser fraction (63-32 µm) would take approximately 5 hours to settle from the surface layers (i.e., overflow) to the bed at approximately 50 m depth at the borrow areas, considering the settling velocity only. The intermediate (32-16 µm) and finer fractions (16-2 µm) would take approximately 20 hours and 5 days, respectively. Vertical mixing and resuspension may make these times longer.”

Figure 2-9 Sedimentation rate Modelling Results for Stage II



Note: The boundaries of plumes for $15\text{ mg/cm}^2/\text{day}$ and $5\text{ mg/cm}^2/\text{day}$ sedimentation rates were drawn taking the outer boundaries of 23 modelled scenarios considered for Stage II. It is to be noted that the boundary is used to define the areas that are expected to exceed the threshold values (15 and $5\text{ mg/cm}^2/\text{day}$) during $\geq 2\%$ of time during the simulated period.

2.4.2 *Embedded Controls and Prevention Measures for Stage II*

As part of Stage II, the mitigation measures, as required in the EIA 2020²³ and implemented during Stage I (Section 2.3.3) are going to be implemented again. Furthermore, the following mitigating measure will be modified:

- Increased height of the row of big bags, to reduce the mixing of water that is occurring in high tide conditions as observed in Stage I. The high tide conditions were passing over the big bag arrangement and therefore reducing its efficacy as a mitigation measure to contain turbidity from bund construction activities. The row of big bags (with increased height) will be placed before the start of bund construction, which is expected to eliminate the need for temporary construction stoppages to mitigate spreading of plumes towards Villingili.

Additionally, the Environmental and Social Management Plan (ESMP) provided in **Section 4** of this report will be implemented for mitigation of impacts to any key environmental, social and ecological receptors as identified in the EIA Addendum and technical studies that are within the purview of this Supplementary ESIA.

²³ Additional mitigating measures may follow from the EIA Addendum process, which is not yet finished at the time of writing this report. Any additional mitigating measures will be included in this report once the EIA Addendum is finalized. Additional mitigating measures may also follow once the Livelihood Restoration measures implementation process has further discussed impacts and appropriate measures with the potentially affected fisherfolk and dive centres and other stakeholders. Once a final set of measures has been agreed, these will be included in the report or made separately available,

3. SUMMARY OF E&S STUDIES

This section presents the summary of the five E&S studies undertaken as part of the Supplementary ESIA namely:

1. Natural and Critical Habitat Assessment (CHA);
2. Cumulative Impact Assessment (CIA);
3. Economic Displacement Assessment (EDA);
4. Human Rights Impact Assessment (HRIA); and
5. Climate Change Risk Considerations (CCRC).

3.1 Area of Influence

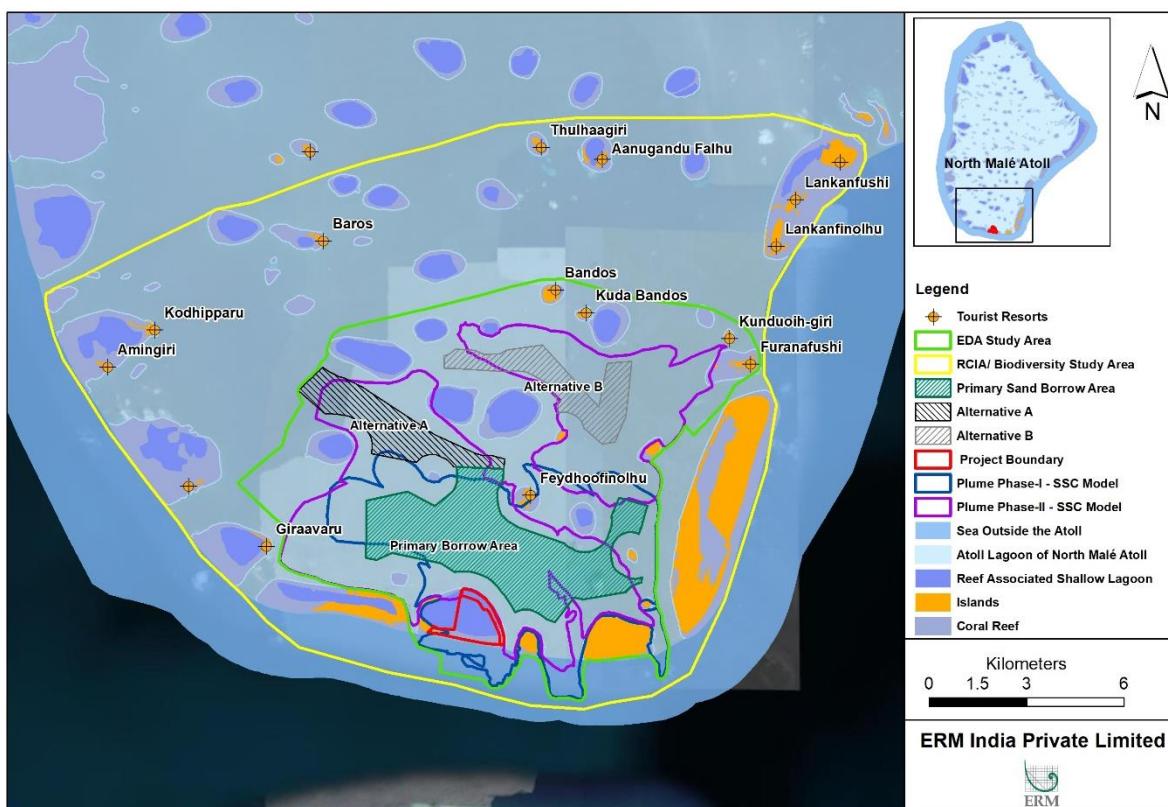
The Project Area of Influence (AoI) for the Supplementary ESIA has been determined based on the spatial boundaries of the Project activities and resources/receptors that interact with them. The Project AoI has been broken down into the following:

- Direct reclamation footprint; i.e. Gulhifalhu Island;
- Dredging area; i.e. primary and alternative borrow areas; and
- Reefs and islands that fall within and near the sediment plume dispersal zone.

The individual studies in the ESIA have used different Study Areas relevant to the topic being assessed. These Study Areas all include the Project AoI but some are larger or more diffuse than the Project AoI as outlined below:

- The HRIA and CCRC is being done at a larger country-level to evaluate the labour concerns and climate change concerns prevalent in Maldives respectively. This data is then applied to identify concerns that could be prevalent at the Project site and assessed as a risk in the respective individual technical studies. There is therefore no set AoI for these two technical studies.
- The EDA Study Area has been determined based on an identification of potential interactions between the spatial boundaries of the Project activities and the entities undertaking economic activities within the Project Area of Influence. The EDA has focused on activities that are dependent on the ecological resources in the vicinity of the Project. These resources are mainly utilised by the immediate surrounding communities who are not easily able to travel to and use alternative resources. Therefore, the Study Area for the EDA is equivalent to the Project Area of Influence.
- The CHA and RCIA have used the same Study Area defined by the interaction between ongoing development in the southern half of North Male Atoll and the larger ecosystem that is impacted. For the CHA, impacts are not just limited to the borrow areas and Gulhifalhu Lagoon but also potential impact from displacement of species to similar habitat immediately north of the sediment plume (See Figure 2-8 and Figure 2-9). The RCIA has identified the cumulating impacts on the water quality and coral reef resources as a result of multiple development projects that will be ongoing in the entire southern half of North Male Atoll. The result will be a larger AoI is a larger Study Area to evaluate impacts to tourist resorts and ecological resources north of the sediment plume model. The Study Area for RCIA and CHA is therefore larger than the Project AoI.

Figure 3-1 Study Areas for EDA, CHA and RCIA



3.2 Summary Outcomes of the Individual Technical Studies

As described in **Section 1.2.1.2**, the individual technical studies have been provided as separate appendices to this ESIA report:

- Appendix C – Human Rights Impact Assessment
- Appendix D – Critical Habitat Assessment and Biodiversity Action Plan
- Appendix E – Economic Displacement Assessment
- Appendix F – Rapid Cumulative Impact Assessment
- Appendix G – Climate Change Risk Considerations

The summary of each of these studies has been presented in subsequent sections.

3.2.1 Human Rights Impact Assessment

The Human Rights Impact Assessment identified various potential human rights risks and impacts for the Project. The assessment was limited to the human rights risks and impacts associated with the Contractor's activities in undertaking the contracted Project scope of work and included activities such as engagement of third party entities such as subcontractors and the supply chain for materials. The objective of the HRIA was to assess if any additional management measures or safeguards are required to mitigate human rights risks and impacts associated with the Contractor's activities in relation to the Project. The results of the human rights screening identified the following salient human rights risks and impact that could potentially be linked to the Project activities:

- Potential Trafficking in Persons (TIP) specifically linked to potential forced labour linked to foreign workers engaged by CIFI (sub-contractor);
- Potential impact of workers' rights related to labour and working conditions;

- Potential impacts on rights and safety of workers in the supply chain;
- Potential risks related to freedom of movement due to retention of travel documents of supply chain workers engaged for the transportation of rocks;
- Potential community health risks related to sedimentation plumes;
- Potential community health risks related to chemical/oil spills;
- Potential inability of stakeholders to participate and/or access remedy; and
- Potential impacts in the event security personnel are engaged during Stage II.

The assessment has also identified specific safeguard measures on each identified impact on the rights holder which have been presented in Section 3.2.5.3.

3.2.1.1 Resources and Receptors Identified

The HRIA identified key rights holders linked to the potential salient human rights risks and impacts associated with the Project activities based on previous engagement by the local consultant during the EIA process as well as during the scoping process of the HRIA. In coordination with the Local Consultant (CDE), a data collection plan was prepared; outlining priority rights holders and stakeholders for engagement. The key rights holders identified are:

- Workers (which include all categories of staff include e.g. security guards, housekeeping staff and secretaries) contracted by CIFI engaged at the reclamation and dredging sites
- Workers contracted by CIFI engaged at the reclamation and dredging sites.
- Workers engaged by suppliers of rock and geotextile material for construction of the revetment structures
- Crew, captain and workers engaged in the transportation of rocks, and
- Local community at Villingli and the islands near the borrow areas.

3.2.1.2 Qualification of Impacts Identified

The key human rights risks salient to the Project were initially screened. Based on the outcomes of the stakeholder consultations as well as review of information, specific issues and impacts with direct relevance to the Project (and aligned with international standards) were screened in. All other applicable rights with limited relevance to the Project and which are largely under the purview of the Government of Maldives to protect, were scoped out.

3.2.1.3 Mitigation Measures

The summary of the key safeguards to be implemented by the Project are as follows:

- Implement Contractor Policy and Procedures related to Human Resources, Human Rights and Labour;
- Develop a Corrective Action Plan (CAP) as part of the Environmental, Social and Governance (ESG) Supply Chain Management Plan which will assess ESG gaps identified as part of the Supply Chain Risk Assessment and capture recommendations based on the Human Right Impact Assessment, and propose actions to be undertaken by subcontractors and suppliers to address these gaps within defined timeframes;
- Develop a Security Management Plan as part of the existing Health, Safety and Environment (HSE) Plan, in the event security personnel are engaged;
- Ensure that CIFI enrolls workers, including migrant workers into social welfare programmes related to pension, health insurance and accident insurance schemes, where applicable;

- Ensure CIFTL develops a Labour Management Plan (LMP) for monitoring aspects related to worker recruitment, worker grievance management, trainings, health screening, and non-engagement of child labour, forced labour and gender-based violence;
- Ensure CIFTL receives consent in writing from workers, prior to handover of passports during the transportation of rocks;
- Coordinate with the Marine Traffic Police and Coast Guard with regard to vessel movement;
- Update Emergency Response Plan to include an analysis of potential receptors and mechanisms for dealing with oil/chemical spills; and
- Update the Projects Stakeholder Engagement Plan to incorporate specific safeguards from EP 4 and IFC PS 1.

3.2.2 Critical Habitat Assessment and Biodiversity Action Plan

3.2.2.1 Natural, Modified & Critical Habitat Assessment

Biodiversity Study Area (BSA)

The Biodiversity Study Area for Impact assessment on Natural Habitat has been determined based on the direct and indirect footprint of the Project:

- Direct Reclamation Footprint - Phase I reclamation of Gulhifalhu reef is considered within the scope of the present assessment.
 - Stage I - (already carried out between July 2020 to March 2021) - Stage I was initiated in June 2020 and revetment works were completed in March 2021. Total 6 million m³ of sand was used to reclaim North Eastern part of Gulhifalhu Reef. Which has led to direct loss of **38.63 Ha** (approximately) of coral reef habitat, underneath the reclamation footprint.
 - Stage II (planned) – Stage II will involve dredging of 18 million m³ from September 2021 onwards to reclaiming the Southern reef of Gulhifalhu and eastern half of Gulhifalhu atoll. In total Stage II will lead to loss of 155.83 Ha (approximately) of Coral reef and reef lagoon habitat, underneath the reclamation footprint.
- Dredging area; i.e. primary and alternative borrow areas - The Project (Stage- II) has identified a primary borrow area and two alternative borrow areas (A and B).
- Sediment plume dispersal zone (plume model) - The Biodiversity Study Area includes the Project Aoi which considers the Suspended Sediment Concentration (SSC) modelling for Stage-1 and Stage-2 activities and sedimentation rate modelling scenarios for Stage-II.
- Considering the limitations of the plume model, the Biodiversity Study Area included reefs within 4-6 km from the boundary of borrow area and outer extent of plume, covering almost all reefs within the southern part of “North Male’ Atoll”.

Entire AOI of the project has been considered as the Biodiversity Study Area (BSA) to carry out primary survey.

Ecological Appropriate Area of Analysis (EAAA)

To carry out the CHA, the full extent of ecosystems that might be affected in any way, together with any additional areas that have a functional role in supporting those ecosystems or their associated biodiversity were considered for determining the EAAA. EAAA typically extend well beyond a project's anticipated physical footprint and may extend beyond the project direct area of influence.

Reefs and coral reef islands in close proximity experience comparatively less flushing from oceanic currents, thus providing more exposure time for coral larval stage to successfully settle and

regenerate. Therefore, likelihood and probability of requirement of coral species and reef associated fish and invertebrates was primarily considered to be the determining factor for delineation of EAAA.

Considering prevalence of strong current and drastic difference in bathymetric profile outside and inside North Male Atoll, recruitment is likely to happen from within the Atoll. So North Male Atoll was considered to be the EAAA for the Critical Habitat Assessment.

Protected Areas and Key Biodiversity Areas

Key Biodiversity Area

No such areas viz, Important Birds Area, Key Biodiversity Area, Ramsar Sites etc. are located within the EAAA.

Nationally Protected Area

Total nine Marine Protected Areas (MPA) are located within the EAAA. Two Marine Protected Areas within a 5 km radius of the reclamation sites; Hans Hass Place located on the southern reef slope of Gulhifalhu (<200 m from the reclamation works), and Lions Head located in Thilafushi (reef west of Gulhifalhu).

The EAAA has 12 Environmentally Sensitive Areas (ESA). None of the ESAs are located within a 5 km radius of the proposed reclamation site. However, there are twelve ESAs located within North Malé Atoll (EAAA). Out of twelve, “Maagiri Reef” is located about 2.7km North East of “Alternative B” borrow site. Rest of the ESAs are located more than 5km from the sand borrow sites.

Natural & Modified Habitat Classification (IFC PS6 Habitat Classification)

Different “Habitat Types” within the EAAA was classified as “Natural Habitat” or “Modified Habitat”, primarily based on degree of anthropogenic pressure/activity on respective habitat types.

Habitat Type	Habitat Classification (IFC PS6) Justification
Coral Reef & Reef Associated Shallow Lagoon	Considering low live coral cover is partially due to “a natural calamity” (bleaching events, tsunami, predator outbreak) and that the coral reefs within the EAAA still supports and has the potential to support diverse lifeforms, primary ecological functions and species composition are still expected to be largely unchanged (though may have diminished or species diversity and abundance may have changed). So, Coral Reef Habitat of EAAA (North Malé Atoll) is considered as a “Natural Habitat”.
Seagrass Meadow	Seagrass can act as carbon and nutrient sink for excess nutrient released in water due to increase in tourism and human settlement. Moreover, seagrass provides habitat for a number of marine lifeforms including feeding ground for Endangered Green Turtle. So, seagrass meadows are considered a “Natural Habitat”.
Atoll Lagoon of North Male Atoll	Considering the scale of reclamation projects that have borrowed sand from the lagoon of North Malé Atoll and slow natural sand replenishment rate, the community structure may have altered over last 10-15 years. So, the atoll lagoon is considered as “Modified Habitat”.
Mangrove (from only one known island)	Considering protected status of the mangroves of Huraa island, though small in size the habitat is expected to maintain its ecological functionality and species composition. So, mangrove habitat in the EAAA (North Malé Atoll) is considered as “Natural Habitat”
Island uninhabited (only one)	The only uninhabited island in the EAAA is Thanburudhoo Island located in Thanburudhoo Region MPA is considered to be “Natural Island Habitat”.

Island habited (residential, resort or commercial)	Apart from Thanburudhoo Island, all other islands in the EAAA have been highly modified and subjected to population pressure, so Island habitat has been considered as “Modified Habitat
--	---

Critical Habitat Assessment (IFC PS6 Habitat Classification)

■ Criterion 1: Critically Endangered and/or Endangered Species

Based on distribution pattern and occurrence in Maldives and specific to EAAA, total 7 Critically Endangered (IUCN v1-2021) and 19 Endangered Species (IUCN v1-2021) species were assessed under Criterion 1. The assessed species includes 2 Oceanic Turtle, 11 Shark, 6 Rays & Guitarfish, 1 Coral species, 3 Sea Cucumber Species, 2 Bony Fish Species and 1 Marine Mammal. **None of the species was assessed to trigger Critical Habitat**

■ Criterion 2: Endemic or Range Restricted Species

One Data Deficient (IUCN v1-2021) bony fish species viz. "*Helcogramma larvata*" was identified to be a critical habitat trigger. Consultation with experts (scientists involved in collection and description of the species) revealed that the entire population of the fish species is probably located within the EAAA. **So, Critical Habitat was triggered due to presence of range restricted species.**

■ Criterion 3: Migratory and/or Congregatory Species

12 marine species listed in Convention on the Conservation of Migratory Species of Wild Animals (CMS) were assessed. Known congregation sites of reef associated rays and sharks located in North Male' Atoll (EAAA) were also assessed. Apart from marine species, 75 birds were also assessed. **None of the species were assessed to trigger Critical Habitat.**

■ Criterion 4: Highly Threatened and/or Unique Ecosystem

Maldives as a whole, houses approximately 3% of global coral reefs. Therefore, Coral Reef Ecosystem of the EAAA will not represent $\geq 5\%$ of the global extent of Coral Reef ecosystem meeting the criteria for IUCN status of CR or EN Ecosystem. **So, critical habitat has not been triggered under Criterion 4.**

■ Criterion 5: Key Evolutionary Processes

Considering the reef systems of Maldives are not unique in terms of species diversity compared to other reefs in Indian Ocean Region and the species diversity is lower than coral ecosystems in other parts of the globe, **Critical Habitat is not triggered under Criterion 5**

Based on Critical Habitat Assessment carried out under Criterion 1, Criterion 3, Criterion 4 & Criterion 5, critical habitat was not triggered. However, assessment under Criterion 2, indicates presence of a range restricted, *Helcogramma larvata*. Entire distribution range (EOO) of the species is most likely restricted within the EAAA of the project. As a result, EAAA is deemed to be Critical Habitat for this particular species.

3.2.2.2 Impact on Natural and Critical Habitat

Impact of dredging and land reclamation in Coral Reef seascape are divided into two impact categories, Project impacts and Process impacts.

Project Impact are associated with the decision to reclaim land at Gulhifalhu and the choice of the layout of the reclamation area.

- **Direct Loss of Coral Reef** - Phase I reclamation activity will lead to direct loss of 194.46Ha (24.64ha in Stage I + 155.83ha in Stage II) of Coral reef and reef lagoon habitat loss at Gulhifalhu Reef.

- **Hydrodynamic Change** - Dredging and land reclamation may cause changes in hydrodynamic conditions such as flow velocity, tidal currents, water levels, wave dynamics, exposure to wave energy, erosion, change in oxygen level in water due to reduced flushing.
- **Water Quality Change** – Major hydrodynamic changes can also have long-term effects on corals through changes in water quality and altered re-suspension-siltation cycles.

Process impacts are associated with the physical land reclamation process at Gulhifalhu, which include activities such as dredging, revetment and land reclamation. Key process impacts include **turbidity** and **sedimentation**.

Reefs from different geographic locations may have different thresholds for stressors where impact is experienced. But an increase (even small) in magnitude of turbidity or sedimentation rate from baseline condition, causes stress. The risk and severity of impacts from dredging on corals is directly related to the intensity, duration and frequency of exposure to stress. Very high sediment stress levels over relatively short periods may well result in sub lethal and/or lethal effects on corals, while long-lasting chronic exposure to moderate levels of sediment stress may induce similar effects. Repetitive stress events could result in deleterious effects much sooner if corals have not been allowed sufficient time to recover between consecutive disturbances.

Habitat Sensitivity Value

Considering the EAAA is a Critical Habitat and regularly supports Critically Endangered and Endangered Species (IUCN 2021-v1), Habitat Sensitivity Value has been classified as “**High**” for this particular Study Area.

Magnitude of Impact on Critical Habitat & Natural Habitat

To summarize, the “project impacts” are direct, site specific impacts and permanent, resulting in pernicious loss of coral reef habitat, but the loss of area is very small compared to availability of such habitat nationally or even regionally (within EAAA). The “process impact” from this project may have severe impact on reefs due to acute disturbances (increased sedimentation and turbidity) in the biodiversity study area, as the disturbances from project related activity are expected to be short term and local. Affected reefs are more likely to recover but recovery may take long time depending on degree of damage and number of factors (not related to this project). So, though “project impact” affects a very small part of the habitat, “process impact” is most likely to impact significant part of coral reef and reef associated shallow lagoon within the biodiversity study area (spread across southern part of EAAA), but is not expected to threaten the long-term viability/ function of the habitat, as reefs are more likely to recover as nature of disturbance is acute, short-term. So magnitude of impact is expected to be “**Medium**”.

Impact Significance

As habitat Sensitivity was found to be “High” and impact magnitude was found to be “Medium” overall Impact significance has been classified as **Major**. The EIA 2020 and CDE describe measures that are taken to mitigate this impact. The residual impact significance will remain **Moderate** because the loss of 194.46 Ha of “Natural Habitat” is unavoidable and irrespective of mitigation measures, turbidity level is expected to rise along with rise in sedimentation rate in reefs close to area of dredging and reclamation.

3.2.2.3 Biodiversity Action Plan (BAP)

Considering the Project is located in “Natural Habitat” as well as “Critical Habitat” a broader “mitigation hierarchy” is recommended for the Project, with a view to achieving “No Net Loss” (considering Natural Habitat) of biodiversity and also achieve “Net Gain” (considering the Critical Habitat).

Step 1 Avoidance Strategy

Among all other atoll systems in Maldives, North Malé Atoll is considered one of the most degraded considering high anthropogenic pressure from population centres, tourism and other commercial activities located in islands like Thilafushi and Hulhumale. Proximity to Capital, infrastructures like International Airport, commercial areas like Tilafushi, further strengthens candidature of Gulhifalhu as a potential site for port construction that will aid in further strengthening trade and economy of Maldives.

So, avoiding impact (which could only be reached through not going ahead with the Project in this location) on coral reef habitat and biodiversity is not feasible if a port is to be developed in the Maldives.

Step 2 Mitigation Measure to Minimise Impact

As also described in Section 2.4.2, as part of Stage II, the mitigation measures, as required in the EIA and implemented during Stage I (Section 2.3.3) are going to be implemented again. Furthermore, the following mitigating measure will be modified:

- Increased height of the row of big bags, to reduce the mixing of water that is occurring in high tide conditions as observed in Stage I. The high tide conditions were passing over the big bag arrangement and therefore reducing its efficacy as a mitigation measure to contain turbidity from bund construction activities. The row of big bags (with increased height) will be placed before the start of bund construction, which is expected to eliminate the need for temporary construction stoppages to mitigate spreading of plumes towards Villingili.

Additionally, the Environmental and Social Management Plan (ESMP) provided in **Section 4** of this report will be implemented for mitigation of impacts to any key environmental, social and ecological receptors as identified in the EIA Addendum and technical studies that are within the purview of this Supplementary ESIA.

Step 3 Coral Relocation Activity

In order to minimize the adverse environmental impact for the Project, the Contractor decided to voluntarily fund a coral relocation activity and contracted Reefscapers. The Sheraton Full Moon Resort, located on the island of Furanafushi, was eventually chosen as the recipient location. Sheraton Resort was already engaged in coral propagation with Reefscapers and were able to support the relocation scope during the Covid-19 lockdown period.

The full details of the coral reef relocation are provided in the Coral Relocation Project and Monitoring Report (2020).

- A total of 4,870 branching coral colonies and 2,479 massive coral colonies were translocated from Gulhifalhu lagoon to Furanafushi;
- Coral reef monitoring was proposed immediately but due to the COVID-19 protocol, no monitoring works could be undertaken for the first five months after translocation;
- Coral monitoring resumed in November 2020 and ~ 200 colonies were found dead but the overall survival rate was estimated at 95%;
- A marine biologist has been commissioned to visit the coral reef on a weekly basis to perform necessary inspections and maintenance and records of the same are retained by Sheraton Resort; and
- A comparison of mortality at Gulhifalhu lagoon from the coral monitoring reports and the weekly records of the translocated site were undertaken and determined that the mortality in the limited period of assessment was lower at the translocated sites than the natural colony at the lagoon. The highest number of mortalities were observed during the first five months when COVID-19 prevented active maintenance of the translocated reef.

Estimation of Residual Impact

- **Habitat Residual Impact on Natural Habitat:** Reclamation at Gulhifalhu will lead to direct loss of **194.46 ha** Coral reef and reef lagoon habitat loss at Gulhifalhu Reef. Overall the rehabilitation area does not cover more than 1ha. In terms of area coverage and the area of rehabilitation is negligible to the area of direct natural habitat loss at (Gulhifalhu). Overall, 7.3% corals were relocated from Gulhifalhu.
- **Species Residual Impact:** 11 Threatened species are present in the project EAAA, which can be considered as species of concern for the project as these species may be impacted from the residual impact such as loss of natural habitat, sediment and plume, resulting from the project.

All reef building coral species (irrespective of conservation status) found in the EAAA are important in context of the EAAA and overall Maldives, as these reef building corals have literally acted and are still acting as the fundamental building block of the island nation.

So, along with threatened species that can be found in the EAAA and the Project Aol, “no net loss” should be targeted for reef building corals as well.

Step 4 Biodiversity Offset

- **Offset Option 1 – Improving Protection Status of Environmentally Sensitive Area to Marine Protected Area.** Adhering to the principal of “Like for like or better”, this offset option considers an Environmentally Sensitive Area (ESA), i.e. an area already recognised for its ecological and biodiversity value, as a potential site for Offset, through elevation of protection status by declaring Marine Protected Area (MPA) and enforcing statutory protection and conservation actions that MPA's enjoy.
- **Offset Option 2 – Community Based Coral Farming and Reef Rejuvenation:** As part of offset strategy if selected reef is provided MPA status, the management plan should ideally consider options for increasing live coral cover in degraded areas of newly declared MPA.

Generally rejuvenation of degraded reef is a cost intensive process. But, community-based coral farming and using such coral to rejuvenation degraded part of offset site can be cost effective option. Moreover, such initiative can provide alternate livelihood options for local communities
- **Offset Option 3 – Post Project Reef Creation at Gulhifalhu (onsite offset):** The EIA for Phase II reclamation suggests that the overall the Project proposes to protect the shorelines facing the sea (as opposed to inner lagoon) using revetments. Rock revetment can provide ideal hard substrate for development of future coral growth (once Phase II work has been completed). Recruitment from nearby reefs are expected to happen naturally.
 - **Offset Measure for *Helcogramma larvata*** (Critical Habitat Trigger) - No information is available on relationship of *Helcogramma larvata*, with live coral. Information from holotype collection data indicates that, in natural condition the species may inhabitant microhabitats like exposed reef areas, occurring on coralline rocks and boulders in shallow water. The species was also collected of sea wall, surge channel with boulders. Thus, 4.5km long rock revetment at Gulhifalhu is expected to provide suitable habitat for the species. Moreover, the speies was recorded from Male' Island, so proximity of Gulhifalu to Male' makes Gulhifalhu a suitable Offset site for *Helcogramma larvata*.

3.2.2.4 Recommendation

Project Proponent should consider all Offset Options, particularly Offset Option 1 (to achieve “No Net Loss”) and Offset Option 3 (to achieve “Net Gain”). Offset Option 2 can complement management effort of Offset Option 1 and Offset Option 3. Though these three offset options can be carried out independently or only two options can be pursued (Option 1 and Option 3), ideally these three options should be carried out in conjuncture to reduce risks in case of adverse events for one or two of the options.

It is recommended to formulate a detailed “Offset Strategies” based on the selected options. The offset strategy should be formulated based on requirement of IFC PS6 and BBOP Biodiversity Offset Design Handbook. The “Offset Strategies” should be complemented by data from primary surveys (on coral reef community structure, coral species diversity & percentage of live coral cover) to make informed decisions on selecting donor sites (in the case of Options 2 and 3) and suitable offset sites (in the case of Options 1 and 2). Offset strategies also focus on identifying specific experts to be consulted and stakeholders to be engaged, specific actions required to be taken, roles and responsibilities to execute such actions, timeline and ultimately cost estimate of offset.

Ultimately a “Biodiversity Offset Management Plan (BOP)” is recommended to achieve biodiversity objectives to achieve a no-net-loss/ net-gain outcome for impacts to biodiversity values from implementation of Biodiversity Offset.

3.2.3 Economic Displacement Assessment

The following aspects summarise the key outcomes of the EDA:

- **Impacts on Bait Fishing:** Bait fishing is an opportunistic activity and can be undertaken at numerous locations within Maldives. The Gulhifalhu Lagoon will be lost permanently as a bait fishing site as a result of the land reclamation within the lagoon. However, there are a number of alternative bait fishing sites available both within the North Male Atoll and in other Atolls and it is not considered that there will be any significant time or cost implications for the commercial fishers to reach these alternative sites. The impacts to bait fishing sites are expected to lead to interrupted access to a few (3-4) bait fishing sites depending on the dredger's location for a short-term; and monitoring results also show recovery in fish density and live coral cover after a reduction in both during Stage I. Therefore, the impacts to bait fishing sites as a result of the Project activities have been assessed to be **Negligible**.
- **Impacts on fisherfolk dependent on artisanal reef fishing** While the loss of the Gulhifalhu Lagoon is permanent in nature, it was not the only primary site accessed by fisherfolk for reef fishing. The temporary loss of reef fishing sites within the EDA Study Area related to temporary turbidity impacts (both loss of access and potential reduction in fish stocks) is expected to last for the duration of the Project but to be intermittent in nature i.e. it will vary based on the dredging location and associated plume and sediment residence time. Specifically, about 30-40 fisherfolk use the south-west and north-west coast of Villingili for fishing regularly and overall around 50 households among the artisanal fisherfolk may be assessed to be impacted in Villingili. These fisherfolk may be dependent on reef fishing either for household consumption or sale to resorts and local markets. Artisanal fisherfolk in Villingili have been assessed to be impacted with a **Low-Moderate** significance.
- **Impacts on independent dive centres:** It is expected that independent local dive centres will face some interrupted access to dive sites depending on the schedule of Project activities (dredger location, borrow area used), monsoon season, dive sites primarily accessed by the dive centres and the type of changes that the dive centres have to make to their regular activities. The impacts are likely to be in terms of the increased travel time and increased costs they may have to incur in order to access alternative dive sites that are located farther away from the ones they typically access. While the independent dive centres may be able to change and align the sites they access on a daily basis based on the Project schedules, they may also incur additional costs and inconveniences based on the response from their customers to changes that may be unfavourable to them. However, in view of the number of independent dive centre entities being only between 5-10 of the 30 independent dive centres, the impact significance has been assessed to be **Minor**.

Overall, the Project activities will not have any major or significant adverse impacts on the general fisherfolk community accessing the EDA Study Area. Localised impacts to entities dependent upon reefs within the EDA Study Area are envisaged for a medium-term. These entities include the

fisherfolk carrying out artisanal reef fishing on Villingili and independent dive centres catering primarily to locals within the EDA Study Area.

A set of proposed livelihood restoration measures has been outlined that considers group focused interventions focusing on key impacts. Further engagement with the potentially Project affected entities is required in order to discuss the predicted impacts and to obtain further information regarding their artisanal reef fishing / dive centre activities and it is proposed that a dedicated organisation undertakes this activity. Potential mitigation and/or livelihood restoration measures can be discussed directly with the potentially affected entities and the proposed measures and implementation process adjusted accordingly. The proposed livelihood restoration measures are:

- Initial support options while the core restoration measure is set up;
- A set of core restoration measures addressing the potential livelihood impacts on identified potentially Project affected entities:
 - community-based coral farming and reef rejuvenation initiative;
 - a mariculture programme for groupers or sea cucumbers; and
 - dive centres providing monitoring and/ or management support (paid initiative) for the Offset initiative which considers the declaration of a selected Environmentally Sensitive Areas (ESAs) into a Marine Protected Area (MPAs) as part of the Biodiversity Action Plan.
- Suggestions of certain enabling safeguards to enhance and sustain the core restoration measures; and
- Linkage to supporting ESMP mitigation.

Additional measures to be implemented to support the livelihood restoration measures implementation as well as ensure that any unexpected impacts on stakeholders are addressed include:

- Damage Compensation Framework as part of the GRM so that any damage to equipment, boats, fish gear due to activities of the Project and/or its contractors can be compensated; and
- Perceived livelihood loss from any stakeholder within the EDA Study Area which will need to be assessed and evaluated through a local community-based grievance management committee (this committee can potentially be the same as the Committee for Community-based Monitoring Activities); and
- Stakeholder Engagement Plan that is intended to be implemented during Stage II will ensure that there will be prior intimation of the dredging calendar/timelines/safeguards to local councils, resorts, dive centres and the Maldives Fisherfolk Association as a proactive and prior communication initiative.

3.2.4 Rapid Cumulative Impact Assessment

Cumulative impacts occur when a project activity acts together with other past, present or reasonably foreseeable future third party projects or developments and natural or anthropogenic stressors to impact the same environmental or social resource or receptor. Significant cumulative impacts can result from individually minor but collectively major actions taking place over a period of time.

Cumulative impacts are contextual and encompass a broad spectrum of impacts at different spatial and temporal scales. The present Rapid Cumulative Impact Assessment follows the International Finance Corporation's (IFC) Good Practice Handbook - Cumulative Impact Assessment and Management: Guidance for Private Sector in Emerging Markets (IFC 2013). The RCIA involved a desk review of available information, including existing EIAs; review of documents and discussion with relevant stakeholders.

The broad objectives of the RCIA study include the following:

- Delineate the spatial and temporal boundary for this RCIA;
- Identify the Valued Environmental and Social Components (VECs)²⁴ and determine their pre-PUC Stage-1 conditions;
- Identify and map past, present and potential future sources of impact or stress that have the potential to cause cumulative impacts on the selected VECs;
- Assess cumulative impacts and evaluate their significance over VECs compared to PUC Pre-Stage-1 conditions;
- Provide recommendations towards management of cumulative impacts
- Assign responsibilities for management of cumulative impacts

The VEC screening process in details and the outcomes are presented in **Appendix A** of RCIA. Based on the screening process, three VECs have been screened in for consideration under the RCIA:

- VEC 1: Marine water quality
- VEC 2: Coral reef ecosystem and
- VEC 3: Livelihoods dependent upon coral reef ecosystems.

3.2.4.1 Identification of Sources of Impacts for RCIA

Sources of impact were identified from desk research and in consultation with stakeholders. Impact sources were categorised as follows, based on the IFC Good Practice Handbook Guidance:

- Past developments and activities: any past projects or activities with a potential to cause cumulative impacts on VECs together with Stage 2 of the PUC. This includes Stage 1 of the PUC. It needs to be noted here that the study has not identified any other project during / prior to the Stage-1 (projects completed too long ago or not in the RCIA study area etc.) that has the potential to cause cumulative impacts on VECs along with the Stage-2 of the PUC;
- Existing developments and activities: any ongoing projects or activities with a potential to cause cumulative impacts on VECs together with Stage 2 of the PUC. It needs to be noted here that the study has not identified any ongoing project or activity that has the potential to cause cumulative impacts on VECs along with the Stage-2 of the PUC;
- Reasonably foreseeable future actions (RFFAs): proposed projects including new future developments that have a potential to cause cumulative impacts on VECs together with Stage 2 of the PUC; in this regard the RFFAs considered are concurrent with the life cycle of Stage-2 of PUC. The following RFFAs in the RCIA study area have the potential to impose cumulative impacts along with the PUC. The projects are mentioned below:
 - Malé' to Thilafushi Link Project (MTL): The link will be 6.7 km long and comprise of navigation bridges, marine viaducts, connections and interchange points in each of the four islands viz. Malé, Villingili, Gulhifalhu and Thilafushi and roads on Gulhifalhu and Thilafushi Island. All the support services for the construction services are to be based on Thilafushi, Gulhifalhu and Malé'.
 - Proposed Resort Development on K. Giravaru Falhu: Development of two additional resort islands on Giravaru Falhu. In this lagoon, there is Centara Ras Fushi Resort and Spa (previously known as Giravaru Island Resort). On the western half of this lagoon, two islands of 8.3 hectares and 8.7 hectares are proposed with a buffer island of 2 hectares.

²⁴ Valued Environmental and Social Components (VECs) are defined as fundamental elements of the physical, biological or socio-economic environment, (including the air, water, soil, terrain, vegetation, wildlife, fish, birds and land use) that are likely to be the most sensitive receptors to the impacts of a proposed project or the cumulative impacts of several projects

- Natural stressors: Natural influences and drivers such as coral bleaching, storms or wave action, etc.
- Stressors linked to anthropogenic activities: External influences and drivers such as vessel movement, in-migration, tourism and recreational activities, the COVID-19 pandemic, etc.

3.2.4.2 VEC Marine Water Quality

Indicator-Turbidity of Marine Water

The dredging and reclamation increased the turbidity values of the marine water in the area, however the turbidity ranged at the borrow area in between <0.00-4.9 NTU during the Stage-1 activities and they were not found to exceed the threshold value of 5 NTU. Modelled results for Stage-1 showed for TSHD dredging an increase of 10-20 mg/L in surface turbidity values can be expected for a distance of up to 4 to 7 km from the TSHD.

The MTL project will source borrow material from the same primary borrow area of the PUC. Though the volume of borrow material is less, however they will increase the turbidity near the primary borrow area. There would be spatial and temporal overlapping of the project activity with the PUC. The project also proposed an alternate dredging area north west of MPA Giravaru Kuda Haa. Hence, there is a possibility of cumulation of impacts along with the PUC. If two dredgers of PUC and MTL projects operate simultaneously from the same primary borrow area then at worst case scenario sediment plume of one dredger can coincide with the plume of the second dredger. At the same time, there could be simultaneous reclamation activities at Gulhifalhu lagoon for PUC and at Villingili for the MTL project. Simultaneous dredging and reclamation activities may cause cumulative impacts.

Increase in concentration of suspended sediments is expected at the junction of multiple plumes i.e. plumes from PUC and MTL or Giravaru project. At the overlapping areas the concentration of suspended solids and also turbidity is expected to increase. As a worst-case scenario we can consider that at the overlapping areas the SSC concentration may exceed the threshold level of 5 NTU. Activities of the MTL project would contribute to the SSC/turbidity levels in the area and cumulatively there could be further exceedances to the threshold levels during the few instances that there is a combination of the two plumes in time and space. However, as the volume of dredging for the MTL project will be significantly less and duration of dredging will be limited, the cumulation of impacts is assessed to lead to only a minor increase of SSC/turbidity levels over short periods of time compared to the PUC Stage-2 alone.

Furthermore, the sediment plume generated from the alternate dredging area of the Giravaru resort development project in conjunction with the plume generated from the PUC may cause more frequent exceedance in threshold values of turbidity at some locations. However, the alternate dredging location at Giravaru will be used only in case of non-availability of sufficient sand from the inner lagoon of Giravaru. In addition, if dredging at the alternate area will occur it will be limited in scale compared to the Stage-2 of PUC and for a small duration compared to the PUC.

Activities like vessel movement, operation of tourist resorts may contribute to the turbidity levels. Monitoring of turbidity conducted during the pre Stage-1 conditions would inherently reflect the turbidity contributions from the vessel operations and ongoing resort operations. It was found the values were less than 3 NTU at all locations.

Monitoring of turbidity conducted during the pre Stage-1 conditions also inherently reflected the contribution from normal wave action to turbidity levels. It was found the values were less than 3 NTU at all locations. However, during storms rough seas may cause generation and transport of sediments and may increase the sediment concentration beyond 5 NTU for some time periods.

Contribution of Stage-2 of the PUC along with operation of MTL and Giravaru Project and storm & waves, vessel movement, operation of tourist resorts are expected to contribute cumulatively in increase of turbidity values beyond the threshold levels for some periods during the dredging and reclamation of Stage-2 of PUC and can cause deterioration of the water quality. Corals need UV light

for photosynthetic processes. If turbidity is high then these ecosystems will become stressed. Studies suggest that long term turbidity levels which are >3 NTU lead to sublethal stress²⁵. However, long term turbidity levels higher than 5 NTU cause severe stress on coral at shallow depth (Cooper et al., 2008)²⁶.

Indicator-Sedimentation Rate

Higher sedimentation rates can cause smothering of corals and reduce light availability for photosynthesis, reduce live coral percentage and deteriorate the health of the coral reef ecosystem. The Pre Stage-1 Sedimentation Rate (SR) values were higher than the threshold value at some locations. Modelling results indicate that the SR values at sensitive receptors near the borrow areas are expected to be within the threshold value, however, monitored data for sedimentation rates conducted during Stage-1 indicated that some values were higher than the threshold levels for small intervals.

Activities of the MTL project and Giravaru project, along with natural and anthropogenic stressors would contribute to the SR levels in the area along with the Stage-2 PUC activities. However, given the volume of dredging would be less for the MTL and Giravaru project, the levels of the SR in conjunction with the MTL and Giravaru project, may exceed beyond the threshold levels, but is expected to happen for limited duration only and not for the significant time period of Stage-2 activities. Natural process like storms, waves and anthropogenic stressors like vessel movement, operation of tourist resorts may also contribute to SR values higher than the threshold levels at few instances. However, in association with the PUC, the exceedance of threshold levels, if happening, is expected to be for limited duration only.

3.2.4.3 VEC Coral Reef Ecosystem

Indicator-Live Coral Percentage

Primary coral reef assessment surveys indicate that the coral reefs in the RCIA study area are “low” in live coral cover. This “low” live coral cover cannot be completely attributed to anthropogenic activity as coral bleaching etc. in the area resulting in loss of live corals in reefs. Moreover, primary surveys also indicate that coral reefs of the RCIA study area still host and provide refuge to a number of coral reef associated IUCN threatened, near threatened and nationally protected species. It is widely accepted that coral reefs with more live coral cover are healthy and able to host diversity of lifeforms. However, bleached reefs and reefs with low live coral, due to their inherent structural complexity²⁷ can still provide cover from predator, shelter from oceanic currents, provide diverse microhabitat and thus support diverse lifeforms, which would otherwise not have existed in an open ocean. The immediate response of corals to deposition of sediments on their surfaces is an attempt to self-clean by moving sediments to edges where they are dropped off²⁸. A number of other mechanisms including movement of sediment by mesenterial filaments, capture of sediment by nematocysts, and sediment ingestion were identified²⁹.

Cumulative impacts due to dredging and reclamation activity planned in Stage-2, contributions of the MTL project and Giravaru project, coral bleaching storm and wave actions, vessel movements and operation of tourist resorts would contribute to the turbidity and sedimentation levels which could lead to effects of smothering and reduction in live coral percentage. Dredging and reclamation works

²⁵ EIA data collection guideline, Maldives

²⁶ Cooper, T.F., Ridd, P.V., Ulstrup, K.E., Humphrey, C., Slivkoff, M. and Fabricius, K.E. (2008). Temporal dynamics in coral bioindicators for water quality on coastal coral reefs of the Great Barrier Reef, Marine and Freshwater Research, 59 (8), 703–716.

²⁷ Graham, N.A.J. Habitat Complexity: Coral Structural Loss Leads to Fishing Decline.

²⁸ Marshall, S.M., Orr, A.P., 1931. Sedimentation on Low Isles Reef and its relation to coral growth. Brit. Mus. (Nat. Hist.).

²⁹ Ross Jones, Pia Bessell-Browne, Rebecca Fisher, Wojciech Klonowski, MatthewSlivkoff. 2016. Assessing the impacts of sediments from dredging on corals. Marine Pollution Bulletin 102 9–29.

during Stage-1 also indicated there is reduction in live coral percentage during the Stage-1 activities compared to the Pre-Stage-1 and at majority of the monitored sites. Coral bleaching could contribute to reduction of live coral percentage, however, mass coral bleaching affecting the entire reef area within the RCIA study area does not necessarily happen each year and there is a possibility that it may not happen during Stage-2 activities. Smothering effects due to Stage-2 could be more pronounced at the time of bleaching events and may negatively affect the live coral percentage. The primary sand borrow area overlaps with the designated anchorage areas for vessels by the Maldives Ports Limited. Hence, there would be movement of vessels in the area apart from the movement of the dredgers. Vessel movement can also increase the expanse of sediment plume and increase turbidity and sedimentation and affect the coral reefs.

As mentioned earlier, live coral percentage during Stage-1 also revealed signs of recovery post Stage-1, hence, the cumulative impacts are considered reversible.

Indicator-Percentage of Crustose Coralline Algae

Dredging and reclamation at the Gulhifalhu for Stage-2 will cause increase in sediment and turbidity of marine water. Sediments will deposit on the reef areas and cause smothering of the CCA. CCA cover is reportedly affected by sediment deposition, water clarity, and the steepness of the reef slopes³⁰. CCA are a prominent element of healthy reef communities³¹. CCA occupy the open space on reefs. If a reef suffers from human disturbance (e.g. pollution, increased sedimentation), the abundance of CCA decreases³². CCA percentage indicate the resilience of reef after a disturbance³³.

Cumulative impacts due to dredging and reclamation activities planned for Stage-2, contributions of the MTL project and Giravaru project, coral bleaching, storm and wave actions, vessel movements and operation of tourist resorts would contribute to the turbidity and sedimentation levels which could lead to smothering and reduction in CCA percentage. Dredging and reclamation works during Stage-1 also indicated there is reduction in CCA percentage during the Stage-1 activities compared to the Pre-Stage-1 and at majority of the monitored sites. Smothering effects due to Stage-2 could be more pronounced at the time of bleaching events and may negatively affect the CCA percentage and reduction of CCA percentage. However mass coral bleaching affecting the entire reef area within the RCIA study area do not happen each year and there is a possibility that it may not happen during Stage-2. Cumulative impacts from individual residual impacts of (post mitigation measures of individual projects) Stage-2 along with past projects and RFFAs may impact a small part of coral reef ecosystem within the RCIA study area. CCA during Stage-1 also revealed signs of recovery post Stage-1, hence, the cumulative impacts are expected to be reversible.

Indicator-Reef associated Fish Density and Richness

Dredging and reclamation at the Gulhifalhu for Stage-2 will cause increase in turbidity of marine water. The proposed MTL project and Giravaru Resort development along with the PUC will contribute cumulatively to turbidity concentration of the marine water in the RCIA study area. Cumulative impacts due to dredging and reclamation activity planned in Stage-2, contributions of the MTL project and Giravaru project would contribute to the SSC levels, which could lead to turbidity levels that could reduce light penetration in the affected area. As a consequence, increased turbidity

³⁰ <https://eatlas.org.au/content/crustose-coralline-algae-and-sedimentation>

³¹ Sandin SA, Smith JE, DeMartini EE, Dinsdale EA and others (2008) Baselines and degradation of coral reefs in the Northern Line Islands. PLOS ONE

³² Vermeij MJA, Dailer ML, Walsh SM, Donovan MK, Smith CM (2010) The effects of trophic interactions and spatial competition on algal community composition on Hawaiian coral reefs. PSZN I: Mar Ecol 31:291–299

³³ Sebastian Teichert, Manuel Steinbauer & Wolfgang Kiessling. 2020. A possible link between coral reef success, crustose coralline algae and the evolution of herbivory. Scientific Reports 10:17748.

that lowers light intensity can reduce fish abundance and diversity^{34 35} and modify trophic structures³⁶. Fish community parameters, such as abundance and diversity, are usually correlated with specific habitat features, such as live coral cover³⁷ and density of macroalgae³⁸. In some cases greater abundances of herbivore and planktivore fishes would be expected in more turbid sites due to more nutrient and phytoplankton availability³⁹ and this could explain the fact that fish density and richness were higher during the Stage-1 stage compared to Pre-Stage-1 and Post Stage-1 values. However, when turbidity gets too high, productivity and algal cover are reduced and can only support small populations of herbivores⁴⁰. Hence, if turbidity gets increased due to the cumulative impacts of dredging of PUC, MTL and Giravaru project there could be negative impact on the fish diversity and richness in the RCIA study area.

Vessel movement can also increase the expanse of sediment plume and affect the coral reefs and in turn can affect the fish density and richness. Natural stressors like coral bleaching, storm and wave actions could contribute to reduction of live coral percentage and thus can reduce fish density and richness. Cumulative impacts due to dredging and reclamation activities planned in Stage-2, contributions of the MTL project and Giravaru project, coral bleaching, storm and wave actions, vessel movements and operation of tourist resorts could contribute to reduction of fish density and richness. Smothering effects due to Stage-2 could be more pronounced at the time of bleaching events and may negatively affect the live coral percentage. Cumulative impacts from individual residual impacts of (post mitigation measures of individual projects) Stage-2 along with past projects, RFFAs may impact a small part of coral reef ecosystem, for a short term within the RCIA study area. As mentioned earlier, adult fish may avoid areas with high turbidity, hence, the cumulative impacts are not likely to cause loss in viability of fish population in the RCIA study area.

3.2.4.4 Livelihoods Dependent upon Coral Reef Ecosystems

Indicator- Access to reef fishing sites that support artisanal fisherfolk

The potential cumulative impacts to artisanal reef fishing livelihoods are likely to be limited to the following areas:

- House reefs to the north-west, south-west corners of the Villingili island as well as along the southern rim of Villingili and in the channels between Villingili and Gulhifalhu; and
- Channel between Giravaru and Thilafushi which are currently alternate sites in close proximity of Villingili island.

In view of the overlapping timelines of the PUC and the RFFAs (1.5 to over 2 year duration), as well as the intensity from the sources of impacts at multiple locations used for reef fishing (impacts may occur around the same time in and around reefs near Villingili as well as Giravaru and Thilafushi); the magnitude of impact is assessed to be Medium.

It is known from the stakeholder feedback that artisanal reef fisherfolk have experienced interrupted access due to Stage 1 and have continued to fish in their house reef even after facing a decline in

³⁴ Amesbury SS (1981) Effects of turbidity on shallow-water reef fish assemblages in Truk, Eastern Caroline Islands. Proc 4th Int Coral Reef Symp, Manila 1: 155–159

³⁵ Mallela J, Roberts C, Harrod C, Goldspink CR (2007) Distributional patterns and community structure of Caribbean coral reef fishes within a river-impacted bay. J Fish Biol 70: 523–537

³⁶ Harmelin-Vivien H (1992) Impact of human activities on coral reef fish communities in French Polynesia. Cybium 16: 279–289

³⁷ Lewis AR (1997) Effects of experimental coral disturbance on the structure of fish communities on large patch reefs. Mar Ecol Prog Ser 161: 37–50

³⁸ Levin PS (1993) Habitat structure, conspecific presence, and spatial variation in the recruitment of a temperate reeffish. Oecologia 94: 176–185

³⁹ Fabricius K, De'ath G, McCook L, Turak E, Williams DM (2005) Changes in algal, coral and fish assemblages along water quality gradients on the inshore Great Barrier Reef. Mar Pollut Bull 51: 384–398

⁴⁰ Ivonne Bejarano, Richard S. Appeldoorn. 2013. Seawater turbidity and fish communities on coral reefs of Puerto Rico. Marine Ecology Progress Series. 474: 217–226.

catch. Given the potential difficulties that fisherfolk in Villingili may experience in accessing alternative sites due to the PUC, MTL and Giravaru project, their vulnerability is assessed to be Medium.

The cumulative impacts of dredging of PUC, MTL and Giravaru projects on the turbidity and the impact from natural and anthropogenic stressors will have an impact on the availability of fish stocks in the Project AOL. Additionally, the interrupted access to the house reefs and difficulty for the fisherfolk in Villingili to access alternative sites will lead to a Medium cumulative impact significance rating.

Indicator- Access to dive sites that support independent dive centres

Cumulative impacts due to dredging and reclamation activity planned in Stage-2, Stage 1 impacts, contribution of impacts due to the MTL project, natural stressors (coral bleaching, storm and wave actions) and the anthropogenic stressors (overfishing, fishing waste, damages due to safari anchors and COVID-19) contribute to either the loss of access or interrupted access to dive sites. The loss of access due to Stage 1 was limited to the Gulhifalhu lagoon, while the MTL project exacerbates the interrupted access to the Villingili House Reef making it inaccessible for dive centres to use during the construction phase as well as the operational phase.

As identified in the EDA, the independent dive centres usually visit their house reef and other dive sites located close to their islands. Therefore, for the independent dive centres in Villingili and Malé that have been identified to be impacted in the EDA, the impacts are exacerbated given the MTL project. The EDA has identified impacts from the PUC that may lead to interrupted access over the medium term (1-2 years). The dive centres will have to market and travel to alternative dive sites within and outside of the EDA Study Area. However, these dive centres identified will now face long term loss (over 2 years) of access to the Villingili House Reef. In addition, dredging as well as movement of vessels for the PUC, the resort and the MTL project will require the dive centres to adapt their diving schedules and itineraries taking into account dredging schedules and vessel movements for ~ 2 years.

Therefore, the impact magnitude is considered to be medium as the duration of impact on the 5-10 independent dive centres identified to be impacted by the PUC has increased. Their vulnerability is considered to be medium as they will have to shift their activities to dive sites away from the Villingili House Reef thus potentially incurring additional costs. They may also face a possible decline in their customers who may either choose to not travel a longer distance or simply opt for an alternative dive centre that is able to offer them access to alternative locations without increased costs. Therefore, the cumulative impact is assessed to be medium.

3.2.5 Climate Change Risk Considerations

The Climate Change Risk Considerations documented the climate change risk considerations during the Project design by the Local Consultant, as well as information provided by the Contractor, and publicly available information. Further recommendations are also proposed for the future developments of the overall Gulhifalhu reclamation.

The Project location is prone to Tsunami, storm surge and sea level rise risks. Main results are summarised as below:

- **Tsunami risk:** According to Multihazard risk analysis, Maldives (UNDP, 2020), the Project is located in Zone 5 (i.e. the highest risk from Tsunami hazard), where the probable maximum wave height ranges from 3.2 m - 4.5 m. The return period of a tsunami wave at a height of 2 m is 50 years.
- **Storm surge risk:** The Project falls into low risk zone of the Surge Hazard Zoning map according to Multihazard risk analysis, Maldives (UNDP, 2020). A storm tide of a height of 1.15 m is predicted to be an event of 1 in 50 years.

- Sea level rise: The Project has mainly adopted the result for future sea level rise from a climate change projection undertaken for a nearby project. The results of the projection suggest the sea level is projected to rise 0.13 m by the end of 2040s.

The design life of the Project is 25 years and a design return period of 50 years is adopted. 'The elevation of land platform to be reclaimed is 2 m in accordance with the default design elevation used by government reclamation projects. Compared with the average elevation of nearby islands, the actual experience suggests that the relatively high elevation of 2 m is able to withstand major impacts during the Indian Ocean Tsunamis and subsequent flood events. In terms of the shore protection, the structure is designed to be at a height of 2.8 m taken an extreme wave height of + 1.3 m MSL into consideration under two scenarios.

Besides the specific guidance under each of alert level imposed by Maldives' alert system, the Contractor will follow some additional measures before, during and after a storm, as detailed in the report **Appendix G**.

4. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The Environmental and Social Management Plan (ESMP) provides a framework for the management of environmental and social issues going forward for the Project. The overall responsibility for the implementation of the ESMP lies with the Project Proponent. The Project Proponent may delegate items to the Contractor to action. Regardless of the delegation of items for action, the Proponent remains responsible for ensuring the management and implementation of the ESMP items.

The ESMP has summarized the recommendations and action items across all of the following E&S documentation prepared for the Project:

- Environmental Impact Assessment (EIA) Report (2020);
- EIA Addendum (2021)[#];
- Human Rights Impact Assessment;
- Critical Habitat Assessment and Biodiversity Action Plan;
- Economic Displacement Assessment^{*};
- Rapid Cumulative Impact Assessment; and
- Climate Change Risk Considerations

Note

(#) The EIA Addendum, capturing details of the second alternative borrow area, is at the time of writing of this report still being developed. The action items from the document will be incorporated into the ESMP once it has been finalized.

(*): For the Economic Displacement Assessment, the outcome is a set of proposed Livelihood Restoration Measures (LRM). The proposed LR Measures have not been included in the ESMP until such time as the proposed measures have been discussed directly with the potentially impacted entities. Once this step has been completed, and a set of final measures has been agreed, the ESMP will be updated and a summary of the agreed measures included.

The ESMP has been structured as follows:

- Action Item or Recommendation as identified in the aforementioned studies;
- Proposed implementation party (either Proponent or Contractor);
- Tentative timelines for implementation of the action item/recommendation and justification for the same; and
- Associated management plan that manages and monitors the activity for review during the implementation phase.

The ESMP table has been provided in Table 4-1.

As the items in the table have been drawn from both the EIA and the Supplementary ESIA, they have been collated, for ease of reference and to reduce a certain element of repetition, into a set of relevant topic headings in the table which are not necessarily an exact match with the original topic allocations in the source documentation. Following the finalisation of the Supplementary ESIA studies, a final ESMP will be prepared focusing on the practical implementation of the ESMP commitments.

Monitoring & Evaluation is a key activity related to the management and implementation of the ESMP. A number of the action items/recommendations will have an ongoing monitoring component across the Stage II of the Project and potentially beyond that. As for the ESMP, the implementation of the Monitoring & Evaluation activities remains the responsibility of the Project Proponent although the Proponent may delegate items to an implementation party, such as the Contractor.

Monitoring & Evaluation activities will be incorporated into the relevant management plans (see Table 4.1 and Section 4.1 for a list of plans) and each plan will contain a dedicated monitoring section with a plan of monitoring and evaluation activities. For each of these sections in the various plans the following issues will be addressed:

- Frequency of monitoring: the periodicity of the monitoring across environmental, social and biodiversity parameters for easy reference and follow-up;
- Monitoring parameters: the parameters being monitored;
- Monitoring specifications: specific aspects that need to be evaluated (e.g. water quality aspects) as part of the monitoring process; and
- Measurable outcome: the indicators/outcome of the monitoring process that can be reviewed and evaluated to determine status

Table 4.1 Environmental and Social Management Plan

Action Item/ Recommendation	Source	Proposed Action Party	Implementation Timeline	Associated Management Plan
Noise Pollution Management				
Properly tune and maintain all vehicles and machinery	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Monitor all occupation areas (construction areas) to ensure noise levels do not exceed OHSA standards and provide appropriate PPE where noise levels cannot be reduced	EIA 2020	Contractor	Throughout the Project	Work Method Statement
Where possible, avoid shore protection and rock handling works on the eastern end facing Villingli between 11 pm and 6 am	EIA 2020 (impacts on tourism)	Contractor	Throughout the Project	Work Method Statement
Air Pollution and GHG Emissions				
All vehicles and construction equipment must be maintained and properly tuned in accordance to manufacturer's specifications.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
All equipment shall be checked to determine if they are in proper condition prior to commencement of construction activities.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Construction equipment idling times shall be minimised by shutting equipment off when not in use.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Marine Water Quality Degradation				
All reclamation works should be undertaken behind bund at least on sides facing the reef slope or sea. Particular attention is required in the vicinity of Hans Haas Place. The bund or containment measures should sufficiently enclose the reclamation area to minimise sediment plumes leaving the project footprint during filling. Given the deep water and narrow shallow reef flats on Gulhifalhu, it is	EIA 2020	Contractor	Prior to start of dredging and reclamation activities with TSHD	Work Method Statement

acceptable to contain only the rim of the reef system. The preliminary plan, as included in Chapter 2 of the EIA, for bund walls can be modified in consultation with the environmental consultant but the basic principle of containing the turbidity plumes to the Project footprint as much as possible must be followed.				
Where practical silt screens or a similar curtain can be used to complement the sand bunds and contain sediment plumes at any turbid water exist points, and protect marine life.	EIA 2020	Contractor	Prior to start of dredging and reclamation activities with TSHD and throughout the Project	Environmental Management Plan
The impacts from dredging the borrow area is more difficult to control. The most important mitigation measure is to control the overflow on TSHD to minimise impacts during loading into the hopper. The proposed TSHD for this project has a Green Valve installed in the overflow structure, which can be switched on if necessary. Routine monitoring and maintenance must be undertaken to ensure that the Green Valve is functioning adequately.	EIA 2020	Contractor	Throughout the Project	Environmental Management Plan
In the areas defined as "Controlled Overflow" in Figure 8.1 of EIA Report, the Green Valve will always be switched on. If the Green Valve fails for any reason, overflow will be minimized or avoided. If the Green Valve fails or needs to be turned off for any reason, overflow shall be minimised or avoided, in the areas defined as "Controlled Overflow" in the EIA Report.	EIA 2020	Contractor	Throughout the Project	Environmental Management Plan

If the Green Valve fails, minimize or restrict TSHD overflow				
If practical, it is advised to restrict dredging during mass coral spawning periods. Predictions and visual observation should be undertaken by a qualified marine biologist to identify spawning events which usually takes place between April and May spring tides. Many species of corals reproduce during one night of the year and different species may have different spawning periods. The marine biologist or the environmental consultant should determine if spawning is going take place, and where it is taking place within the footprint of the Project and advise the contractors. If practical, it is advised to stop dredging and reclamation works at least for 12 days – 5 days before and 7 days after spawning. In case the date is missed, dredging can be ceased for 7 days after spawning event is detected. Daily monitoring by marine biologist is recommended during this period.	EIA 2020	Proponent	Throughout the Project	Environmental Management Plan
Maintain a threshold level for sedimentation among the identified monitoring sites within atoll lagoon, in proximity to the borrow site, to not exceed a maximum of 15mg/cm ² /day for at least 20% of the measurements. Exceptions shall be made where background rates presented in this report exceeded the threshold rates (including T-9 (Hans Hass Place), T- 13 (Lion's head - Thilafushi), T-27 (Baros), T-28 (Banana Reef), T- 32 (Bandos)); and in reefs where	EIA 2020	Proponent and Contractor	Throughout the Project	Environmental Management Plan

extensive reclamation work has been undertaken (including e.g. Thilafushi, Gulhifalhu, Villigili, Malé, Hulhumalé). Considerations shall also be made to account for naturally elevated sedimentation levels which may occur during storm events or bad weather.				
Maintain a threshold level for turbidity at all reefs within the atoll lagoon in proximity to the dredging site, measured as Total Suspended Solids (TSS) to a maximum of 10 mg/L not exceeding 20% of the measurements (see monitoring chapter). Exceptions shall be made where background rates exceeded the threshold level and in reefs where extensive reclamation work has been undertaken. Considerations also shall be made to account for naturally elevated levels of turbidity which may occur during storm events or bad weather.	EIA 2020	Proponent and Contractor	Throughout the Project	Environmental Management Plan
Complete dredging and reclamation works in shortest time period possible. Contingencies should be planned ahead in the event of dredger or key equipment failure as has been witnessed in some other reclamation projects in the Maldives. If work needs to be stopped for an unforeseen reason for an extended time (over a year), all temporary sand bunds placed must be secured from erosion or removed.	EIA 2020	Proponent and Contractor	Throughout the Project	Environmental Management Plan
Rainbowing shall not be used as a method for reclamation or filling.	EIA 2020	Contractor	Throughout the Project	Work Method Statement

Excavator movement should stick to predefined routes for travel along the reef.	EIA 2020	Contractor	Throughout the Project	Environmental Management Plan
Regularly monitor floating pipelines for leakage and fix leaks identified before the next load.	EIA 2020	Contractor	Throughout the Project	Environmental Management Plan
All staff involved in dredging and reclamation works must be briefed on the sensitivity of the reef and the mitigation measures proposed in the EIA report.	EIA 2020	Contractor	Throughout the Project	Environmental Management Plan
Monitor the level of Turbidity and Sedimentation Rate on select locations to verify that the sediment containment measures are effective (see Monitoring section).	EIA 2020	Proponent and Contractor	Throughout the Project	Environmental Management Plan
Supervise all construction activities to ensure that large vehicles and dredger do not move outside the project boundary, and ensure the reef flat levelling is restricted to the required area only.	EIA 2020	Contractor	Throughout the Project	Environmental Management Plan
Place buoys to clearly identify reef edges along the path of major traffic routes that may be affected due to turbidity. Buoys can be deployed after monitoring the turbidity patterns.	EIA 2020	Contractor	Throughout the Project	Environmental Management Plan
Marine Habitat Loss and/or Degradation				
Clearly mark the dredging (for channel excavation) and reclamation boundaries, and ensure no dredging, or reclamation are conducted outside these boundaries. For TSHD, the ships navigation system ensures dredging is undertaken within the boundary.	EIA 2020	Contractor	Prior to start of work and to be monitored prior to any dredging/reclamation activities	Environmental Management Plan
Instruct all construction workers to strictly restrict all construction activities within the marked boundaries.	EIA 2020	Contractor	Throughout the Project	Environmental Management Plan

Relocate coral colonies from the reclamation footprint, where possible. The following options should be considered. a. Relocate as many smaller colonies as possible from the reclamation footprint to suitable nearby locations and nurseries. b. Attempts could be made to move some of the moderately large coral colonies. c. For all remaining colonies and where relocation of corals is not feasible/practical, proponent should discuss with the Ministry of Environment to identify possible mechanisms to offset the loss. This includes funding conservation measures at other protected marine site(s) in Maldives.	EIA 2020	Proponent	Prior to the start of dredging & reclamation activities with the TSHD	Environmental Management Plan
Dredge vessel should not enter a marine protected area during dredging or when returning with a full hopper.	EIA 2020	Contractor	Throughout the Project	Environmental Management Plan
Construct a barrier of 1m x 1m x 1m sand filled bags that should reach above high-tide level between the outer reef edge and sand bund. The barrier should be placed before the bund construction starts, so that sediment plume is minimized. For Stage II, increased height of the row of big bags, to reduce the mixing of water that is occurring in high tide conditions as observed in Stage I. The high tide conditions were passing over the big bag arrangement and therefore reducing its efficacy as a mitigation measure to contain turbidity from bund construction activities. The row of big bags (with increased height) will be placed before the start of bund construction, which is expected to eliminate the need for	Supplementary ESIA (CHA)	Contractor	Prior to start of land reclamation and before completion of permanent revetment	Environmental Management Plan

temporary construction stoppages to mitigate spreading of plumes towards Villingili.				
Given that the coral habitats within Gulhifalhu lagoon will be permanently lost due to burial or sedimentation, and that there is no practical mitigation measure to save them within the project timeframe, it is recommended to compensate the loss by substantially funding marine conservation efforts by NGOs or Conservation Groups in the Maldives	EIA 2020	Proponent	During the Project's timeline	Biodiversity Action Plan
A Biodiversity Offset Plan (BOP) should be developed for the Project after evaluating feasibility of the following offset options that are further detailed in the CHA-BAP: <ul style="list-style-type: none"> ■ Improve protection status of Environmentally Sensitive Areas (ESAs) to Marine Protected Areas (MPAs). The selected ESAs should ideally be in the AoI of the Project (Figure 3-1) or if not possible, in the EAAA of the Project (provided in CHA-BAP); ■ Support community-based coral farming and reef rejuvenation projects in offset areas. Generally rejuvenation of degraded reef is a cost intensive process but community-based coral farming and using such coral to rejuvenate degraded parts of offset sites can be a cost effective option and such initiative can also provide alternate livelihood options for local communities; and/ or ■ Post-Project reef should be created at Gulhifalhu using the permanent revetment structure to create 	Supplementary ESIA (CHA)	Proponent	During the Project's timeline	Biodiversity Offset Plan

appropriate hard substrate for resident species as rock revetment can provide ideal hard substrate for development of future coral growth. <ul style="list-style-type: none">○ Offset Measure for <i>Helcogramma larvata</i> (Critical Habitat Trigger) - The 4.5km long rock revetment at Gulhifalhu is expected to provide suitable habitat for the species. Moreover, the species was recorded from Male' Island, so proximity of Gulhifalhu to Male' makes Gulhifalhu a suitable Offset site for <i>Helcogramma larvata</i>.				
The expansion of an existing Marine Protected Area, or the designation of a new Marine Protected Area and enforcement of its protection: It is also recommended to assess and declare a new Marine Protected Area in North Malé Atoll to compensate for the expected impacts on Hans Hass Place during construction and from future operations on the island.	EIA 2020	Proponent	During the Project's timeline	Biodiversity Offset Plan
Waste and Contamination (groundwater and soil)				
Oil, solid waste & hazardous waste handled carefully & transported in sealed containers.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
All paints, lubricants, and other chemicals used on site stored in a secure and bunded location	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
General refuse stockpiled in one central area	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Keep spill clean-up materials readily available	EIA 2020	Contractor	Throughout the Project	HSE Management Plan

Train workers in spill prevention and clean-up, and designate responsible individuals	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Properly tune and maintain all machinery	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Carry out construction activities under the supervision of a suitably experienced person	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Septic tanks systems must be installed on any temporary toilets constructed on the newly reclaimed land.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Reduced Landscape Integrity/Scenery				
Future, landscape planning must consider limiting aesthetic impacts on Villigili by wherever possible using vegetation as a screen on its eastern side to hide activities on Gulhifalhu.	EIA 2020	Proponent	Port Design	Port Development Vegetation Plan
Natural Hazards				
Possibility of seasonal wave over topping exists on the southern shoreline. Landscape planning must consider limiting the effects of over topping on any land use in the vicinity.	EIA 2020	Proponent	Port Design	Port Development Plan
Changes to Hydrodynamics				
Monitor the changes to current speed within Villigili channel	EIA 2020	Proponent	Post-construction	Environmental Management Plan
If there is an increased speed: <ul style="list-style-type: none"> ■ Monitor scouring at the toe of breakwater and revetment on the western side of Villigili, which is in close proximity to reef edge (see monitoring programme). If scouring is present, inform Ministry of Planning National Infrastructure. ■ Place safety signs on Villigili beach warning of increased currents, if required. 	EIA 2020	Proponent	Post-construction	Environmental Management Plan
Changes to Coastal Processes				

Monitor coastal changes at Villingili Island as defined in monitoring programme.	EIA 2020	Proponent	Throughout the Project	Environmental Management Plan
Where possible or practicable, dredge vessel to limit the movement through Villingili channel to minimize boat wake related erosional pressure when possible/practical.	EIA 2020	Contractor	Throughout the Project	Environmental Management Plan
Risks to Occupational Health and Safety				
Construction workers operating equipment that generates loud noise should be equipped with appropriate hearing protection. As a guide, workers operating equipment generating noise of > 80 dBA should wear ear mufflers and workers experiencing prolonged noise levels > 70 dBA must wear ear plugs.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Employees to be fit for duty according to Contractor's HSE requirements.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Necessary safety gear will be worn at all times. These include safety gloves, construction boots, facemasks, earmuffs, etc. according to Job Hazard Analysis requirements.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Fire extinguishing equipment would be readily available and employees will be familiarised with its use.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Oxygen, acetylene or LPG bottles will be stored properly.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
First aid kits will be made available on site.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
The construction site will be visibly closed to unauthorised personnel.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Risk to Public Health and Safety				

Announce on public media a safety notice regarding dredger activities and reclamation works on Gulhifalhu.	EIA 2020	Proponent	Prior to start of dredging works	Stakeholder Engagement Plan
Coordinate with marine traffic police all activities related to dredging with in the major local travel routes out of Malé.	EIA 2020	Proponent	Prior to start of dredging works	Stakeholder Engagement Plan
Warning signs, barricades or warning devices will be provided and used.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Based on turbidity patterns on site, deploy buoys to clearly identify the reef edges along the path of boats that may be affected due to turbidity.	EIA 2020	Contractor	Throughout the Project	HSE Management Plan
Increase in Demand for Resources/Services				
Use temporary power generators for the project site if STELCO cannot provide sufficient power for the project.	EIA 2020	Contractor	Throughout the Project	Work Method Statement
Coordinate with Gulhifalhu Ferry Operators on the anticipated travel requirements for Project teams to ensure enough ferry space is available for the Project staff and locals.	EIA 2020	Contractor	Throughout the Project	Work Method Statement
Impact on Marine Traffic				
Publicly inform all boats using the Malé region including resorts and ferries regarding dredger activities.	EIA 2020	Proponent	Throughout the Project	Stakeholder Engagement Plan
Inform Maldives Transport Authority and Maldives Ports Limited in a timely manner to remove vessels at anchorage to temporarily shift vessels as required.	EIA 2020	Proponent	Throughout the Project	Stakeholder Engagement Plan
Inform Marine Police and Coast Guard on the Project schedule and regularly coordinate with them to minimize incidents, given that the area is a high traffic zone.	EIA 2020	Proponent	Throughout the Project	Stakeholder Engagement Plan

Contractor to consider start dredging in areas with no ships anchored and request for moving ships only if necessary	EIA 2020	Contractor	Prior to start of works and continuously as required during the Project activities	Stakeholder Engagement Plan
Share the dredging schedule in advance and coordinate with MPL to shift the vessels anchorage which are in the path of the dredger if required.	EIA 2020	Proponent	Prior to start of works and continuously as required during the Project activities	Stakeholder Engagement Plan
Regularly coordinate with the Marine Traffic Police and Coast Guard with regard to movement of their vessels. The boats and ferries operating within the Male region should also be continuously kept updated about the dredging activities, as proposed in the EIA.	Supplementary ESIA (HRIA)	Proponent	Prior to start of works and continuously as required during the Project activities	Stakeholder Engagement Plan
Social Impacts and Livelihoods				
<ul style="list-style-type: none"> ■ Inform all resorts within a 5 km radius of dredging site, all dive centres in Malé Atoll, Whale Submarine operators and Villigili Dive schools/centres about the project work plan to help them prepare for the construction stage. ■ Inform resorts in the Project area about the Project work plan to help them prepare for the construction phase. ■ Inform Villingli community and nearby resorts on the overall plans and reclamation schedule. ■ Adequate and timely communication to the potentially affected fisherfolk and dive centres on the schedule, type and time period of the Project activities so that they can plan their activities accordingly. ■ Stakeholder Engagement Plan that is intended to be implemented during Stage II will ensure that there will be prior intimation of the dredging calendar/timelines/safeguards to local 	EIA 2020 (noise pollution, resource use conflicts, impacts on tourism) / Supplementary ESIA (EDA)	Proponent	Prior to start of works and continuously as required during the Project activities	Stakeholder Engagement Plan

councils, resorts, dive centres and the Maldives Fisherfolk Association as a proactive and prior communication initiative.				
Identify and inform resorts of a person responsible for liaising (CLO) with resorts on their complaints and requests.	EIA 2020	Proponent	Prior to start of works and continuously as required during the Project activities	Stakeholder Engagement Plan
Where possible, perform dredging in areas closest to resorts during night time, to reduce visual impacts due to turbidity and ship presence for guests.	EIA 2020	Contractor	Throughout the Project	Work Method Statement
Ensure that fisherfolk and local dive centres have access to the Project Community Grievance Redressal Mechanism Damage Compensation Framework to be included as part of the Community GRM so that any damage to equipment, boats, fish gear etc due to activities of the Project and/or its contractors can be compensated Perceived livelihood loss from any stakeholder within the EDA Study Area which will need to be assessed and evaluated through the Project Community Grievance Redressal Mechanism.	Supplementary ESIA (EDA)	Proponent	Prior to start of works and continuously as required during the Project activities	Stakeholder Engagement Plan
Inclusion of representatives of fisherfolk and local dive centres as part of Stage 2 Community-based Monitoring Activities.	Supplementary ESIA (EDA)	Proponent	Prior to start of works and continuously as required during the Project activities	Environmental Management Plan
Livelihood restoration measures as agreed via the process outlined in the Economic Displacement Assessment (EDA).	Supplementary ESIA (EDA)	Proponent	Prior to start of works, throughout the Project and post-construction	Activity-Wise Sub-Plans for Proposed LR Measures
Stakeholder Engagement				
Inform and consult all stakeholders at all stages of the Project	EIA 2020	Proponent	Prior to start of dredging, land reclamation and revetment	Stakeholder Engagement Plan

			works and continuously as required during the Project activities	
Implement the Grievance Redress Mechanisms as proposed in the EIA to address complaints regarding the project activities.	EIA 2020	Proponent	Prior to start of dredging, land reclamation and revetment works and continuously as required during the Project activities	Social Management Plan
Review and update the Project's Stakeholder Engagement Plan to incorporate specific safeguards from EP 4 (2020) and IFC PS 1 (2012) which will include: <ul style="list-style-type: none"> ■ Develop a mechanism (website and in-person meetings) disseminate information on the Project status, ongoing activities, likely impacts and control measures (including islands around borrow areas); this can be done on an on-going basis, to be determined by the SEP to be developed; ■ Ensure vulnerable groups within identified stakeholders are specifically mapped out and included for engagement; ■ Ensure implementation of Grievance Mechanism by the Sub-Contractor. Any grievances received by the Sub-Contractor from external stakeholders may be directed to the Project's grievance mechanism for overall coordination and monitoring (recording, tracking and redressal). ■ Record and document all stakeholder engagement activities in a central database; ■ Recruit and engage Project's Community Liaison 	Supplementary ESIA (HRIA)	Proponent	Prior to the mobilization of contractors or workers to the site for reclamation works in Stage II	Stakeholder Engagement Plan

Officer(s) (CLO(s)), to be deputed full time during the reclamation activities and before/after through appropriate engagement techniques (commensurate with projects activities as there will not be full engagement post-construction).				
Human Rights				
The Contractor will ensure the implementation of the it's relevant corporate policies across the Gulhifalhu Stage II process and will extend applicability of these policies to any subcontractors commissioned for the Project: Contractor Supplier Code of Conduct.	Supplementary ESIA (HRIA)	Contractor	Prior to and on an ongoing basis as part of Stage II contractor mobilization	Contractor Supplier Code of Conduct
Implement the following provisions of the Contractor Human Rights and Labour Policy: <ul style="list-style-type: none"> ■ No forced labour, modern slavery or human trafficking; ■ No child labour; ■ Freedom of association, right to collective bargaining and employee representation; ■ Work culture; ■ No discrimination and harassment; ■ Equal opportunities, talent development and diversity; ■ Safety and health; ■ Labour conditions; and ■ Community engagement. 	Supplementary ESIA (HRIA)	Contractor	Prior to and on an ongoing basis as part of Stage II Contractor mobilization	Contractor Human Rights and Labour Policy
In the event security personnel/ agencies are engaged at the Site, develop and implement Contractor Security Management Plan, to be integrated into the existing HSE Plan.	Supplementary ESIA (HRIA)	Contractor	Prior to and on an ongoing basis as part of Stage II Contractor mobilization	Contractor HSE Plan

In the Labour and Content Management Plan include measures on addressing Gender-based Violence and Harassment (GBVH), which should be in line with IFC's Good Practice Note on Addressing Gender-Based Violence and Harassment in the Private Sector. The plan should specify the Project's commitment to non-tolerance of GBVH and also specify the behaviours expected of workers, as well as training and reporting requirements.	Supplementary ESIA (HRIA)	Contractor	Prior to the start of Stage II of the Project	Addendum to the Human Rights and Labour Policy
Develop a Corrective Action Plan as part of the Environmental, Social and Governance Supply Chain Management Plan, prior to the commencement of Stage 2. The Corrective Action Plan will address ESG gaps identified as part of the Supply Chain Risk Assessment and capture recommendations based on the Human Rights Impact Assessment, and propose actions to be undertaken by subcontractors and suppliers to address these gaps within defined timeframes. The Corrective Action Plan shall further: <ul style="list-style-type: none">■ Assess information received from the Supply Chain Questionnaires from suppliers, including FSM (basis information and access provided), and complete in case of any gaps in information■ Include guidance to audit as per the 11 ILO indicators of forced labour■ Mandate an annexure to any further purchase orders by the Sub-Contractor requiring suppliers to provide an undertaking specifying the suppliers' obligations to confirm with the applicable laws on employment terms as well as working conditions as well as the Contractor's Supplier Code of Conduct.	Supplementary ESIA (HRIA)	Contractor	Prior to and on an ongoing basis as part of Stage II contractor mobilization	Corrective Action Plan

Contractor will undertake monitoring of subcontractors and supplier based on the Supplier Code of Conduct				
Labour and Working Conditions				
Implement Contractor Human Resources Management Plan which will be renamed as Labour and Local Content Management Plan. The following aspects are presently covered and will be further updated for Stage II: <ul style="list-style-type: none"> ■ Labour standards which include guidelines on working hours and conditions as well as accommodation; ■ Health and safety screening, preventative measures for Covid-19; ■ Policy on child labour, forced labour and human trafficking; ■ Workforce grievance mechanism ■ Recruitment and local hiring procedures; and ■ Procurement policy. 	Supplementary ESIA (HRIA)	Contractor	Prior to and on an ongoing basis as part of Stage II contractor mobilization	Contractor Labour and Local Content Plan
Contractor to require Sub-Contractor to develop a Labour Management Plan which shall include the following and Contractor to regularly monitor and audit Sub-Contractors implementation of the management procedures. The plan shall include: <ul style="list-style-type: none"> ■ Policy to ensure labour recruitment of all categories of workers, including migrant workers, are in compliance with national regulations as well as international standards, including applicable policies for wages and benefit structures, working hours, and overtime. 	Supplementary ESIA (HRIA)	Contractor	Prior to the start of Stage II of the Project	Sub-Contractor Labour Management Plan

<ul style="list-style-type: none"> ■ A policy for non-engagement of child labour, forced labour and TIP as well as gender and gender-based violence. ■ Measures for worker accommodation, in line with IFC PS2, ILO and EBRD requirements. ■ The plan should also include policies for labour recruitment, wages and benefit structures, working hours and overtime. ■ A mechanism for screening the health of workers as well as measures for management of Covid-19. ■ A mechanism for receiving workers' grievances, aligned with the <u>Contractor's Project Worker Grievance Procedure</u>. ■ Mandatory training for all workers to be aware of their role in the stakeholder engagement and community grievance mechanism process, and to follow the Contractor's Code of Conduct ■ Grievances raised by workers of the Sub-Contractor should also be raised to and addressed by the Sub-Contractor. 				
<p>Sub-Contractor to ensure the following provisions for its workers:</p> <ul style="list-style-type: none"> ■ Include any contractual workers in the Maldives into the voluntary Maldives pension scheme (MRPS); migrant workers who may be interested, may also enrol in the scheme; ■ Enrol (migrant) workers in the Maldives into the group personal accident insurance scheme; and ■ Enrol its (migrant) workers in the Maldives into the health insurance scheme. 	Supplementary ESIA (HRIA)	Contractor	Prior to the start of Stage II of the Project	Sub-Contractor Labour Management Plan

Contractor to check and monitor that these provisions have been put in place by Sub-Contractor.				
Sub-Contractor to ensure that the supplier Hari & Co receives consent in writing from the workers, prior to their handover of the passports. The Contractor to monitor the implementation of this recommendation.	Supplementary ESIA (HRIA)	Contractor and Sub-Contractor	Prior to the start of Stage II of the Project	Sub-Contractor Labour Management Plan
Provide proper orientation to all workers regarding local values and customs	EIA 2020	Contractor	Prior to the start of Stage II of the Project	Contractor Labour and Local Content Plan/ Sub-Contractor Labour Management Plan
Climate Change Risk				
Revetment design: <ul style="list-style-type: none">■ Increasing the design return period (to 1/100 per year) and design lifetime (to 50 years) to align with similar coastal protection projects in the area. A design lifetime of 50 years is in line with the national building code of The Maldives for buildings (Ministry of Construction and Public Infrastructure, 2008);■ The impact of increasing temperatures or more intense rainfall on the workforce and port safety should be considered; and■ Assessing the hydraulic boundary conditions (including governing wave conditions and the effects of cyclones) into more detail.	Supplementary ESIA (CCRC)	Proponent	As part of the design of the overall port	Project Design Review
Constructed sections of the revetment: It is recommended to make these sections more climate-resilient in the first 25 years by: <ul style="list-style-type: none">■ Adopting an extensive operation and maintenance program that ensures	Supplementary ESIA (CCRC)	Proponent	As part of the design of the overall port	Project Design Review

structural stability during the design lifetime; and <ul style="list-style-type: none"> ■ Strengthening the current revetment (e.g. widening and/or strengthening the crest and rear side of the crest to prevent scour by either widening the crest or by building an asphalt layer / high quality grass cover). 				
Design / Layout of the Port Area: Regarding the alignment and layout of the future port area on the reclamation, the following recommendations are made: <ul style="list-style-type: none"> ■ Integrating design of the revetment in relation with the area directly behind the crest with the consideration of the overtopping criterion; ■ A minimum level of at least 3 m +CD is recommended for minimum floor levels or levels for critical elements of facilities (e.g. electrical equipment and mechanical installations) within the national building code; and ■ Considering impact from events such as increasing temperatures or more intense rainfall on the workforce and port safety. 	Supplementary ESIA (CCRC)	Proponent	As part of the design of the overall port	Project Design Review
Emergency Response				
Update Emergency Response Plan to include measures proposed in the CCRC: Before the Storm and Tsunami <ul style="list-style-type: none"> ■ Staff should pause working in advance of storm arrival; ■ Staff should be trained to understand where emergency medical assistance can be obtained and where disaster stations will be established before storm arrives; ■ Staff should stay away from oceans; 	Supplementary ESIA (CCRC)	Contractor	Throughout the Stage II activities	Emergency Response Plan

<ul style="list-style-type: none"> ■ Set up an office routine of checking reports on progress of storms; and ■ Secure all outdoor objects that might be blown away or uprooted by anchoring them or moving them indoors. ■ Labour facilities should be protected against damage and labour should have an appropriate shelter during the storm, also for sub-contractors. ■ Have a satellite phone at main locations, charged and functional. ■ Bring ships in sheltered areas. <p>During the Storm and Tsunami</p> <ul style="list-style-type: none"> ■ Beware the eye of the storm. A lull in the wind can occur lasting from minutes to over an hour when the calm storm centre passes. ■ Keep communication lines open among the different shelters and with the emergency services. <p>After the Storm and Tsunami</p> <ul style="list-style-type: none"> ■ Stay out of disaster areas; ■ When electric power is disrupted, turn off appliances and light switches so that electric circuits will not be overloaded when electricity is restored; ■ Eat food stored in refrigerators and freezers within first few hours only, otherwise eat canned food; and ■ Check on colleagues and assist anyone in need of medical attention. ■ Check and repair damage on facilities, equipment and ships. 				
Update the Emergency Spill Response Plan prepared in the EIA to include an analysis of potential receptors and	Supplementary ESIA (HRIA)	Contractor	Prior to the start of Stage II of the Project	Emergency Spill Response Plan

mechanisms for informing them in the event of an oil/chemical spill.				
Considering that the Maldives is a state prone to tsunamis and cyclones, the country has deployed an earthquake and tsunami awareness alert system that is classified as Alert 1, Alert 2 and Alert 3 from low to high risk level. Contractor is recommended to follow the specific guidance under each of alert level during Phase I.	Supplementary ESIA (CCRC)	Contractor	Throughout the Stage II activities	Emergency Response Plan
Cumulative Impacts				
<ul style="list-style-type: none"> ■ Timing and design of dredging/reclamation operations- ■ Since both the PUC and MTL projects share a common project proponent and since the dredging for MTL is expected to happen over a shorter time duration than for PUC, dredging operations at the primary borrow area could be planned in a way that simultaneous dredging of Stage-2 of PUC and the MTL project could be avoided. MNPHI to consider measures to avoid cumulative dredging impacts between PUC and MTL during the MTL EIA process. ■ MNPHI to discuss with Giravaru Project proponent and EPA to be conducted to identify any plan for dredging from alternate borrow area of Giravaru project and its tentative timeline. Regular discussion to be conducted with the Giravaru Management so that dredging at alternate borrow area for Giravaru project could be avoided at the time of PUC dredging near Giravaru so that possibility of cumulative impacts could be avoided/minimized 	Supplementary ESIA (RCIA)	Proponent	During dredging/reclamation period	Environmental Management Plan

<ul style="list-style-type: none"> ■ MNPHI to lead coordination for a study of the designs of the PUC and reclamation at Villingili for landing of MTL project and consider optimisations in design and timing so that cumulative impacts of due to dredging and reclamation for PUC and MTL project could be avoided. 				
<ul style="list-style-type: none"> ■ Coordination and alignment of adaptive dredging and reclamation works for turbidity impact mitigation: ■ Regular monitoring of turbidity values near the dredging areas and adapt dredging and reclamation methodology (e.g. location, timing) temporarily as feasible when visible turbid plume reaches sensitive receptors (e.g. Villingili, resort islands, MPAs, ESAs), or when turbidity limits are exceeded. 	Supplementary ESIA (RCIA)	Proponent	During dredging/reclamation period	Environmental Management Plan
<ul style="list-style-type: none"> ■ Coordination and alignment of monitoring of water quality for turbidity and sedimentation rates among the different projects, adjusting the monitoring programme if necessary based on the experience gained during construction. This information will help to identify the areas where there is possibility of increase in turbidity and sedimentation due to cumulative impacts 	Supplementary ESIA (RCIA)	Proponent	During dredging/reclamation period	Environmental Management Plan
<ul style="list-style-type: none"> ■ Coordination and alignment of monitoring of coral reefs among the different projects, adjusting the monitoring programme if necessary based on the experience gained during construction. ■ Monitoring of coral reef ecosystems will consider <ul style="list-style-type: none"> ■ Live coral percentage ■ Percentage of CCA 	Supplementary ESIA (RCIA)	Proponent	During dredging/reclamation period	Environmental Management Plan

<ul style="list-style-type: none"> ■ Density and richness of reef associated fish <p>This information will help to identify the areas where there is possibility of impact to live corals, CCA and fish due to cumulative impacts.</p>				
<p>Development of a regional engagement strategy which will include:</p> <ul style="list-style-type: none"> ■ Proactive engagement mechanisms focused on the Kaafu Atoll and the Greater Male Region to communicate schedules (e.g. dredging calendar) as well as calendar of vessel movements (among other issues) with key stakeholders (including project teams); ■ Proactive information disclosure (through the print/social media) on mitigation measures being implemented and outcomes of any ongoing monitoring in English and Dhivehi; ■ Consolidated mechanism to receive, address and thereafter disclose the outcomes of concerns and grievances raised (keeping confidentiality provisions in mind) 	Supplementary ESIA (RCIA)	Proponent	During the dredging/reclamation period with specific focus on the overlapping timelines of the projects (MTL and Giravaru)	Stakeholder Engagement Plan
<ul style="list-style-type: none"> ■ Any proposed core LR measures for Villingili under the EDA to be implemented taking into account potential impacts of the PUC as well as the MTL project in order to holistically consider intensity of cumulative impacts on coral reef dependent livelihoods as well as the feasibility of the core LR measures. ■ Consider implementation of the current core restoration measures proposed under the EDA as a regional initiative to be implemented at various locations across the RCIA Study Area 	Supplementary ESIA (RCIA)	Proponent	Prior to start of works, throughout the Project and post-construction	Activity-Wise Sub-Plans for Proposed LR Measures

4.1 Document Control

The EIA/ESIA ESMP recommendations provided in **Table 4.1** require the development and maintenance of various documents by both the Proponent and Contractor that govern the environmental and social performance of the Project (Phase I). The documents have been listed below and allocated to the Proponent and Contractor accordingly.

Project Proponent

- **Environmental and Social Management Plan (ESMP) Table:** The ESMP Table provided in this section of the report provides the key outcomes of the EIA, EIA Addendum and Supplementary ESIA technical studies and should be maintained as part of all monitoring and audits to review the key action items that need to be undertaken for the Project.
- **Environmental Management Plan:** Details how environmental issues and impacts, including relevant commitments in the ESMP, will be managed. The document may be overarching and include other named topic specific plans such as the Biodiversity Action Plan and Biodiversity Offset Plan.
- **Social Management Plan:** Details how social issues and impacts, including relevant commitments in the ESMP, will be managed. The document may be overarching and include other named topic specific plans such as the Stakeholder Engagement Plan and Community Grievance Mechanism.
- **Stakeholder Engagement Plan (SEP):** The SEP summarizes the key stakeholder groups, engagement mechanisms and documentation of the engagement across all stakeholder groups that would be affected/impacted by the Project.
- **Community Grievance Mechanism and Grievance Register:** An external grievance process and associated register receives, records and addresses specific complaints/issues/concerns raised by stakeholder groups and should be maintained as a feedback mechanism for the Project.
- **Activity-wise Sub Plans for any agreed Livelihood Restoration Measures:** Action plans for the completion of any livelihood restoration measures across the Project lifecycle.
- **Biodiversity Action Plan**
- **Biodiversity Offset Plan:** Provides a feasibility assessment for the three offset options provided in the CHA-BAP and can be used to evaluate the best course of action for an offset of any residual biodiversity impacts.
- **Port Development Vegetation Plan**
- **Port Design Master Plan:** The master plan for the port design and especially the key aspects that need to be undertaken in Phase I including landscape planning, climate change considerations and vegetation management.

Contractor (and Subcontractor)

- **Health, Safety and Environment (HSE) Management Plan:** Details how the Contractor will manage health, safety and environment issues including relevant commitments in the ESMP.
- **Work Method Statement:** Sets out the approach and methodology for performing the works under the scope of work for the Project allocated to the Contractor.
- **Social Management Plan:** Details how the Contractor will manage social issues and impacts including relevant commitments in the ESMP. The document may be overarching and include other named topic specific plans such as the Labour and Local Content Plan and ESG Supply Chain Corrective Action Plan).

- **Environmental Management Plan:** Details how the Contractor will manage environmental issues and impacts including relevant commitments in the ESMP (this Plan may form part of the overarching HSE Management Plan).
- **Emergency Response Plan:** Details how the Contractor will manage emergency situations including relevant commitments in the ESMP
- **Emergency Spill Response Plan:** Details how the Contractor will coordinate a response to an oil/chemical spill including relevant commitments in the ESMP.
- **Corrective Action Plan (part of ESG Supply Chain Management Plan)**
- **Labour and Local Content Plan:** Details the approach and commitments in relation labour and local content issues including relevant ESMP commitments and a Workers Grievance Mechanism
- **Subcontractor Labour Management Plan**

APPENDIX A ENVIRONMENTAL IMPACT ASSESSMENT

APPENDIX B APPPLICABLE REGULATIONS

1. INTRODUCTION

This section describes the applicable reference framework for this assessment under the purview of which the ESIA study is governed. In addition to the below, specific guidance manuals have been used in the social technical studies i.e. HRIA and EDA that has been described in greater detail in Appendix C and Appendix E respectively.

1.1 International Standards

1.1.1 Equator Principles 4

The Equator Principles (EPs) is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects. It is primarily intended to provide a minimum standard for due diligence and monitoring to support responsible risk decision-making. EP 4 requires that the environmental and social assessment should assess socio-economic impacts, impacts on affected communities, and disadvantaged or vulnerable groups, land acquisition and involuntary resettlement, where applicable.

The equator principles refer to the IFC PSs as well as the World Bank Group EHS Guidelines, both general as well as the industry sector guidelines.

1.1.2 IFC Performance Standards 1-8

IFC Environmental and Social Performance Standards is the benchmark used by international lenders to evaluate environmental and social risks and impacts across industrial sectors and geographies.

The standard is broken down into eight (08) components namely, *PS 1: Assessment and Management of Environmental and Social Risks and Impacts*, *PS 2: Labour and Working Conditions*, *PS 3: Resource Efficiency and Pollution Prevention*, *PS 4: Community Health, Safety and Security*, *PS 5: Land Acquisition and Involuntary Resettlement*, *PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources*, *PS 7: Indigenous Peoples* and *PS 8: Cultural Heritage*.

The individual technical studies for the Supplementary ESIA have been developed to conform to specific performance standards including HRIA (PS 2), EDA (PS 5) and CHA + BAP (PS 6).

1.1.3 Good Practice Handbook Cumulative Impact Assessment and Management

The present Cumulative Impact Assessment follows the methodology established by the IFC's Good Practice Handbook - Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (IFC 2013). The methodology is consistent with IFC Performance Standards (PS). Unlike an Environmental and Social Impact Assessment (ESIA), a Cumulative Impact Assessment focuses on Valued Environmental and Social Components (VECs) as receptors of impacts from different projects and activities and not on a project as a generator of impacts on various environmental and social receptors.

1.1.4 OECD Guidelines for Multinational Enterprises

The OECD Guidelines for Multinational Enterprises are recommendations addressed by governments to multinational enterprises operating in and from adhering countries. The guidelines provide non-binding principles and standards for responsible business conduct in a global context consistent with applicable laws and internationally recognized standards.

The guidelines have primarily been used with respect to the assess international standards for human rights and incorporated into the Human Rights Impact Assessment (Appendix C).

1.1.5 WBG/IFC General EHS Guidelines

The General EHS guidelines are technical reference documents with general examples of Good International Industry Practices. The General EHS Guidelines includes EHS considerations into corporate- and facility-level business processes in an organized, hierarchical approach to risk and impact identification, site selection, product design, engineering planning, engineering work, facility modification, layout plans, training, prioritization of risk management strategies, undertaking feasibility assessments, responding to accidents/incidents and improving EHS performance.

1.1.6 Business and Biodiversity Offsets Programme

The Business and Biodiversity Offsets Programme (BBOP) is a collaborative initiative across companies, financial institutions, government agencies and civil society organizations who are testing and developing best practice on biodiversity offsets and conservation banking worldwide. BBOP provides a range of industry sector experiences that can help achieve significant more, better and cost-effective conservation outcomes in infrastructure development.

The BBOP principles have been used in developing appropriate offsets as part of the BAP in Appendix D.

1.2 National Regulations

The policy and legal framework of Maldives applicable to this ESIA is presented in table below.

Applicable National Regulations

Sl. No.	Policy/Regulations / Guidelines	Key Elements /Provision	Applicability
1.	Environment Protection and Preservation Act (Act no. 4/93)	<p>The Environmental Protection and Preservation (EPPA) Act (4/93) which is enacted on 19th March 1993, provides the framework for environment management in the Maldives. Environmental Impact Assessment (EIA) process is included within environment management. The process is being implemented by Environmental Protection Agency (EPA) on behalf of Ministry of Environment (ME).</p> <p>Article 2 stipulates that the guidelines and policies on necessary guidelines and advise on environmental protection as per the country's need and prevailing condition respective needs to be provided by the respective government authorities and all concerned parties need to comply with the guidelines.</p> <p>Article 4 stipulates that the responsibility of identifying protected areas and natural reserves is on Ministry of Environment. Ministry of Environment is also responsible for drawing up the necessary rules and regulations for the protections and preservation of protected areas and natural reserves.</p> <p>According to Article 5 of the Act, environmental impact assessments are a mandatory requirement for all economic development projects.</p> <p>According to Article 6, the Ministry of Environment can terminate any project that has any undesirable/ irreversible impact on the environment.</p> <p>Article 7 of the EPPA (4/93) refers to the disposal of oil, wastes and poisonous substances in to the Maldivian territory. Disposal of any type of waste, oil, toxic gas or any substance that may have harmful effects on the environment are not allowed in the Maldivian territory. In cases where the disposal of the substances becomes absolutely necessary, they shall be disposed only within the designated areas. If such waste needs to be incinerated, appropriate precaution should be taken to avoid any harm to the health of the population.</p> <p>Article 8 of the EPPA (4/93) states that Hazardous/ Toxic or Nuclear Wastes that is harmful to human health and the environment are not allowed to be disposed anywhere within the Maldivian territory.</p>	<p>Proponent shall abide by any guideline or advice given by concerned government authorities regarding the project.</p> <p>No protected area within Project boundary i.e the reclamation footprint area.</p> <p>Dredging and Reclamation requires EIA under the EIA Regulation 2012 formulated under EPPA 4/93.</p> <p>Proponent must take measures to ensure there is no irreversible and significant adverse impact from the project on the environment.</p> <p>Proponent must comply with Waste Management Regulation (2013/R-58).</p>
2.	EIA Regulation (2012/R-27)	The EIA process is regulated by the Environmental Impact Assessment Regulation 2012 (2012/R- 27) issued on 8th May 2012. For any development activity listed in the regulation, EIA application form along with a project brief to be submitted and Approvals from EPA to be obtained.	Proponent submitted the EIA Addendum application along with Project Brief and approved concept plan to the EPA on 4th May 2021.

3.	Environmental Liability Regulation	<p>This regulation is pursuant to Article 22 of National Constitution that states that protection, preservation and maintenance of the Maldivian natural environment, the richness of the living species, the natural resources and the beauty of the Maldives for the present generations as well as for the future generations is a basic obligation of the Maldivian government. The government shall enforce that the activities conducted in order to gain economic and social development should be of sustainable nature that protect the environment and such activities shall not deteriorate the environment, endanger any species, damage the environment, and shall not waste any natural resources. This regulation is also pursuant to Environment Protection and Preservation Act of Maldives (4/93).</p> <p>One of the key objectives of the environmental liability regulation is also to practice polluter-pay-principles in the Maldives.</p> <p>The project developer and contractor(s) shall be aware of this provision and contractor(s) shall take all practical measures to ensure that all relevant laws and regulations, and the EMP proposed in this EIA are followed.</p>	<p>Project proponent must stop work or take preventative measures to minimise damage to the environment in an event the project activity results in damages to the environment and inform MoE and EPA and comply with their orders.</p> <p>Project Proponent must bear the costs of implementing the mitigation measures ordered by the enforcement agency under Clause 7.</p>
4.	Protected Areas Regulation (2018/R-78)	<p>The following activities are prohibited:</p> <ul style="list-style-type: none"> • Impeding works of agency entrusted to look after a protected area. • Disguising oneself as a personnel of the agency entrusted to look after a protected area. • Contravening management plan of a protected area. <p>Must be aware of Protected Areas and management plans for these areas and align project activities accordingly.</p>	<p>Proponent must ensure that activities prohibited are not undertaken at all protected areas.</p>
5.	Environmentally Sensitive Areas (ESA)	<p>Environmentally Sensitive Areas (ESA) 2014 are islands with unique features, reef systems, mangroves, wetlands, sea grass beds or places that are vital to the long-term maintenance of biological diversity, beach sediments, soil, water and other natural resources and features especially as they relate to human health, safety, and welfare, both on an island and in an atoll context. These features are highly valued, both for their scenic beauty and for the habitats they provide for the flora and fauna. The compilation of the list was initiated in 2009 with the assistance of the local Island Offices and other stakeholders. The list has been produced to identify environmentally and economically significant areas to offer protection, safeguard and enhance the conservation of the biological diversity of the country. Commencing from 1st January 2011, under the Environmental Protection and Preservation Act: 4/93, the sites listed had been identified as ESAs. This ESA list helps in safeguarding, minimizing and mitigating the environmental impacts from different development projects, by monitoring the development in the area with the involvement of all stakeholders. The areas identified in the ESA are not protected areas. A site/habitat being identified as an ESA does</p>	<p>Proponent must take mitigation measures to minimize negative impacts on the ESAs.</p> <p>The nearest ESA to the project footprint are:</p> <ol style="list-style-type: none"> 1. Maagiri (located 2.31 km NE of Alternative Borrow Area B) 2. Okobe Thila (located 4.9 km N of Alternative Borrow Area B) 3. Kohdhipparu Finolhu (located 4.79 km W of

		<p>not indicate that sustainable development cannot take place. It encourages development to take place, taking into consideration the conservation of the sensitive area, thereby mitigating the negative impacts. There are 274 ESAs in Maldives.</p>	Alternative Borrow Area A)
6.	Protected species	<p>Provides a list of protected species that are protected in Maldives, which includes</p> <ul style="list-style-type: none"> ● Marine species protected includes ● Black Coral ● Napoleon Wrasse ● Turtles ● Whale Shark ● Conch (triton) Shell ● Whales ● Giant Clams ● Dolphins ● Lobster ● Rays and Skates ● Green Turtle ● Hawksbill Turtle ● Olive Ridley Turtle ● Loggerhead Turtle ● Leatherback Turtle ● All Sharks species <p>The following activities are prohibited under this regulation</p> <ul style="list-style-type: none"> (a) Damaging or harming protected species, their nesting, roosting, breeding sites. This includes activities that may hinder the natural processes. (b) Killing, using, catching, harming, abusing and culture of protected species. (c) Disobeying authorities and obstruction of works of authorities entrusted to implement the regulation. (d) Contravening the guidelines set in the regulation for handling protected species. (e) Providing false information in forms submitted to the authorities under this regulation. (f) Contravening the permit conditions set for operation of Centers under this regulation. <p>Contravening the permit conditions of any permit issued under this regulation.</p>	Proponent must be aware of this provision and ensure that contractor(s) of the project take all practical measures to adhere to this regulation.
7.	Regulation on Migratory Birds (Regulation No. 2014/R-169)	<p>This regulation is drafted under the Act number 4/93 (Maldives Environment Protection and Preservation Act) and issued on 21st August 2014. Birds which migrate to the Maldives during different monsoon periods are considered as an integral part of the Environment of Maldives and the main purpose of this regulation is to protect migratory bird species by</p>	Proponent must be aware of this provision and ensure that contractor(s) of the project take all practical measures to adhere to this

		<p>deterring any activities that may harm their population levels.</p> <p>Under this regulation, all birds found in the Maldives with the exception of the following are considered as Migratory birds;</p> <ul style="list-style-type: none"> ● Dhivehi Kambili ● Huvadhoo Raa'Bondhi ● Dhivehi Raa'Bondhi ● Medhu-Rajajetherey Raa'Bondhi ● Dhivehi Koveli ● Kaalhu <p>And, for such migratory birds, it is illegal to carry out any activity that involves;</p> <ul style="list-style-type: none"> ● Rearing in captivity, ● Trade of birds or their eggs, ● Poaching birds or their eggs, ● Eating bird meat or their eggs, and ● Harming birds or their nests. 	regulation.
8.	Dredging and Land Reclamation (2013/R-15)	<p>Published on 2nd April 2013 with the aim of minimising environmental impacts associated with dredging and reclamation activities in islands and reefs across Maldives.</p> <ul style="list-style-type: none"> ● All dredging and reclamation activities must be approved by EPA. ● The regulation defines rationales for reclamation as those absolutely necessary for social, economic or safety purposes. ● Dredging for land reclamation is restricted in the following areas: <ul style="list-style-type: none"> ○ 100 m from the outer reef edge towards the island's shoreline ○ 500 m from the outer reef edge ○ 50 m from any island vegetation line ○ Protected Areas and Environmentally Sensitive Areas declared under EPPA 4/93 ● Dredging, sand mining, and land reclamation is restricted within 200 m of a declared Protected Areas and Environmentally Sensitive Area. ○ There is a Marine Protected Area in proposed reclamation area Gulhifalhu named Hans Hass Place, and also three Marine Protected Areas (MPAs) in close proximity to the proposed dredging area; Giraavaru Kuda Haa, Lions Head, and Gaathugiri (Banana Reef). ○ A 200 m buffer has been maintained around Giraavaru Kuda Haa, Lions Head is located over a kilometre from the nearest location of the dredging site and about 2km from the reclamation site, and Banana Reef is located over 2 km from the nearest point from the sand borrow area. 	<p>Dredging and Reclamation permit must be obtained from EPA prior to commencement of dredging and reclamation works. Project is within 200m of a Protected Site and hence at present not in compliance with this regulation. But an exemption has been granted by EPA by revising the buffer boundaries of the site.</p>

		<ul style="list-style-type: none"> ○ There was initial confusion over the boundary of the Hans Hass Place as the published information showed a single point as the protected site and internal documents at EPA showed a wider buffer which overlapped with the proposed reclamation area. Proponent sought clarifications from Ministry of Environment and in coordination with EPA, they have issued revised boundaries and buffer zone for the Hans Hass Place MPA (Figure 4.1). The buffer zone has been revised to approximately 23 m north and about 120 m east and west from the defined “Core Area”. It is understood that this information is in the process of being Gazetted. ● Land reclamation cannot exceed 30% of the house reef area on islands leased for commercial use like tourism and agriculture. <p>The first Amendment to the Regulation (2014/R-13) allows for dredging and reclamation works within Declared Protected Areas and Sensitive Areas for Government projects, if another site or sites of same natural attributes with equal or larger area is protected with a plan to manage the area.</p> <p>The proposed sand borrow area has been prepared according to this regulation. In particular, the 500 m radius from existing reefs have been maintained when determining TSHD borrow sites.</p> <p>There are two Marine Protected Areas within a 5 km radius of the reclamation sites; Hans Hass Place located on the southern reef slope of Gulhifalhu (<200 m from the reclamation works), and Lions Head located in Thilafushi (reef west of Gulhifalhu).</p> <p>A copy of the dredging and reclamation plan, along with the application form is submitted to EPA along with this EIA. Dredging and Reclamation approval is expected along with the EIA Decision Note.</p>	
9.	Employment Act (2/2008)	<p>Employment Act (2/2008) was ratified and signed into law in May 2008. It includes the legal framework to govern the rights and responsibilities of workers in the Maldives. Four amendments have been brought to the Employment Act (2/2008) till date.</p> <ul style="list-style-type: none"> ● All employees involved in the project shall have an employment contract prepared according to the Employment Act. ● The job specification, work hours, payment of wages and benefits, maximum allowable hours in a work week, leaves and off days have to be followed according to the Employment Act ● No worker employed for the project shall be compelled or forced into employment. 	Proponent must ensure compliance to the employment act.

		<ul style="list-style-type: none"> No minors shall be recruited. Minors under the age of 16 years will not be involved in the project. <p>The third and fourth Amendments are directly relevant to foreign migrant workers in the Maldives.</p> <ul style="list-style-type: none"> The Amendment 3/2014 passed by Parliament on 03 December 2013 requires an Employment approval for foreign migrant worker to be issued prior to arrival in the Maldives. The Amendment also made a deposit mandatory for all foreign migrant workers to be paid by the Employer. A deposit (to the sum of return airfare) to be made to Department of Immigration and Emigration (DoIE) at the time of work visa. The Amendment 14/2015 on Ramazan allowance for Muslim workers makes it optional for Employers of Muslim foreign migrant workers to pay them a Ramazan allowance. The Amendment 22/2016 concerns wages for foreign migrant workers. The Amendment specifies that the wages and other sums to which the worker is entitled shall be paid through a bank registered in the Maldives to an account in the name of the foreign migrant worker (art. 53 a). 	
10.	Immigration Act (1/2007)	<p>The Maldives Immigration Act (1/2007) provides the rules for entry, departure and deportation of foreign nationals. Article 15 of the Act refers to work visa i.e. the permit to remain in the Maldives for the stipulated duration of a work. Permit are granted to a foreign national visiting the Maldives for the purpose of working and the obtained work permit is consistent with the regulations of the concerned Government authority.</p>	Most of the workforce involved in this project are foreigners. As a result, all workers need to have the relevant work visas and proper documentation while working in the Maldives.
11.	Anti-Human Trafficking Act (12/2013)	<p>The Anti-Human Trafficking Act passed by the parliament on 03 December 2013 and ratified on 08 December 2013 makes trafficking in persons a criminal offence in the Maldives. The purposes of the Act are given below:</p> <ul style="list-style-type: none"> prevent trafficking of persons through and across the Maldives; establish the crimes of trafficking in persons and prescribe punishments; provide for prosecution of perpetrators of trafficking in persons; provide protection and assistance to victims of human trafficking; promote and protect the human rights of trafficked victims; and engage with local and international NGOs working against human trafficking. <p>Trafficking, exploitation, and debt bondage are defined by the Act. Forced labour and fraudulent recruitment are</p>	As stated earlier, the majority of the workforce for this project are foreigners. Hence, it is important to ensure that contractor(s) abide by stringent measures to ensure there is no exploitation of foreign migrant workers. Special attention shall be given to ensure wages are paid in full and on time; the travel documents of workers are not held by contractor(s) against the will of the

		considered as human trafficking in the act. The Act specifies the penalties for perpetrators of trafficking.	workers, foreign migrant workers are not required to pay recruitment fees, there is no forced labour and all workers are treated with dignity and respect.
12.	Human Rights Commission Act (6/2006)	The Human Rights Commission Act was passed on 2005 and it was subsequently amended in 2006 to ensure compliance with the Paris Principles on the status and functioning of national institutions for protection and promotion of human rights. The amended Human Rights Commission Act made the Human Rights Commission of the Maldives (HRCM) independent and autonomous as a statutory body.	Human trafficking, forced labour, child labour can be investigated by HRCM.
13.	Regulation on Employment of Foreign Workers in the Maldives (6/2006)	The Regulation on Employment of foreign workers in the Maldives (2011/R-22) requires the following <ul style="list-style-type: none"> • Employers to apply for a foreign worker quota; pay a security deposit for the foreign migrant worker; • ensure that work permits are issued before a foreign migrant worker can commence work; apply for a work permit card within 15 days of arrival of the foreign migrant worker to the Maldives; • apply for a work visa within 30 days of arrival of the foreign migrant worker to the Maldives; • pay a work visa fee of Maldivian Rufiyaa (MVR) 250 per month; receive the foreign migrant worker at port of entry to the Maldives; • register the foreign migrant worker at the registry maintained by the applicable island council or city council. 	All foreign workers should have a valid work permit
14.	Work Visa Regulation	The Maldives Immigration (MI) has issued a Work Visa Regulation (2010/R-7) under the Maldives Immigration Act (1/2007). The Work Visa Regulation (2010/R-7) gazetted on 12 October 2010 requires foreign migrant workers who enter the Maldives for the purpose of work to have a valid work visa. The conditions for entry of work visa holders as specified in the regulation includes the following: <ul style="list-style-type: none"> • a passport with minimum six months validity; security deposit paid to MI 48 hours before arrival; truthful answers to questions posed by Immigration Officers; • not prohibited from entry to the Maldives under article 4 of the regulation; specification of the purpose of entry; • an Employment approval from the concerned authority with a copy transmitted to MI; and • Being over 18 years of age. 	Foreign nationals coming to Maldives for this project must have at least 6 months on their valid passport. Contractor may need to pay fines for noncompliance.
15.	Regulation on the Safety Standards for Construction Work (2019/R-	According to this regulation, a health and safety plan should be prepared for safety of the employees and public if contractor's work is more than MVR 1,500,000. Contractor has to enforce measures listed in the handbook along with training of employees.	This project is over the MVR 1.5 million limit, as such a Health and Safety Plan will be required

	156)		for implementation of this project.
16.	Coral and Sand mining regulation	<p>A directive from President's Office dated 26 September 1990 has imposed a ban on coral mining from house reef and atoll rim.</p> <p>According to sand mining regulation, Sand should not be mined from any part of the existing island, beach or the newly reclaimed island beach. Sand should also not be mined from within 100 ft. of the shoreline. The regulation covers the following:</p> <ul style="list-style-type: none"> • sand mining from uninhabited islands that have been leased; • sand mining from the coastal zone of other uninhabited islands; and • aggregate mining from uninhabited islands that have been leased and from the coastal zone of other uninhabited islands. 	Proponent must ensure compliance to the regulation
17.	Waste Management Regulation (2013/R-58)	<p>The aim of WMR is to implement the national waste policy which contains specific provisions to:</p> <ol style="list-style-type: none"> a) Implement measures to minimize impacts on human health, b) Formulate and implement waste management standards, c) Implement an integrated framework for sustainable waste management, d) Encourage waste minimization, reuse and recycling, e) Implement Polluter-Pays Principle, and f) Introduce extended Producer Responsibility. <p>WMR contains main sections:</p> <ol style="list-style-type: none"> (i) Waste management standards: Defines standards for waste collection, transfer, treatment, storage, waste site management, landfills and managing hazardous waste. (ii) Waste management Permits: Defines approval procedures for waste sites, (iii) Waste transfer: Standards and permits required for waste transport on land and sea, including transboundary movements, (iv) Reporting requirements: Defines reporting and monitoring requirements and procedures, (v) Enforcement: Defines procedures to implement WMR and penalties for non-compliance. <p>Disposal of hazardous waste including electronic waste in Maldives should be handled by waste sites specifically approved to manage hazardous and Special Category waste.</p> <p>Transportation and handling needs to comply with standards specified in WMR. An application needs to be</p>	Proponent/Contractor must ensure that waste generated from the project is disposed at the designated waste disposal site at Thilafushi.

		submitted for reuse or disposal of waste in another country to WMR clauses and international conventions.	
18.	Public Health Protection Act (07/12)	<p>To protect the public health, identify the responsible person, define procedures for implementation off public health policy, Public Health Protection Act has been established.</p> <p>The objectives of the Act also include the followings:</p> <ul style="list-style-type: none">• establishing policies to respond to public health emergencies;• classify situations which may be harmful to health and establish methods to act in such a situation;• establish roles and responsibilities of island, atoll, and city councils in protection of public health. <p>As per Chapter 5 of the Public Health Protection Act, it covers identifying health hazards, eliminating risk, reporting health hazards.</p>	Proponent must ensure compliance to the regulation

APPENDIX C HUMAN RIGHTS IMPACT ASSESSMENT

APPENDIX D CRITICAL HABITAT ASSESSMENT AND BIODIVERSITY ACTION PLAN

APPENDIX E ECONOMIC DISPLACEMENT ASSESSMENT

APPENDIX F RAPID CUMULATIVE IMPACT ASSESSMENT

APPENDIX G

CLIMATE CHANGE RISK CONSIDERATIONS

**APPENDIX H STAKEHOLDER CONSULTATION RECORDS – AVAILABLE
UPON REQUEST**

APPENDIX I SEDIMENT PLUME MODELLING RESULTS

ERM has over 160 offices across the following countries and territories worldwide

Argentina	The Netherlands
Australia	New Zealand
Belgium	Norway
Brazil	Panama
Canada	Peru
Chile	Poland
China	Portugal
Colombia	Puerto Rico
France	Romania
Germany	Russia
Ghana	Senegal
Guyana	Singapore
Hong Kong	South Africa
India	South Korea
Indonesia	Spain
Ireland	Sweden
Italy	Switzerland
Japan	Taiwan
Kazakhstan	Tanzania
Kenya	Thailand
Malaysia	UAE
Mexico	UK
Mozambique	US
Myanmar	Vietnam

ERM China

Suit 2005, Shanghai Litong PLAZA
No. 1350 North Sichuan Road
Shanghai, China

T: +86 21 53853050
F: +86 21 64692185

www.erm.com