

# Supporting vulnerable communities in Maldives to manage climate change- induced water shortages

## Environmental and Social Management Plan

26 November 2018

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## EXECUTIVE SUMMARY

This Environmental and Social Management Plan (ESMP) has been prepared in support of the project titled 'Supporting vulnerable communities in Maldives to manage climate change-induced water shortages', submitted by the Government of Maldives (GoM) to the Green Climate Fund (GCF). As a project supported by UNDP in its role as a GCF Accredited Entity, the project has been screened against UNDP's Social and Environmental Safeguards Procedure, and is deemed a moderate risk project (e.g. a GCF Category B).

The project was approved by GCF in November 2015 and has undergone some changes since that time. GCF has requested that documentation be updated to reflect changes to the project since its original inception. This updated ESMP is in response to the GCF request and represents a more detailed and thorough version of the original ESMP that was submitted and approved by GCF. This ESMP provides the general framework applies to the whole project. Additional, site-specific ESMPs will also apply for islands where desalination (RO) plants will be installed.

The Ministry of Environment and Energy of the Maldives (MEE) as the National Designated Authority and as the implementing agency will lead the project. The MEE will be supported by a Project Management Unit (PMU) for the implementation of the project and compliance with this ESMP.

As a result of the project, 45 priority islands will have increased rainwater collection capacities, and a further four larger islands will additionally have water production systems of water desalination (Reverse Osmosis – RO water production plants), that will secure sufficient water production capacity, enabling a decentralized and timely water distribution across all northern outer atolls during the extended dry periods, when water shortages may occur.

The project has very significant direct beneficial impacts for 32,000 people in the 49 islands (direct high intensity beneficiaries) and will also directly benefit 73,000 people that are currently faced with water shortages in the dry period (direct, medium intensity beneficiaries).

The project has the potential to cause moderate environmental and social impacts. These include impacts arising from the brine generated from the desalination process at the four selected islands, and the impact of the construction phase including the use of machinery and the increased waste management associated with water distribution. Minor impacts include increased waste and noise generated during the construction phase.

The ESMP describes in detail the required actions to address and mitigate these issues, which will avoid, and where avoidance is not possible, significantly reduce the potential impacts of the project to an acceptable level. Moreover, the project will have significant environmental and social benefits that will be achieved more generally.

The ESMP outlines the Grievance Redress Mechanism to address any complaints and issues that may arise as a result of the project. This Grievance Redress Mechanism complies with the laws and current practices of Maldives and UNDP's Social and Environmental Standards.

Budgeting for environmental interventions and the application of mitigation measures to enhance positive impacts for the project is an investment in the future as it will reduce the environmental and social liability at local and national levels. The end result of this project will be the improved water security for the island communities covered under the project and the overall resulting improvement in the quality of life for the communities.

## 1. INTRODUCTION

1. This Environmental and Social Management Plan (ESMP) has been prepared in support of the project titled '*Supporting vulnerable communities in Maldives to manage climate change-induced water shortages*', submitted by the Government of Maldives (GoM) to, and approved by, the Green Climate Fund (GCF). As a project supported by UNDP in its role as a GCF Accredited Entity, the project has been screened against UNDP's Social and Environmental Standards; and is deemed a moderate risk project (e.g. a GCF Category B).
2. A proposal for '*Supporting vulnerable communities in Maldives to manage climate change-induced water shortages*' was submitted for funding to GCF and was approved by GCF in November 2015; GCF has requested that documentation be updated to reflect changes to the project since its original inception. This updated ESMP is in response to the GCF request and represents a more detailed and thorough version of the original ESMP that was submitted and approved by GCF.
3. This ESMP provides the general framework applies to the whole project. In addition to the requirements of this ESMP, site-specific ESMPs will be adopted for islands where desalination (RO) plants (moderate risk activities) will be installed.

### 1.1 BACKGROUND

4. The Maldives consists of 1,190 small, low-lying coral islands clustered in 26 ring-like atolls (with a population of 407,660<sup>1</sup> across 194 inhabited islands), spread over a North-South axis. The total area of Maldives is about 90,000km<sup>2</sup>. With high-end tourism as the main driver of economic growth, the country has made a significant development progress and graduated from being a Least Developed Country in 2011.
5. The outer islands of the Maldives experience drinking water shortages during the dry season. These shortages have had significant adverse human, environmental and social impacts on the communities living in these atoll islands. The result is a worsening water insecurity problem for the outer islands and the use of saline water for everyday use.
6. The freshwater lens underlying each island has historically been the most important water source for islands in the Maldives. The thickness of the freshwater lens, which typically floats atop denser seawater, is controlled by island width, rainfall rates and associated infiltration and recharge. Depending on these factors, lens thickness ranges from less than a few meters to 1-1.5 meters. There is a lack of knowledge regarding the quantity and quality of groundwater of the Maldives during average annual climatic variations; however recent modelling results indicate that many of the islands have a significant decrease (freshwater lens at least 50%) in thickness during the dry season months.
7. For small islands (less than 300 meters in width), the complete depletion of the lens is likely to occur during the dry season and/or after successive years of low annual rainfall. The freshwater lens is thicker for southern islands due to higher rainfall levels than the Central and Northern regions, with the north being particularly dry. Furthermore, excessive groundwater abstraction compared to recharge has led to salt water intrusion and up-coning of saline water. This results in a reduction of the efficiency of natural recharge processes. Significantly, the concern is that during droughts, over-extraction could alter the size of the aquifer and limit recovery of the lens to its stable level.
8. In 2004, an estimated 30 percent of the outer islands' population experienced water shortages, and since 2005 an average of 81 islands per year has requested emergency shipments of water to be delivered from Malé during the annual dry season. The calls for emergency shipments have intensified as the islands' stored rainwater reserves are depleted. Over the last 10 years, this has resulted on an average of 3,500 liters supplied annually. During 2005-2012, the National Disaster Management Centre (NDMC) spent US\$2.4 million (average of US\$300,000/annum) to provide desalinated water to over

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<sup>1</sup> Census 2014, National Bureau of Statistics

90 islands. The average unit cost of water, including production and distribution cost, was US\$77m<sup>3</sup>. This is a recurrent pressure over already strained budgetary resources of Maldives. Furthermore, the cost of supplying bottled water is high and provides no economic rationale.

9. Due to the seasonality of the replenishment potential of the underground freshwater lenses, rainwater collection is an important source of water in Maldives. The national average rainwater storage per household is 2,900 liters. In a survey carried out in 2012, 141 islands reported that island rainwater tanks supplied water for only 8 months or less, indicating a major gap between supply and demand in the dry season. This is a particular issue in the northern atolls, characterized by longer dry periods and where almost two thirds of the outer island population is located. Even in the wetter south, maintaining rainwater supply in the dry season is a challenge for relatively large households. Yet, inter-annual variability means that an estimated 60% of flooding is caused by heavy rainfall events, highlighting a potential opportunity for better capture of water.

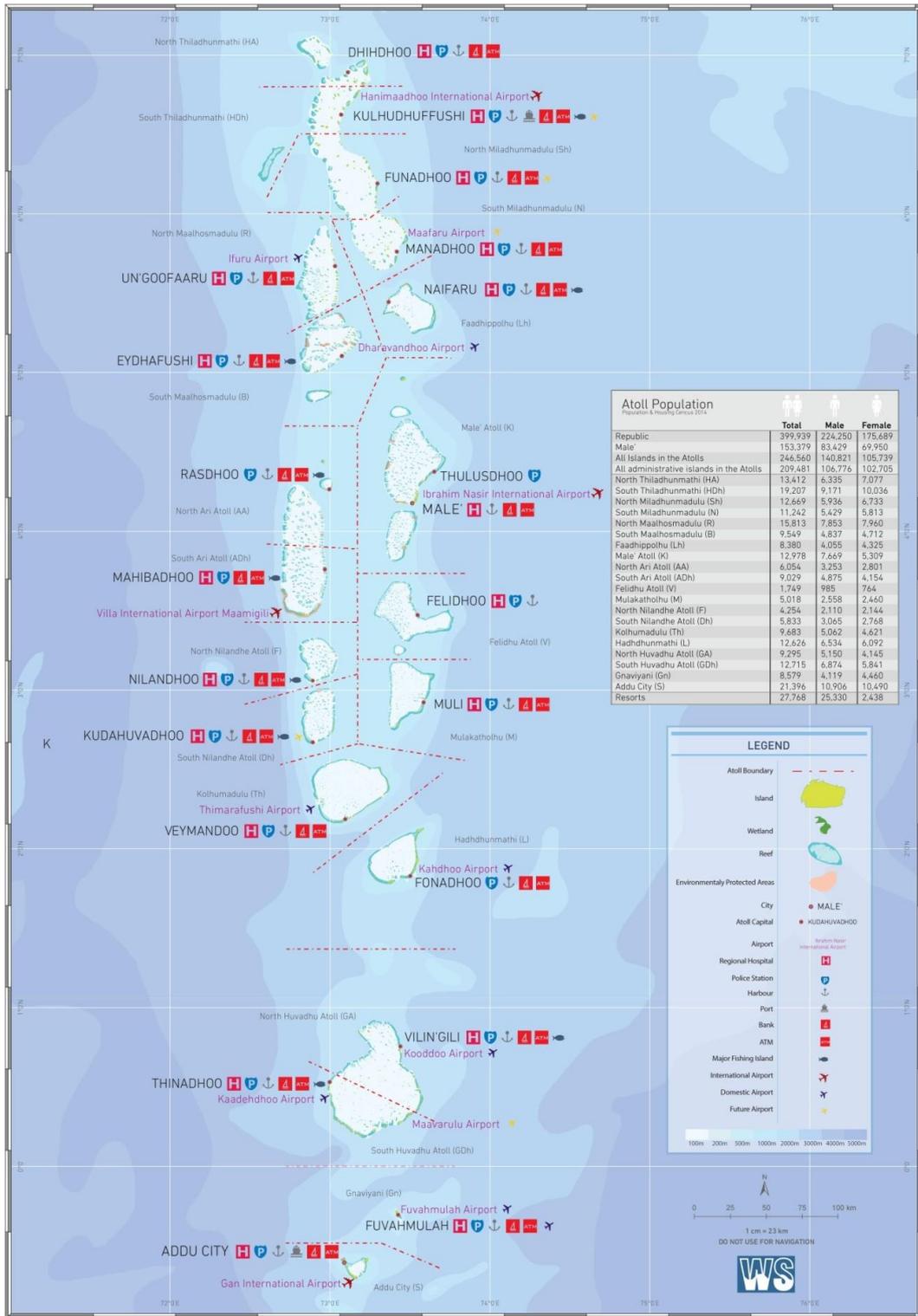


Figure 1: Map of Maldives (Source: State of the Environment 2016)

## 1.2 DESCRIPTION OF THE PROJECT

10. The overall project will supply the potable water needs of the targeted island residents year-round for a 35-year design period to 2050. Ultimately, the project will achieve an uninterrupted water supply on the islands that currently experience a 90-day chronic water shortage during dry season and depend on transported water from Malé, which is an extensive, overlong and costly operation.
11. Project finance will be used to establish an integrated water resources management system that integrates the two main sources of water (rainwater and desalinated water) into a least cost delivery system and which is able to maintain service levels against a context of rainfall variability and sea level rise and also includes measures for groundwater quality recovery to secure freshwater reserves in the long term.
12. As a result of the project, 49 priority islands will have increased rainwater collection capacities, out of which, four larger islands (H.Dh. Nohivaranfaru, Sh. Fokaidhoo, R. Maduvvari and B. Dharavandhoo) will be provided with additional water production systems of water desalination (Reverse Osmosis – RO water production plants), that will secure sufficient water production capacity, enabling a decentralized and timely water distribution network across all northern outer atolls during the extended dry periods, when shortages may occur. The priority islands selected under this project are given in the Table 1.

Table 1: Project sites (islands to be installed with RO plants highlighted in blue)

No.	Atoll	Island	No.	Atoll	Island
1	H.A.	Filladhoo	25	A.A.	Bodufolhudhoo
2	H.A.	Maarandhoo	26	A.A.	Himandhoo
3	H.A.	Muraidhoo	27	A.A.	Mathiveri
4	H.A.	Uligan	28	A. Dh.	Dhigurah
5	H.A.	Utheemu	29	A. Dh.	Kunburudhoo
6	H.A.	Molhadhoo	30	M.	Naalaafushi
7	H. Dh.	Finey	31	M.	Raiymandhoo
8	H. Dh.	Hirimaradhoo	32	M.	Veyvah
9	H. Dh.	Kurinbee	33	Dh.	Bandidhoo
10	H. Dh.	Neykurendhoo	34	Dh.	Hulhudheli
11	H. Dh.	Nohivaranfaru	35	Dh.	Meedhoo
12	Sh.	Bilehfahi	36	Th.	Dhiyamigili
13	Sh.	Feevah	37	Th.	Gaadhiffushi
14	Sh.	Feydhoo	38	Th.	Kandoodhoo
15	Sh.	Foakaidhoo	39	Th.	Kinbidhoo
16	Sh.	Funadhoo	40	Th.	Omadhoo
17	Sh.	Lhaimagu	41	Th.	Vandhoo
18	Sh.	Narudhoo	42	G.A.	Kondey
19	Sh.	Noomaraa	43	G.A.	Maamendhoo

20	N.	Henbadhoo	44	G.A.	Nilandhoo
21	N.	Lhohi	45	G.Dh.	Faresmaathodaa
22	N.	Magoodhoo	46	G.Dh.	Fiyoari
23	R.	Maduvvari	47	G.Dh.	Hoandehdhoo
24	B.	Dharavandhoo	48	G.Dh.	Nadella
			49	G.Dh.	Rathafandhoo

13. The details of the islands where RO plants will be established and the capacity of these plants are given below.

Table 2: IWRM islands and RO plant capacity

Island	Capacity ( CBM/Day)	Number of Units
B.Dharavandhoo	25	2
R.Maduvaari	55	2
Sh.Foakaidhoo	36	2
Hdh. Nolvivaranfaru	45	2

14. The RO plants will utilize the island grid as the primary source of power, but will contain a solar PV system for supplementary power. It is also important to note that the existing island grid will be capable to cater to the additional power demand of the RO plants.

Table 3: RO plant capacity and supplementary PV systems

Atoll	Island	Water production capacity	Size of solar PV system installed
B	Dharavandhoo	50m <sup>3</sup> /day ( 2 Nos of 25m <sup>3</sup> /day)	1- Solar Panels (Capacity: 250 watt), Three Phase, Standard: IEC,
			2.Hybrid Solar inverter (Capacity: 40 KVA), Make: Eneritech, Series: Sun magic, Three Phase, Standard: IEC
			3.Supply of Finished solar Battery, 12 V 200 AH
R	Maduvvari	110m <sup>3</sup> /day ( 2 Nos of 55m <sup>3</sup> /day)	1- Solar Panels (Capacity: 250 watt), Three Phase, Standard: IEC,
			2.Hybrid Solar inverter (Capacity: 40 KVA), Make: Eneritech, Series: Sun magic, Three Phase, Standard: IEC
			3.Supply of Finished solar Battery, 12 V 200 AH
SH	Foakaidhoo	72m <sup>3</sup> /day ( 2 Nos of 36m <sup>3</sup> /day)	1- Solar Panels (Capacity: 250 watt), Three Phase, Standard: IEC,

			2.Hybrid Solar inverter (Capacity: 40 KVA), Make: Enertech, Series: Sun magic, Three Phase, Standard: IEC
			3.Supply of Finished solar Battery, 12 V 200 AH
Hdh	Nolhivaranfaru	90m <sup>3</sup> /day ( 2 Nos of 45m <sup>3</sup> /day)	1- Solar Panels (Capacity: 250 watt), Three Phase, Standard: IEC,
			2.Hybrid Solar inverter (Capacity: 40 KVA), Make: Enertech, Series: Sun magic, Three Phase, Standard: IEC
			3.Supply of Finished solar Battery, 12 V 200 AH

15. The system will achieve cost effectiveness in service provision through effective management of water resources and the utilization of locally appropriate technologies. Alongside the system design will be a capacity development work stream designed to obtain the support and ownership from communities, which is necessary for financial sustainability of the system, as well as the capacity development of the State Utility company (FENAKA) to manage service delivery, and of the decentralized authorities and central government to provide an enabling environment for sustainability and scale up.

### 1.2.1 Summary of Activities

16. The project has three outputs with multiple activities under each output. These include:

- Scaling up integrated water supply system to provide safe water to vulnerable households (at least 32,000 people including 15,000 women);
- Introducing decentralized dry season water supply system benefitting 73,000 people across seven northern atolls; and
- Improving groundwater quality to secure freshwater reserves for long-term resilience in 49 islands.

#### **Scaling up integrated water supply system to provide safe water to vulnerable households**

17. The project will enable 49 targeted islands (across 13 atolls) to implement integrated water supply systems. The island systems will integrate locally appropriate combination of the two main sources of water that are currently largely disconnected (harvested rainwater and desalinated water). This approach will generate the necessary diversification and redundancy in the water supply system to ensure there is always a sufficient supply of safe freshwater for the local population at the selected atoll level.

18. The two sources of water will be used and distributed on the selected islands with large customer bases (H.Dh. Nolhivaranfaru, B. Dharavandhoo, Sh. Fokaidhoo, and R. Maduvvari), where desalinated water is necessary to serve as a back-up source. The current rainwater collection systems are not sufficient to satisfy the growing demands on water. These four target islands (H.Dh. Nolhivaranfaru, Sh. Fokaidhoo, R. Maduvvari, and B. Dharavandhoo) will become the water production and distribution hubs for all seven northern atolls during the dry season, lifting their dependency on Malé. The RO plants will be operated FENAKA Corporation to deliver, operate and maintain water services in the islands.

19. A further 45 islands (20 islands across four northern atolls and 25 islands across seven southern atolls) will benefit from improved community rainwater collection infrastructure combined with ground water improvements. As the 45 islands are smaller islands with limited population, desalination on these islands is not commercially viable. The primary supply will be rainwater, complemented by the more expensive desalinated water as a backup supply when and if harvested water runs out at the more populated islands or growth centers. Treated rain water together with desalinated water will be combined in clean water tanks. Rainwater will be collected from the roofs and transferred into community tanks, treated and transmitted to a mixing tank with the desalinated water.

The treated rainwater and desalinated water will be blended in varying proportions according to the season and the availability of rainwater. Purpose-designed drains will be put in place to enable excess rainwater from the communal system to infiltrate and recharge the groundwater.

20. The results that will be delivered under this output include:

- Rainwater harvesting systems for 26,000 residents in 45 islands installed;
- Standard Operating Procedures (SOPs) prepared and used by utilities, local councils and households;
- RO desalination water plants in four islands installed and made operational, using a grid-tied and/or off-grid solar PV technology to provide backup capacity in times of water stress;
- Groundwater recharge system installed for excess rainwater from the RWH collection system on 45 islands;
- Tariff evaluation criteria and tariff setting guidelines designed and introduced;
- Training programmes in integrated water resource management, planning and budgeting, water economic modelling, expenditure management and performance monitoring developed and delivered for relevant atoll and island Councils and the Ministries; and,
- Certification courses for the utilities and sector specialists in the areas of water engineering, capital construction, operation, maintenance, financial management and planning introduced at Maldives Polytechnic.

#### **Introducing decentralized and cost effective dry season water supply system benefitting 73,000 people across seven northern atolls**

21. Given the number of inhabited islands in Maldives (194), developing integrated dry season solutions across all atolls and islands is a long term solution. In the short term, island level potable water supplies can be supplemented by desalinated water supplies external to the island most preferably at a decentralized, atoll-level to reduce the transportation cost as well as to improve the timeliness of water delivery. The average cost over the last three years for emergency water costs has been US\$93/m<sup>3</sup> (about 16% of average income in 2012 of the outer islands), compared to tariff rates that are closer to USD\$10/m<sup>3</sup>. As such, this price differential is a significant additional cost to GoM annually. A major portion of the cost is transportation costs – around 10 times more than the amount spent on purchasing the water from suppliers in Malé.

22. The project will improve regulatory and institutional frameworks and arrangements governing the dry season water supply in Maldives. Regulatory instruments for water delivery tendering procedures and sub-laws on institutional coordination and accountability mechanisms will be developed. The decentralized, atoll-based water supply and distribution points developed under Output One will serve as water production and distribution points for all northern atolls. These new decentralized water production and distribution points will follow the existing mechanisms (logistical setup and infrastructure) for emergency water supply during the dry period, but with a considerable improvement by shifting from centrally operated to a decentralized system, closer to the beneficiary communities, thereby reducing costs drastically. SOPs will be developed between the relevant institutions such as the utilities, councils, NDMC and the Ministry of Environment and Energy (MEE) to establish clear and streamlined water distribution operations.

23. The results that will be delivered under this output include:

- Four sub-national water production and distribution locations to serve all Northern atolls established;
- Institutional coordination and accountability mechanisms between the utilities, the NDMC, MEE and Local Government Authority (LGA)/councils to facilitate cost-effective and timely water supply during dry season;

- Regulatory framework for competitive and wholesale water distribution services established; and
- Early warning system established on the basis of forecasted meteorological information for water emergency alerts and for effective operation of integrated water system.

### **Improving groundwater quality to secure freshwater reserves for long-term resilience in 49 islands**

24. This output complements Output One in addressing the quality and quantity of the ground water, mainly from the perspective of land-use planning and water quality monitoring. Given the hydrogeology of the islands, the interrelated issues of groundwater quality and quantity can only be addressed by management approaches that encompass the entire recharge/catchment area, which can mean the whole island.
25. The project will conduct water quality monitoring and establish and maintain a data bank. To undertake this, groundwater monitoring protocols, equipment and training will be procured. Measuring both groundwater level and quality are equally important. Partnership between FENAKA and the health centers in the outer islands will be developed to ensure groundwater quality is achieved. Protocols will include which parameters are to be measured and at which interval in time. The protocols will also detail sampling procedures and chain of custody. This will involve basic water testing equipment to check for contaminants and minerals concentrations.
26. Professional training in groundwater statistics and monitoring compliance will be delivered to the government staff at the EPA, utilities and health centers.
27. The project will further support institutional development through the establishment of a water quality task force in each island under the leadership of the Island Council. The water quality task force will comprise of the members representing the relevant institutions at the island level such as utilities, women's development committees, and health centers. The water quality task force will be a voluntary body, hosted by each island council, as part of the extended advisory body. The water quality task force will ensure a full stakeholder engagement process is undertaken in local water access and safety decisions as well as serving as a mechanism for participatory monitoring of results delivered by water projects and investments. Women's Development Committees at Island Councils will be particularly prominent to empower women in stewarding groundwater protection.
28. The results that will be delivered under this output include:
  - Baseline assessment (hazards inventory and catchment characterization) of groundwater;
  - Groundwater monitoring protocols with associated equipment and training delivered; and
  - Regulatory framework established for coastal land use, including zoning to protect coastal catchment areas and enable natural recharge of groundwater lenses.

#### **1.2.2 Project Alternatives**

29. As part of the project development, a range of alternatives was considered.

#### **1.2.3 Do Nothing Alternative**

30. The project is expected to generate some small scale spatial environmental impacts. Without the project, the existing environment would remain the same in the short term; however, the projected impacts of climate change, including salinization of the freshwater lens due to sea level rise and increased instances of high tides would deteriorate the existing environment even without human intervention
31. This alternative may also give rise to unfavorable social impacts linked to the recurrent shortages of drinking water during the dry period that would necessitate the provision of emergency water during this period. As the primary reason for these shortages is the

inadequate storage capacity in the islands in question, the 'do nothing alternative' will not meet the additional storage need.

32. Furthermore, access to safe drinking water will improve the health aspects of the islands as the cases of water borne diseases will be significantly reduced. Additionally, the quality of food preparation and healthcare services in the islands is expected to improve due to the availability of safe drinking water.

#### **1.2.4 Alternative Locations**

33. The proposed activities could be undertaken in a number of different locations. The proposed locations, particularly those related to desalination processes have been identified through a full needs assessment and risk analysis considering future climate change projections. The needs assessment was supported by the undertaking of environmental impact assessments for the four desalination sites. The needs assessment and risk analysis determined that undertaking the project in the proposed 49 islands would achieve the greatest economic, social and environmental benefits, in comparison with other alternative locations.

## 2. LEGAL AND INSTITUTIONAL FRAMEWORK FOR ENVIRONMENTAL AND SOCIAL MATTERS

### 2.1 LEGISLATION, POLICIES AND REGULATIONS

#### 2.1.1 Constitution

34. Article 22 of the Constitution of the Republic of Maldives states that the State has a fundamental duty to protect and preserve the natural environment, biodiversity, resources and aesthetics of the country for the benefit of the present and future generations. Furthermore, the Constitution also stipulates that the State shall undertake and promote economic and social goals through ecologically balanced sustainable development and shall take measures necessary to foster conservation, prevent pollution, extinction of any species, and ecological degradation.
35. Article 23 of the Constitution provides every citizen the following rights and requires the State to undertake the progressive realization of these rights by reasonable measures within its ability and resources:
  - Adequate and nutritious food and clean water;
  - Clothing and housing;
  - Good standards of healthcare, physical and mental wellbeing;
  - A healthy and ecologically balanced environment;
  - Equal access to means of communication, the State media, transportation facilities, and the natural resources of the country;
  - The establishment of a sewerage system of a reasonably adequate standard on every inhabited island; and
  - The establishment of an electricity system of a reasonably adequate standard on every inhabited island that is consummate to the needs of the island.

#### 2.1.2 Environmental Protection and Preservation Act (Act no. 4/93)

36. The Environment Protection and Preservation Act (Act 4/93) was enacted in April 1993. The Act provides that MEE shall have authority to identify protected areas and nature reserves and enact rules and regulations for the protection and conservation of the environment. The Act also introduced the EIA process in Maldives and states that an environmental impact assessment shall be submitted prior to implementation of any development project that may have a potential impact on the environment. The EIA Regulation (see section 2.15) has been enacted under this Act. The Act also provides MEE the authority to terminate, without compensation, any project that has any undesirable impact on the environment.
37. Furthermore, the Act states that any type of waste, oil, poisonous gases or any substance that may have harmful effect on the environment shall not be disposed within the territory of the Maldives. In case where this becomes absolutely necessary, these shall be disposed only within the areas designated for the purpose by the government. If such waste is to be incinerated, appropriate precautions shall be taken to avoid any harm to the health of the population.
38. The Act also set the penalties its breach, and damage to the environment. Depending on the gravity and seriousness of the offence, the fine for major offences are set at not more than MVR 100,000,000 (one hundred million ruffiya) whereas minor offences are fined between a range of MVR 5 (five ruffiya) and MVR 500 (five hundred ruffiya). Through the Act, the government also reserves the right to claim compensation for all the damages that are caused by the activities that are detrimental to the environment.

#### 2.1.3 Draft Water Act

39. GoM is currently developing a comprehensive water policy that will serve as an overarching national water policy to help the nation achieve the water and sanitation goals set forth in its constitution

#### **2.1.4 Public Health Act (Act no. 7/2012)**

40. The Public Health Act contains sections related to water security, human rights obligations such as provision of essential water, quality assurance and regulations for implementing the Act. It also has specific reference to rainwater tanks requiring protection from insects and animals. Although the Public Health Act addresses health concerns related to water quality, it is still in its infancy and the institutional arrangements for implementation of water quality monitoring to achieve stated health targets remain unclear.

#### **2.1.5 Act on Decentralization of the Administrative Divisions of the Maldives (Act no. 7/ 2010)**

41. The Act gives island councils specific powers and responsibility for, amongst other things:

- Administering and developing the island in accordance with the Constitution and statutes and providing municipal services as prescribed under this Act;
- Preparing island development plans in consultation with the community, and submitting the plan to the Atoll Council;
- Implementing development projects planned and assigned by the government in line with the island development plans formulated by islands and submitted to the Atoll Councils;
- Assisting Government Ministries and Atoll Councils in monitoring the progress of various development projects;

42. Under Chapter 14 of the Act the Island Councils have the power to formulate regulations on matters that fall within their jurisdiction with advice of the Local Government Authority.

43. The Act allows island communities to make their own decisions to improve living standards and to empower people by bringing the scope of services closer to them. The Act gives atoll and island councils wide powers, including:

- Provision of water, electricity, and sewerage
- Collection of fees for services provided
- Supervision of the services provided by Divisions of Government Ministries
- Power to take on loans and issue securities
- Power to enter into service contracts for services to be provided under their authority

#### **2.1.6 The Regulation on Environmental Liabilities (Regulation no. 2011/R-9)**

44. The objective of this regulation is to prevent actions violating the Environmental Protection and Preservation Act 4/93 and to ensure compensations for all the damages that are caused by activities that are detrimental to the environment. The regulation sets mechanisms and standards for different types of environmental liabilities and equal standards that shall be followed by the implementing agency while implementing the regulation.

45. Through this regulation, the GoM reserves the right to claim compensation for all the activities that have breached the Environmental Protection and Preservation Act 4/93.

#### **2.1.7 Regulation on cutting down, uprooting, digging out and export of trees and palms**

46. This Regulation states that the cutting down, uprooting, digging out and export of trees and palms from one island to another should only be done if there is an absolute necessity and no other alternative exists. It also states that for every tree removed two more trees should be planted in the island.

47. Removal of the following types of trees are completely prohibited under the by-law:

- The coastal vegetation growing 15m from the shoreline and inwards toward the center of the island;
- All the trees and palms growing in mangrove and wetlands spreading to 15 meters of land area;

- All trees and palms that are growing in a designated protected area;
- Trees which are protected by the government to protect animal species which lives in the tree;
  - a. Trees that are unusual in their structure.

48. The current project will avoid removal of any tree protected under this regulation and will clear only few trees that are in the proposed project site where the temporary construction site will be established as needed.

#### **2.1.8 Protected Areas and Environmentally Sensitive Areas**

49. Under article 4 of the Environment Protection and Preservation Act, the MEE is vested with the responsibility of identification and designation of protected areas and natural reserves and establishing rules and regulations for the management of protected areas and natural reserves in the country.

50. The project does not propose development in any protected areas and there are no protected sites in the vicinity of the project sites. The site surveys conducted for the project further showed that there no environmentally sensitive areas close to the proposed site.

#### **2.1.9 Dewatering Regulation**

51. The main objective of the Dewatering Regulation was to introduce regulating measures to minimize the adverse effects on the environment and ecosystem due to dewatering, which may be carried out as an indispensable activity of construction works. The Dewatering Regulation states that any project that involves dewatering can only commence once approved by the EPA. The regulation is not applicable for dewatering which may be required for the installation or cleaning of a groundwater well for personal use or groundwater utilized for agricultural purposes.

52. The proponent of such projects must submit an application to the EPA with the relevant documents prior to commencement of dewatering. It is mandatory for the proponent to inform relevant councils, any existing residential areas or agricultural land within 100 meters radius of the dewatering site. The regulation further provides guidance on what should be done with the extracted water from the dewatering process and what actions should be taken if dewatering affects water resource users within a radius of 30 meters from the dewatering site. Furthermore, the regulation provides information on the fines applicable for proponents that do not comply with the dewatering regulation.

53. The relevant activities within the project that require conformity within the regulation will do so by first submitting an application to carry out dewatering within the project site. The proponent will also carry out all the additional measures necessary to obtain the approval from EPA and to abide by the regulation.

#### **2.1.10 Regulation on Desalination**

54. Under this regulation, all desalination plants in operation in Maldives for public and commercial purpose needs to be registered with the EPA.

55. The regulation states that all seawater desalination plants installed and intended to supply water to more than 200 people or large scale agricultural needs or tourism related activity need to be registered prior to the operation of the plant and the registration renewed every five years. As such, regular monitoring is necessary to renew the plant registration. The operators of the desalination plants will further need to obtain an operating license during the operation phase of the project where necessary.

56. The Borehole Guideline (2011) is also of relevance to desalination projects. These guidelines provide the basis for installing boreholes in the Maldives.

57. A borehole will be drilled during the construction phase of the project. The borehole guideline must be strictly followed during the construction and the operational phase of this project.

#### **2.1.11 Borehole Guideline**

58. The main components of this guideline include safe disposal of solid waste, ensuring safe disposal of chemical industrial and hazardous waste.
59. The borehole drilling guideline is applicable to any project that involves drilling boreholes and installation of pumps for source water extraction for water supply development projects. The borehole location must be designated by the client in consultation with the Environmental Consultant and EPA. Further, an EIA is required to be carried out.
60. Article 6 states that the volume of drilling fluids, drilling fluid additives, and lubricants used during drilling of a borehole should be recorded.
61. Article 8 states that any in-land borehole depth will not be less than 30 m even if the electrical conductivity of discharge water has reached 50-60mS/cm. If electrical conductivity of discharge water at 30 m depth is measured less than 50-60mS/cm, drilling must be continued until electrical conductivity reaches to 50-60mS/cm.
62. Article 9 states that any applicable drilling technique is acceptable as long as the drilling method is mentioned in the EIA report.
63. Article 9 also states that the final design of the borehole must ensure that the pumped raw water does not interact with the fresh groundwater aquifer. For monitoring purpose, boreholes drilled will provide water sampling tubes at the interval of 5m from top to bottom.
64. Article 11 states that yield estimates must be made during the course of drilling applying an appropriate method agreed to make sure that the drilled borehole will provide required volume of raw-water.
65. Article 12 states that pumping test must be performed to establish the performance and yield of the borehole using a suitable, self-contained, mobile test pumping unit. The method for varying the discharge rate of the pumps will depend on the type of pump used, but the Contractor will ensure the provision of a suitable means of achieving the range of constant flow rates specified by the Supervisor.
66. Article 13 states that the Electrical conductivity or salinity of discharge water during the process of drilling and test pumping will be conducted and recorded. Further daily activities records must be submitted to EPA after completion of drilling as follows;
  - Name of the Island
  - Date of drilling
  - Reference number of borehole
  - GPS Co-ordinates of borehole (latitude / longitude)
  - Method of drilling
  - Diameter of borehole and depth
  - Description of strata drilled
  - Vertical water quality profile at 5 m intervals (E. Conductivity/Salinity)
  - Depth at which seawater is reached
  - Records of components and quantities used or added to the drilling fluid or air.
  - Water level at the start of each working day
  - Problems encountered during drilling
  - Details of installations in the borehole (if any)
  - Depth, size and description of well casing
  - Depth, size and description of well screens
  - Aquifer depth after completion of well

- Borehole design and installation details (as built drawings)
67. Article 15 states that upon completion of borehole pumped water must be collected and tested at a certified laboratory for; pH, E. Conductivity ( $\mu\text{S}/\text{cm}$ ), TDS (mg/l), Chloride (mg/l), Calcium Hardness (mg/l), Magnesium Hardness (mg/l), Boron (mg/l), Phosphate (mg/l), Sulphate (mg/l), Iron (mg/l), Fluoride (mg/l), Ammonia (mg/l) and Lead (mg/l).
68. The test results must be made available to EPA upon request as part of the borehole completion report.

#### 2.1.12 Waste management policy

69. The main components of this policy include safe disposal of solid waste, ensuring safe disposal of chemical industrial and hazardous waste.
70. All waste management activities under the current project will adhere to the waste management policy.

#### 2.1.13 Land Act (Act no. 1/2002)

71. When land is required for public projects, the standard practice adopted by GoM is that the legal owner or registered user is compensated on a land-for-land basis, with fixed assets being paid for at a fair price.
72. As the site locations under this project are all to be undertaken on GoM owned land and buildings, there will not be any further implications in terms of land allocation and/or use and compensation.

#### 2.1.14 National Biodiversity Strategy and Action Plan

73. The goals of the National Biodiversity Strategy and Action Plan (NBSAP) are:
- Conservation of biological diversity and sustainable utilization of biological resources
  - Build capacity for biodiversity conservation through strong governance framework and improved knowledge and understanding
  - Foster community participation and support for biodiversity conservation
74. Consideration of the goals of NBSAP will be taken into account during the implementation of the project's activities by minimizing the potential loss of biodiversity in the area. Qualitative and quantitative surveys were undertaken to assess baseline coral reef and marine environment biological diversity during the required assessment processes under this project. Subsequently, practical mitigation measures to minimize the impact and monitoring strategies have been identified to protect the biodiversity.

## 2.2 ENVIRONMENTAL IMPACT ASSESSMENT IN MALDIVES

75. The *Environmental Protection and Preservation Act* (Act no. 4/93) is the main legal framework for environmental protection in Maldives. The law requires all development projects that may have a significant impact on the environment undergo environmental impact assessment process. The EIA process is administered by EPA on behalf of the MEE.
76. Article 2 of Act gives the mandate to the MEE to formulate relevant policies and regulations to preserve and protect the environment of Maldives.

### 2.2.1 Environmental Impact Assessment Regulation

77. The *Environmental Impact Assessment Regulation* (EIA Regulation) provides the regulatory framework and processes for conducting EIA in the Maldives.
78. The regulation outlines the prime EIA procedures to be conducted and the processes that development projects that require EIA should follow. It also lists the activities that require an EIA study to be conducted prior to the commencement of the project.
79. This regulation has undergone number of amendments. These amendments included revision of EIA review period and associated costs, qualification required for monitoring the Environmental Management Plan, revision to the list of projects that requires EIAs, projects that can be undertaken by simply applying mitigation measures defined by EPA

such as for dredging of harbors, clearance of vegetation within allocated plots for households and for roads, transferring EIA decision making to Minister of Tourism for tourism related activities; categorization of EIA consultants, point system for consultants to assess performance and license suspension, a code of conduct for consultants, and increment to the fine for non-compliance of regulation and violations.

80. As the proposed IWRM projects are a water and sanitation infrastructure project, as per Schedule D of the EIA regulation, an EIA study needed to be conducted in order to comply with this regulation. These have already been prepared and approved by the EPA. The required EIAs for this Project were conducted in 2017 and submitted to the EPA for approval in August 2017. The mitigation measures approved for the EIA have been integrated within this ESMP, and the EIA Decision Statement provided as an annex (annex 7).

## 2.3 MULTILATERAL AGREEMENTS AND BIODIVERSITY PROTOCOLS

81. The GoM is a signatory to a number of international and regional agreements and conventions, which are related to the environment. These include, amongst others:

No	Name of Treaty	Signature	Ratification	Status
1	United Nations Convention on Biological Diversity	12 June 1992	9 Nov 1992	Ratification
2	United Nations Framework Convention on Climate Change	12 Jun 1992	9 Nov 1992	Ratification
3	Kyoto Protocol	16 Mar 1998	30 Dec 1998	Ratification
4	Paris Agreement	22 Apr 2016	22 Apr 2016	Ratification
5	United Nations Convention to Combat Desertification	NA	3 Sep 2002	Accession
6	Basel Convention on the Control of Trans boundary Movements of Hazardous Waste and their Disposal & Ban Amendment to the Basel Convention	NA	28 Apr 1992	Accession
7	Stockholm Convention on Persistent Organic Pollutants	NA	17 Oct 2006	Accession
8	Vienna Convention for the Protection of the Ozone Layer	NA	26 Apr 1988	Accession
9	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	NA	17 Oct 2006	Accession
10	Montreal Protocol on Substances that Deplete the Ozone Layer	12 Jul 1988	16 May 1989	Ratification

11	Convention on International Trade in Endangered Species of Wild Fauna and Flora	12 Dec 2012	12 Mar 2013	Accession
12	SAARC Convention on Co-operation on Environment			Ratification

### 3. DESCRIPTION OF EXISTING ENVIRONMENT

83. This section identifies the existing environmental and social baseline conditions of the project intervention sites.

#### 3.1 GEOLOGY, TOPOGRAPHY AND SOILS

##### 3.1.1 Geology

84. The coral atolls of Maldives are formed upon minor elevations on the Chagos-Lacadive submarine plateau, which ascends from the deep Indian Ocean. This plateau has provided a base for reef building corals, from where they have risen to the surface.
85. Islands initially formed on a foundation of lagoonal sediments between 5500 and 4500 yr B.P. when the reef surface was as much as 2.5 m below modern sea level. Islands accumulated rapidly during the following 1500 yr, effectively reaching their current dimensions by 4000 yr B.P. Since then the high circum-island peripheral ridge has been subject to seasonal and longer-term shoreline changes, while the outer reef has grown upward, reducing the energy window and confining the islands<sup>2</sup>. All land above the surface in the Maldives is of coralline origin.
86. Based on Kench *et al* (2005), subsurface stratigraphy can be divided into four discrete facies: reef, “velu” (shallow lagoon), “finolhu” (unvegetated sand bank), and island-margin facies (Figure 2). The peripheral reef facies comprises a layered framework of *Porites* heads and plates, branching *Acropora* corals, and *Heliopora*; medium to coarse coral-algal sand and gravel fill the intercoral voids. The surface of this facies is exposed as the contemporary reef flat and is continuing to accrete. The velu facies occupies the shallow depression occluded by the peripheral reef and provides the foundation for island sediments. It comprises horizontally bedded coarse-grained sand, primarily of unmodified calcified segments of *Halimeda*, with a fine lime mud matrix.
87. Extensive areas of the subsurface sediments are lithified on the islands. Phosphate rock and cay sandstone can be found in the central depressions. Shoreline sediments are also lithified as beachrock.

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<sup>2</sup> Kench, P.S., McLean, R.F. and Nichol, S.L. (2005). New Model of reef-island evolution: Maldives, Indian Ocean. *Geology*, 33(2): 145-148.

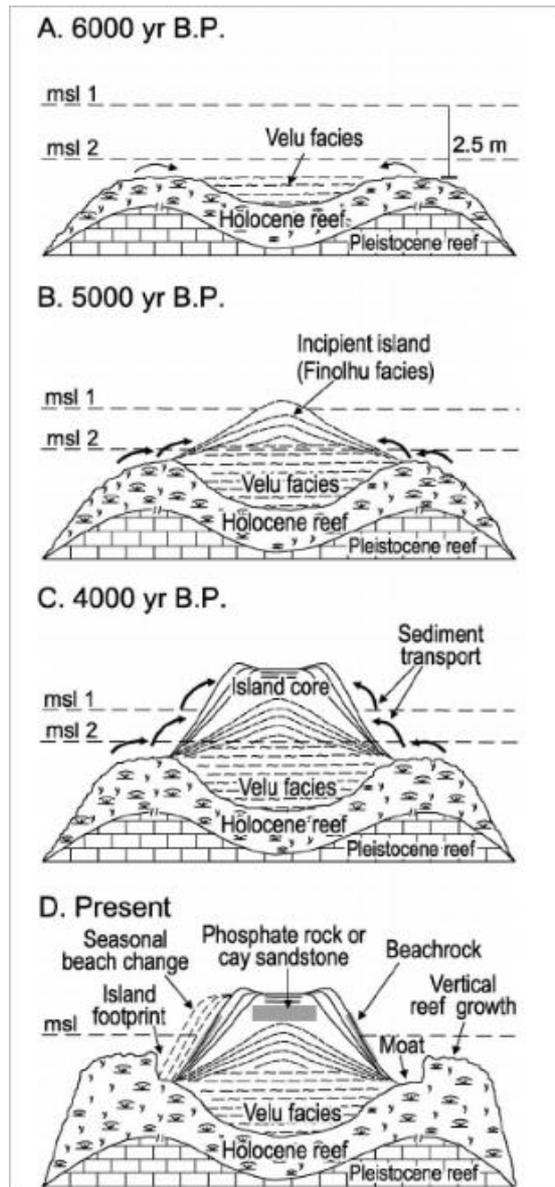


Figure 2 Model of Maldivian reef-island formation and development in mid-Holocene to late Holocene (Source: Kendle *et al* 2005)

### 3.1.2 Topography

88. The islands of Maldives are flat, with topographic variations generally less than two meters at highest elevation across an island. Over 80% of the total land area of the country is less than one meter above mean sea level. Historically, Maldives is divided into 26 natural atolls, however based on a scientific evidence concluded in the 2004, Maldives is classified into 16 complex atolls, five oceanic faros (reefs with a central enclosed lagoon or depression) and four oceanic platform reefs. **Error! Reference source not found.** is a map of Maldives with the atolls and faros.
89. Most of the atolls have a number of channels or openings in the outer reef that provide access to the islands in the enclosed interior sea or lagoon of the atoll. The shape of the atolls varies from circular and oval, to pear shaped.
90. The islands can be divided physiographically into three zones namely: i) the foreshore or lower beach, ii) the beach crest (beach top) and iii) the inner island. The foreshore or lower beach zone, which includes the beach area between the high tide line and the beach crest, is totally exposed to wave action, wind and salt spray. It is unstable and composed mainly of coarse coral sand in the lower portion and shingle. The beach crest or beach top rises gradually and sometimes abruptly to a height of 0.8 to 1 meter above

the high tide line and includes a stable beach frontage composed of coral sand and rubble. It is exposed to winds and salt spray and its lower margin is occasionally or, in the case of an eroding beach, regularly inundated by seawater during spring tides. The beach crest may extend 5 to 20 meters.

### 3.1.3 Soils

91. The soils in the islands of Maldives are geologically young. They consist of substantial quantities of the unweathered coral parent material, coral rock and sand. Soils are coarse in texture and shallow in depth with a top layer of brown soil (0 to 40 cm in depth) followed by a transition zone on top of the underlying parent material of coral reef limestone. In some low-lying areas and areas subjected to significant mechanical breakdown from human activity, fine deep soils are found with accumulated deposits of clay. In the wetland environment called *kulhi*, the depth of the clay is substantial due to the accumulation of material from marine and biological sources over a long period of time.
92. In many places, top layers of the soils have a weakly developed structure and at times a 30 cm thick hard-pan layer cemented with calcium carbonate is present, preventing penetration of the roots of most plants except large trees. The water-holding capacity of the soil is very poor due to high porosity and very high infiltration rates. The soils of Maldives are generally alkaline with pH values between 8.0 and 8.8; this high alkalinity is due to the presence of excess calcium.
93. The soils that contain higher levels of humus, as found in depressions and wetlands, are less alkaline. The quality of the soils in the small islands is generally poor with marked deficiency in nitrogenous nutrients, potassium and several micronutrients particularly iron, manganese and zinc. Though the phosphorus content of the soils is high, it is unavailable to plants as it is present mostly in the form of calcium phosphate.

## 3.2 CLIMATE

Maldives has a tropical monsoon climate. The southwest monsoon (the wet-season) extends from May to November, while the northeast monsoon (dry-season) extends from January to March. The daily temperatures of the country vary little throughout the year with a mean annual temperature of 28°C. The mean daily minimum temperature recorded for Hanimaadhoo, Hulhule and Gan in 2014 was 25.3°C, 26°C and 25.5°C respectively. The mean daily maximum temperature recorded for Hanimaadhoo, Male' and Gan in 2014 was 31°C, 31.1°C and 31.2°C respectively. The long-term mean monthly temperatures for Hanimaadhoo, Hulhule and Gan is given in

94. Figure 3.

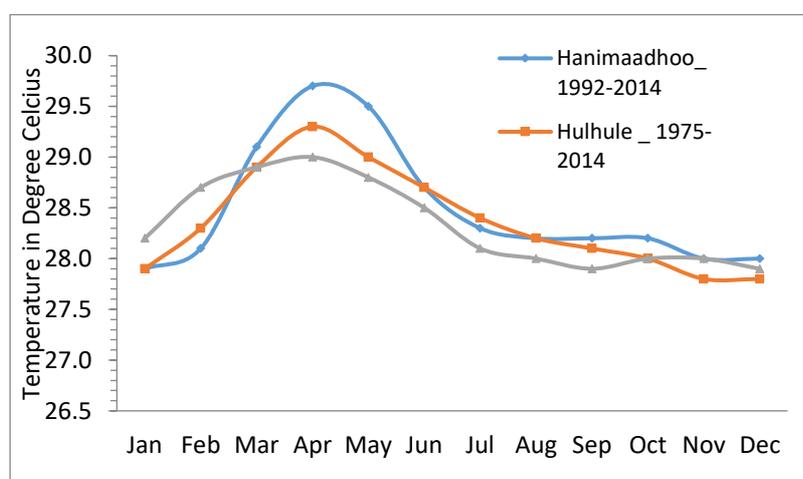
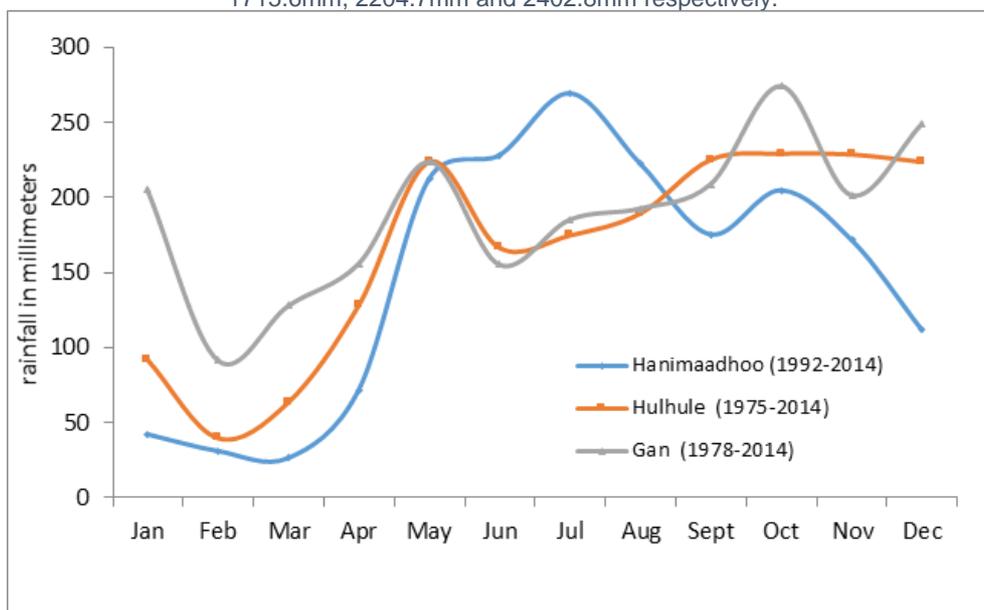


Figure 3 Monthly mean temperatures across Maldives.

Maldives receives greater rainfall during the Southwest monsoon. Variations in rainfall exist from north to south of the country, with north being drier and south being wetter. The Maldives received a total annual rainfall of 1961.4mm for Hanimaadhoo, 1742.3mm for Hulhule and 2095.4mm for Gan in 2017.<sup>3</sup> In 2016, these figures were 1715.6mm, 2204.7mm and 2402.8mm respectively.



95. Figure 4 shows the mean monthly rainfall for Maldives.

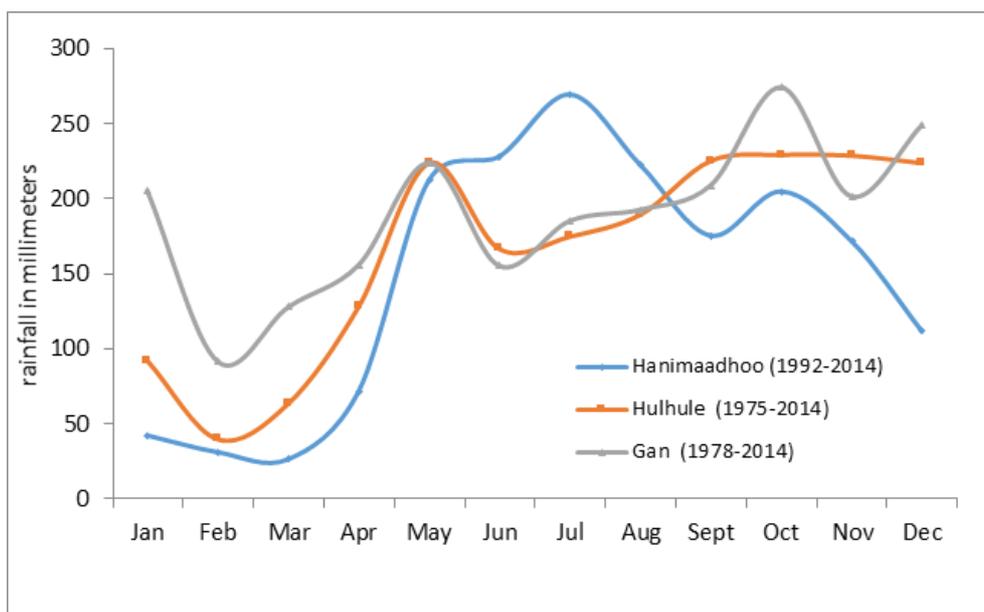


Figure 4 Long-term mean monthly rainfall (Data provided by: Maldives Meteorological Service, 2015)

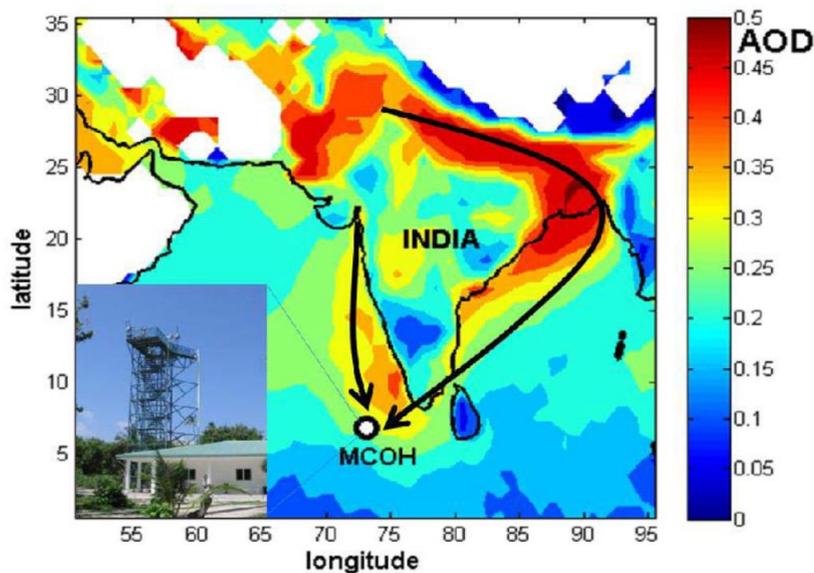
96. The Maldives is influenced by monsoon flows but the annual and seasonal patterns vary from north to south because strengths of the monsoon flows change with proximity to the equator. The strongest west monsoon occurs in the extreme north of the Maldives while the strongest northeast monsoon occurs in the north-central part of the country. The extreme northern part of the Maldives has a wind climate featuring a strong west monsoon from May through August and a moderate northeast monsoon from December through February. The ocean wind speeds during June, July, and August are strong with wind speeds from 6 m/s to 7.5 m/s at 10 m above the surface. The

<sup>3</sup> Data from Maldives Meteorological Service

northeast monsoon is of moderate strength (4 m/s to 5 m/s) from December through February.<sup>4</sup>

### 3.3 AIR QUALITY

97. Rapid urbanization and increased economic growth have significantly contributed to the deterioration of the air quality in densely populated islands such as Male'. In the outer islands, waste burning at dumpsites and backyards contribute to air pollution. In addition to local pollution, transboundary pollution also impacts air quality of Maldives. In this regard, the Indian Ocean Experiment (INDOEX) showed that emissions from mainland South Asia were transported long distances over the ocean.<sup>5</sup> The figure below shows the MODIS satellite image of high loadings of aerosols over South Asia. The dominating air mass transport pathways of winter time Indian subcontinent outflow which are intercepted at Maldives Climate Observatory-Hanimadhoo (MCOH) are shown by black arrows.



98. At present, local air pollution monitoring is limited, with no empirical data to illustrate ambient emission levels.
99. No air quality data has been collected for the preparation of the ESMP. However, due to the limited urban development and heavy industry, air quality is considered to be relatively good.
100. The proposed project interventions are not expected to contribute significantly to air pollution and as such long-term adverse impacts to air quality are not anticipated as a result of the project. None the less, all construction activities have the potential to cause air quality nuisance.
101. Workers involved in construction and operation activities should be familiar with methods minimising the impacts of deleterious air quality and alternative construction procedures as contained in Maldives legislation or good international industry practice.

### 3.4 AMBIENT NOISE

102. The project areas are predominantly urban or village in character. Existing ambient noise reflects those environments, with general urban noise such as from traffic being

<sup>4</sup> Wind Resource Atlas of Sri Lanka and the Maldives [available at: <https://www.nrel.gov/docs/fy03osti/34518.pdf>]

<sup>5</sup> Budhavant, K., Andersson, A., Bosch, C., Kursu, M., Murthaza, A., Zahid., & Gustafsson, O. (2015). Apportioned contributions of PM<sub>2.5</sub> fine aerosol particles over the Maldives (northern Indian Ocean) from local sources vs long-range transport. *Science of the Environment*, 536, 72-78.

the main source of noise nuisance. However, in the island of B. Dharavandhoo, the existence of a domestic airport means that aviation noises are apparent. These have been detailed in the site specific ESMP for B. Dharavandhoo.

103. No noise data has been collected for the preparation of this ESMP. However, due to the limited urban development and heavy industry, environmental noise is considered to be relatively low.

### 3.5 SURFACE WATER

104. There is no terrestrial surface water in Maldives, however, the islands do have sub-surface freshwater lenses that sit above the denser seawater. Historically, water abstracted from these lenses have been used for potable needs. These are discussed below in the Groundwater section.

### 3.6 GROUNDWATER

105. The conventional freshwater resources available in Maldives are in the form of rain-fed shallow freshwater lenses that lie at an average depth of 1-1.5 meters below the ground surface. However, in many inhabited islands of Maldives, the freshwater lenses have been depleted due to over extraction and this has led to salinization of the groundwater. The quality of freshwater lenses has further deteriorated due to disposal of untreated wastewater into the ground and unplanned disposal of solid waste on land.

106. Due to the current status of the freshwater lenses in many islands, rainwater and desalinated water are the most important sources of drinking water used in the islands and Male' respectively. However, there is a lack of storage capacity and the lack of land for adequate storage capacity is a major hindrance to achieve water security.

107. Groundwater quality assessments were carried out in four islands for the Second National Communication (SNC) of Maldives to the United Nations Framework Convention on Climate Change. Samples taken from all four islands indicated significant contamination of groundwater as indicated in Table 4.

Table 4 Indicators of groundwater quality in study islands (Source: State of the Environment 2016).

<b>Water quality parameters (averages)</b>	<b>B. Hithaadhoo</b>	<b>Hithadhoo, Addu city</b>	<b>Gn. Fuvahmulah</b>	<b>Ga. Dhekanbaa</b>
<b>pH</b>	8.0	7.5	7.6	8.8
<b>Electrical Conductivity (µS/cm)</b>	1108.3	824.7	687.8	1725.6
<b>Salinity (‰)</b>	0.9	0.5	0.3	12.6
<b>Percentage of samples positive with faecal coliforms (%)</b>	100.0	60.0	100.0	100.0
<b>Faecal Coliform counts (CFU/100ml)</b>	97.0	59	54.0	45.5

108. The feed water used for the RO plants will not be drawn from the freshwater lens. Instead, it will rely on water drawn from boreholes drilled to at least 30 m. The Borehole

Guidelines in Maldives mandate that the discharge water drawn from such boreholes reach electrical conductivity of 50-60mS/cm, and that if the electrical conductivity measured at 30 m is below this threshold, then drilling be continued until the electrical conductivity reaches the specified threshold. As such, given these stringent requirements on drawing water from boreholes, the RO plants will not utilize any freshwater from the island's freshwater lens.

### 3.7 MARINE ENVIRONMENT

109. Maldives has a range of coastal ecosystems including coral reefs, seagrass beds, lagoons, beaches, and areas of mangroves. The total area of the atolls, including lagoons is 21, 372 km<sup>2</sup> The total reef area of Maldives is 4,515.14 km<sup>2</sup>, of which include 2,041 distinct coral reef structures (larger than 0.01 km<sup>2</sup>) with an area of 4,493.85 km<sup>2</sup> and small areas of coral substratum covering another 19.29 km<sup>2</sup>.<sup>6</sup>
110. The coastal and marine ecosystems and their resources also form the bedrock of the country's economy. These ecosystems also play a key role in providing employment, income, food security and leisure. Furthermore, coral reefs, wetlands and mangrove systems protect the shorelines from wave action and maintain the balance of the environment.
111. However, over extraction of coral and sand, habitat destruction and modification, pollution and unsustainable development have led to degradation of these ecosystems. Beach erosion is among the most serious environmental issues facing the islands of Maldives. Climate change and sea level rise aggravate the erosion process. In addition, El-Nino induced bleaching is a significant threat to the coral reefs.

#### 3.7.1 Marine Water Quality

112. Table 5 represents the typical marine water quality in the project sites, tested for the parameters as indicated.

Table 5 Water Quality from project sites

Parameter	Result
Physical appearance	Clear with particles
Conductivity	50700
pH	6.29
Salinity	33.15
Temperature	21.1
Total dissolved solids	25300
Total suspended solids	<5 (LoQ 5mg/L)
Turbidity	0.317
Total alkalinity	109

#### 3.7.2 Marine Hydrodynamics

113. Maldives experiences mixed semi-diurnal and diurnal tides with a strong diurnal inequality. Tides have an influence on the wave conditions and the sediment movements in and out of the reef system. The hourly tide data from the University of

<sup>6</sup> State of the Environment 2016

Hawaii sea level archive for year 2011, covering both spring and neap tides indicate an approximate tidal range at 1.7 - 3m, and is observed to be mixed and dominantly diurnal in nature.

Ocean currents play a significant role in sediment movement. Currents can be wind driven or tide driven. Available satellite information is used to draw information about the climatology of the currents around the Maldives region. This climatology is based on 23 years (1992-2014) data and the general pattern is show for the NE monsoon in

Figure 5. The long-term average current speeds during NE monsoon varies between 0.08-0.2  $\text{ms}^{-1}$ , which is typical current speeds around the islands of Maldives. However, it can attain speeds between 0.3 to 0.6  $\text{ms}^{-1}$  in the SW monsoon.

114. Figure 5 and Figure 6 show current regimes in the two monsoon periods.

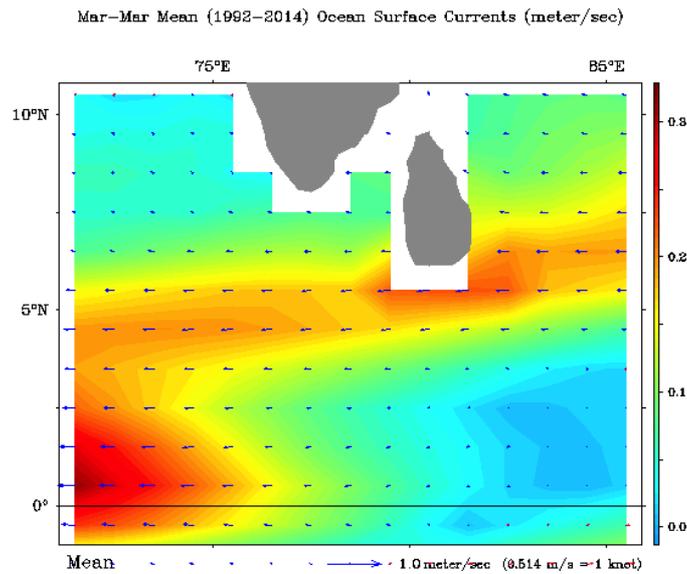


Figure 5 Average current regime around Maldives in NE Monsoon

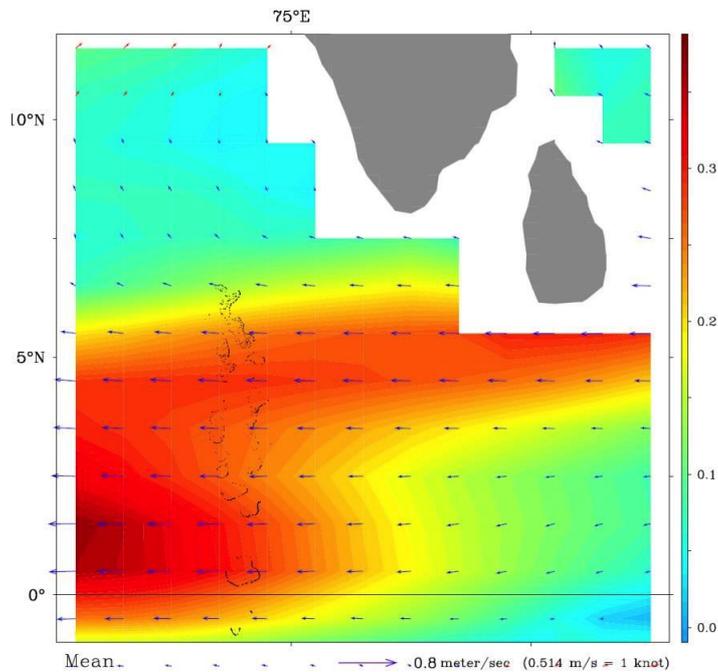


Figure 6 Average current regime around Maldives in SW Monsoon

115. The coastal dynamics such as accretion and erosion of islands depends on wave energy. Waves play a significant role in the modification of the beach environment and the surrounding areas. Swell waves in Maldives are experienced by the swells generated by distance storms and have a period of 14-20 seconds. Assessment done by Lanka Hydraulics shows that significant wave height (Hs) for the Male' region was 1.23m with a mean period (Tm) of 7.53s. Maximum Hs was 1.51m with a Tm of 7.74s

## 3.8 TERRESTRIAL FLORA AND FAUNA

### 3.8.1 Background

116. Despite the poor and infertile soils, the islands of Maldives support extremely rich coastal vegetation. Vegetation and other ecological features vary between islands from north to south in the country. Furthermore, variations exist between exterior and interior islands in atolls. The characteristics of the foreshore area also influence the ecology and vegetation in these islands.
117. The microclimate of the inner islands, protected by the beach-crest communities, supports the growth of a number of trees and shrubs, which occur either in pure stands or as a mixed forest. In many islands coconut plantations are present immediately adjacent to beach-crest vegetation and in moist areas the shelter provided by a complete coconut tree canopy supports the growth of under story tree species such as *Morinda citrifolia* and *Guettarda speciosa*. In some places, *Pandanus odoratissimus*, *Calophyllum inophyllum* and *Hibiscus tiliaceus* are also found in low numbers within coconut groves. In some other, particularly moist, areas small pure stands of *Hernandia nymphaeifolia*, *Cordia subcordata* and *Barringtonia asiatica* are present. In drier places, including the northern group of islands, pure stands of *Hibiscus tiliaceus* and *Premna serratifolia* are also seen.<sup>7</sup>

### 3.8.2 Terrestrial

118. While tall trees such as *Ficus*, *Casuarina* and coconut are particularly common in most islands, large stands of mangroves are characteristic of some of the northern islands.
119. Vegetation found in Maldives can be categorized into five groups, namely beach pioneer, littoral hedge, sub-littoral thicket, climax forest, and mangrove and swamp forests. Past publications on terrestrial diversity revealed that the flora of Maldives comprises of 583 species of vascular plants, of which 323 are cultivated species, while 260 are naturalized plants. The Catalogue of Plants (1992) reported 486 species of plants in Maldives. Among these, the highest species diversity exists in the medicinal plants group, while the least species diversity is found in the cereal group.
120. At least 14 species of mangroves belonging to ten genera grow in about 150 islands of Maldives. Mangroves in these islands are found in enclosed or semi-enclosed brackish water locally known as *kulhi* or in muddy areas without standing water (locally known as *chas bin*). Among the dominant species of mangroves are *Lumnitzera recemosa*, *Bruguiera cylindrica* and *B. gymnorhiza*.
121. Compared to the rich marine fauna, the terrestrial fauna is poor in Maldives. A study on fruit bats and birds, insects, arachnids and mollusks revealed that Maldives is particularly rich in species of spiders. In the same study, four species of bumblebee, which are very much a feature of the islands, were also collected<sup>8</sup>.
122. Among reptiles, the Maldivian Black Turtle (*Melanochelys trijuga thermalis*) is a species of turtle listed as 'near threatened' on the International Union for Conservation of Nature (IUCN) Red List and is found only in Kaafu Kaashidhoo, Meemu Muli and Haa Dhaalu Kanburudhoo. It is protected under Environmental Protection and Preservation Act (Law No. 4/93). Other reptilian species recorded include two gecko (*Hemidactylus spp*) commonly seen throughout the country. In addition, two agamid lizards, the common garden lizard or blood-sucker (*Calotes versicolor*) and the snake skink (*Riopa albopunctata*), and two species of snakes, the common wolf snake (*Lycodon aulicus*) and *Typhlops braminus*, are also found. Among amphibians, only one species of frog (*Rana breviceps*), and a larger toad (*Bufo melanostictus*) are seen.
123. The only native terrestrial mammals found in Maldives include two sub-species of fruit bats. Among these, *Pteropus giganteus ariel* is common and widespread within the country, while *Pteropus hypomelanus maris* is rare and has only been recorded from Addu City.

<sup>7</sup> FAO [available at: <http://www.fao.org/docrep/010/ai387e/AI387E03.htm>]

<sup>8</sup> Fifth National report to the CBD, 2015

### 3.8.3 Protected Areas

The first protected areas in the Maldives were designated in 1995. There are currently 15 Marine Protected Areas (MPAs). MPAs were initially established for tourism purposes. Other reasons for MPA establishment included banning of export of baitfish as aquarium fish, banning fishing from 'house' reefs of tourist resorts and protection of threatened marine species. While some of the terrestrial protected sites including uninhabited islands and wetlands are known for their diverse bird life, other areas serve as rookeries for sea turtles. To date, a total of 42 protected areas totaling more than 24,494 hectares and one biosphere reserve, consisting of marine, mangrove and terrestrial ecosystems are designated under EPPA 4/93.

124. Figure 7 shows the protected areas in Maldives.

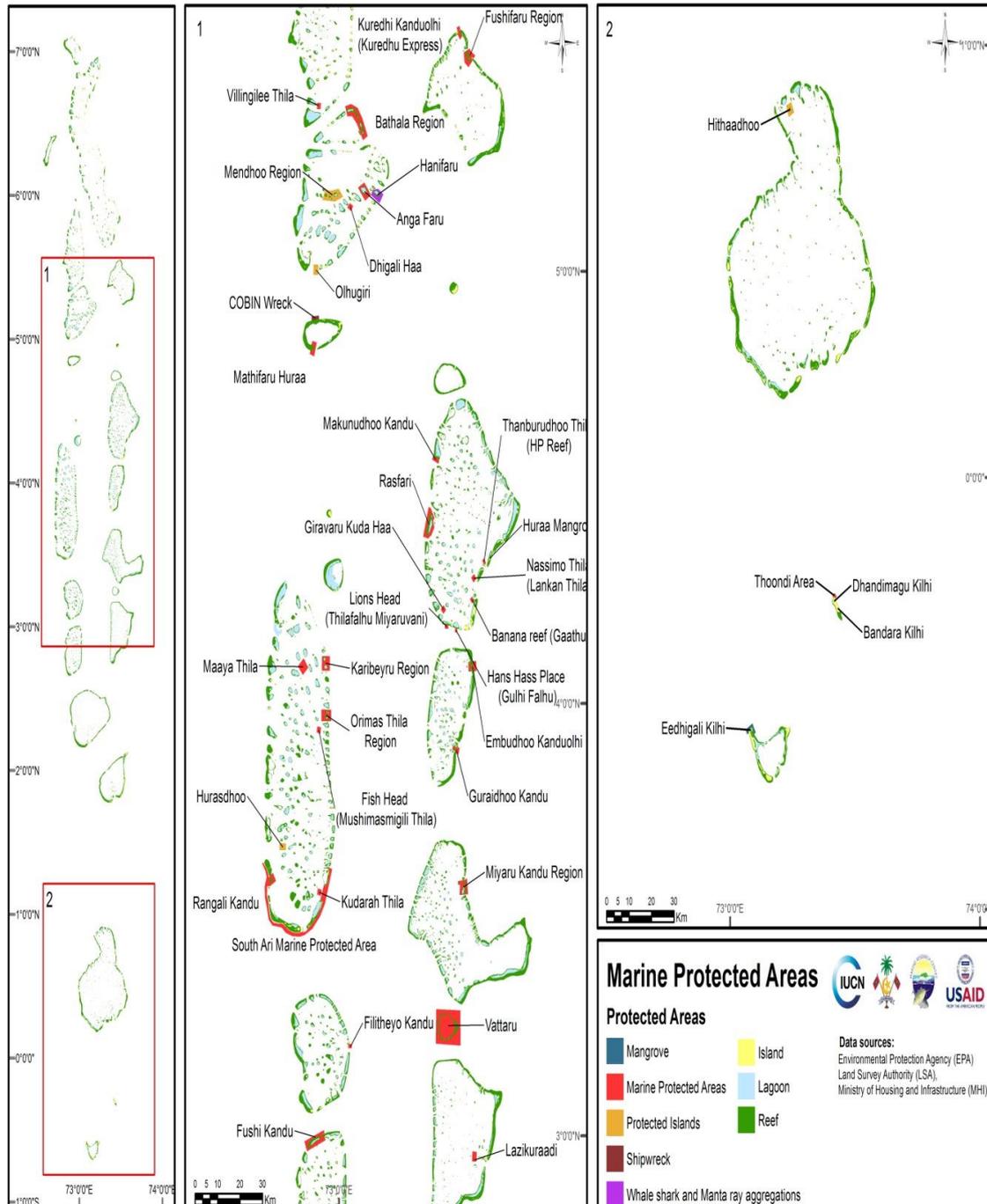


Figure 7 Protected areas of Maldives (Source: State of the Environment 2016)

### 3.9 MARINE FLORA AND FAUNA

125. The unique and rich diversity of coral reefs of Maldives makes them globally significant. Covering a total reef area of 4,500 km<sup>2</sup>, the coral reefs of Maldives are the seventh largest reef system in the world and represents about 3.14% of the global reef area. Thiladhummathi Atoll has the largest reef area with approximately 500 km<sup>2</sup>. Of the 2,041 distinct coral reefs in the Maldives, 529 are found on the rims of the 16 complex atolls. Five reefs make up oceanic faros and four are oceanic platform reefs. The rest are found as patch reefs within the lagoons of the complex atolls.
126. The coral reef system of Maldives consists of 209 species of hermatypic corals. Furthermore, over 1,200 species of fish, 285 species of algae, 36 species of sponges, 400 species of molluscs, 350 species of crustaceans and 83 species of echinoderms, 20 species of cetaceans and five species of marine turtles are found in Maldives (Fifth National Report to the CBD 2015). Among the globally significant species found are the whale shark, manta rays, reef sharks, dolphins, Napoleon wrasses, giant grouper, giant clam and black coral. Table 6 provides reef area statistics across Maldives.

Table 6 Reef Area Statistics of Maldives (Source: State of the Environment 2016)

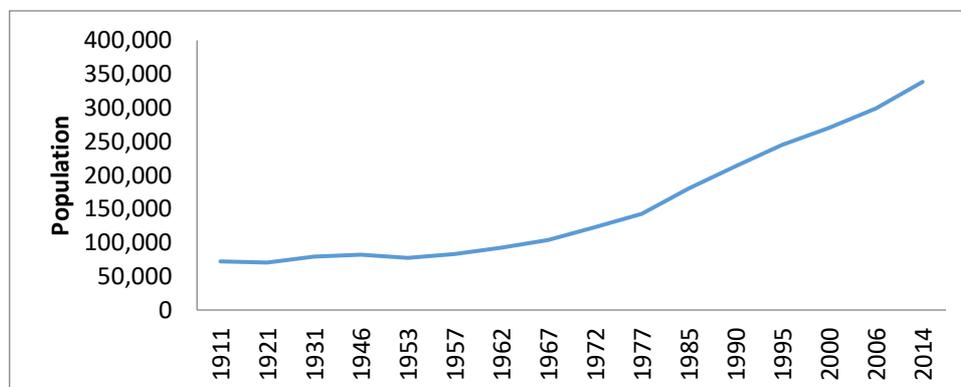
Major Coral Reef Structures	Total Surface Area (km <sup>2</sup> )	Number of Reefs	Reef Area (km <sup>2</sup> )	Reef Island Area (km <sup>2</sup> )
<b>Complex Atolls</b>				
Ihavandhippolhu	289.81	30	119.50	5.70
Thiladhunmathi	3,788.71	164	500.70	68.70
North Maalhosmadulu	1,184.31	155	223.50	12.90
South Maalhosmadulu	1,126.95	105	262.90	5.50
Faadhippolhu	701.42	84	158.00	7.20
North Male'	1,568.18	189	349.00	9.40
South Male'	536.33	112	175.60	2.00
Ari	2,271.75	268	489.40	8.30
North Nilandhe	597.15	86	151.30	2.20
South Nilandhe	736.46	98	179.40	4.40
Felidhe	1,090.97	203	251.10	0.92
Mulaku	983.92	111	197.30	4.20
Kolhumadulu	1,695.79	154	243.30	9.30
Hadhdhunmathi	884.63	56	203.70	23.10
Huvadhoo	3,278.59	210	437.90	34.30

Addu	157.22	7	70.32	15.00
<b>Oceanic Faros (5)</b>				
Makunudhoo	142.48	1	142.48	0.96
Goidhoo	112.61	1	112.61	2.20
Gaafaru	88.05	1	88.05	0.19
Rasdhoo	61.84	1	61.84	0.62
Vattaru	46.72	1	46.72	0.01
<b>Oceanic Platform Reefs (4)</b>				
Alifushi	4.38	1	4.38	0.71
Kaashidhoo	9.54	1	9.54	2.89
Thoddoo	4.75	1	4.75	1.62
Fuvahmulah	10.18	1	10.18	5.13
<b>TOTAL</b>	<b>21,372.72</b>	<b>2,041</b>	<b>4,493.85</b>	<b>227.45</b>

### 3.10 POPULATION

127. While very little is known of the early history of Maldives, the islands are estimated to have been populated for at least 2500 years.<sup>9</sup> The ethnic root of the population can be traced to the populations of the Indian subcontinent as well travelers from Middle East and Africa. Over time, the Maldivian population has developed a distinct identity as well as a local language. This language, Dhivehi, is an Indo-European language with roots in Sanskrit and is spoken in Maldives and the island of Minicoy, India. The population of Maldives adhere to Sunni Islam. The Islamic religion and traditions are an important part of the local culture.

128. Figure 8 shows the population growth of Maldives over the last century. Comparison of the 2006 population figure with 2014 figure reveals that the population has increased from 298,968 in 2006 to 338, 434 in 2014. The population growth rates have declined from 2.69% in 2006 to 2.65% in 2014. Based on the current trend, the population is expected to reach 400,000 by 2025.



<sup>9</sup> Mohamed., N. 2005. 'Note on the early history of Maldives'. *Archipel* 70, pp 7-14

Figure 8 Population data for Maldives

### 3.10.1 Gender

129. According to the results of the 2014 Census, males constitute 50.8% of the population of Maldives and female equal 49.2%.

130. Figure 9 shows that the population of Maldives is relatively young, with most of the population being under 30 years old

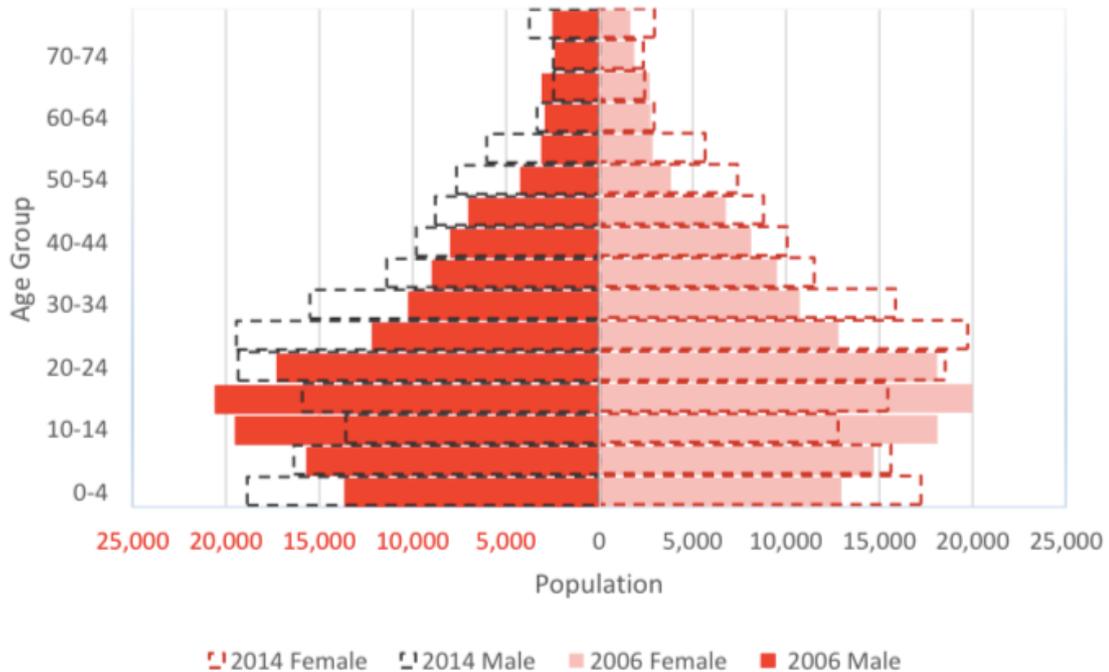


Figure 9 Population pyramid – census 2006 and 2014 (Source: National Bureau of Statistics)

### 3.10.2 Employment, Labor and Working Conditions

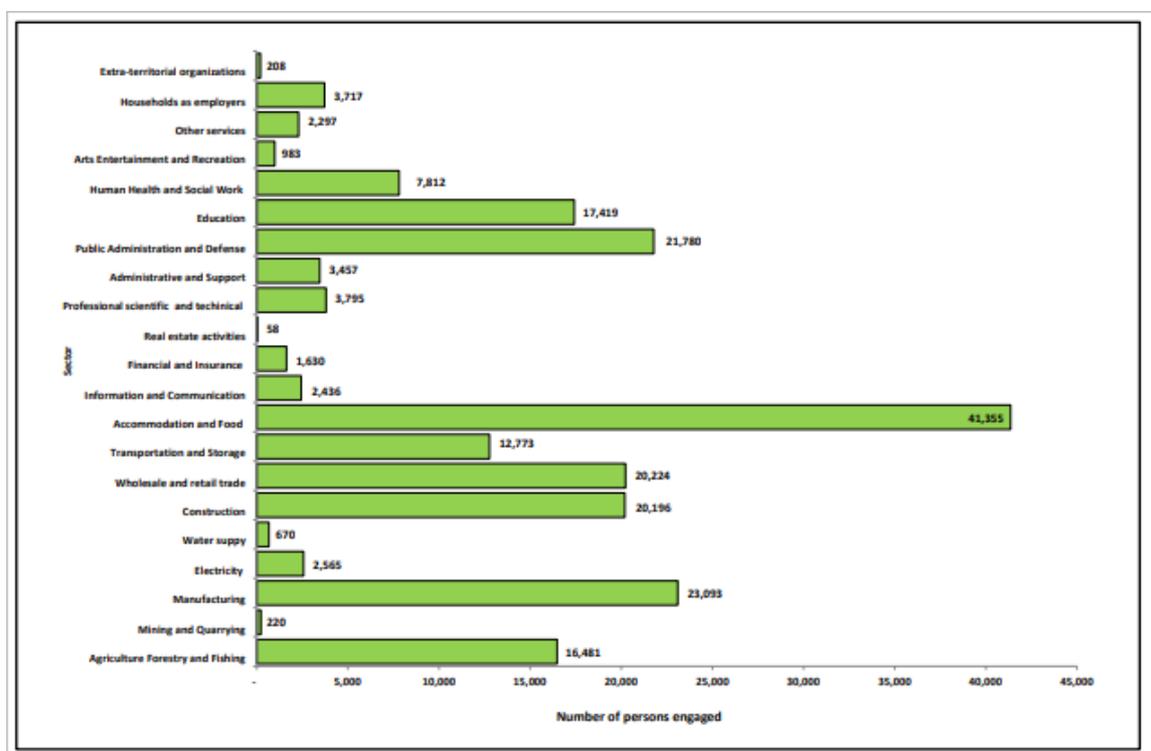
131. Maldives has enjoyed a long period of robust economic growth following the rapid growth of its tourism and fisheries sectors. Economic diversification is leading to higher incomes.

132. Unemployment is relatively low in the Maldives. The unemployment rate in Maldives averaged 3.89% from 1991 until 2016, reaching an all-time high of 14.40% in 2006 and a record low of 0.80% in 1994. The unemployment rate decreased to 3.20% in 2016 from 3.90% in 2015.



Figure 10 Unemployment rate in the Maldives (2008-2016).<sup>10</sup>

133. The government was the principal employer in the Maldives until tourism was introduced in the early 1970s. Although private owners/operators of carpentries, retail shops, small passenger and cargo vessels and other small enterprises did employ workers and paid monthly wages to them, private employment was not a factor in the economic life of the Maldives. Owners of fishing vessels paid to fishermen in kind. However, with the beginning of 1980s and the expansion of tourism and related industries, including the construction industry, wage earning workers became a regular feature in the economic activities of the country.



<sup>10</sup> <https://tradingeconomics.com/maldives/unemployment-rate>

134. Figure 11 shows the major sectors and number of people employed in them, based on the 2014 Census.
135. The communities covered under this project are primarily employed in the fishing sector, agriculture, government services and tourism.
136. Women face little discrimination in basic aspects of life such as primary education, health and survival, unlike in much of South Asia, however, and gender inequality endures, despite constitutional guarantees to the contrary.
137. Women's labor force participation is high, but limited to lower echelons of the economy. Women are slightly more likely than men to be unemployed. Men struggle with different gendered situations. Unemployment is high among young men, who also increasingly are alienated from society and family.<sup>11</sup>

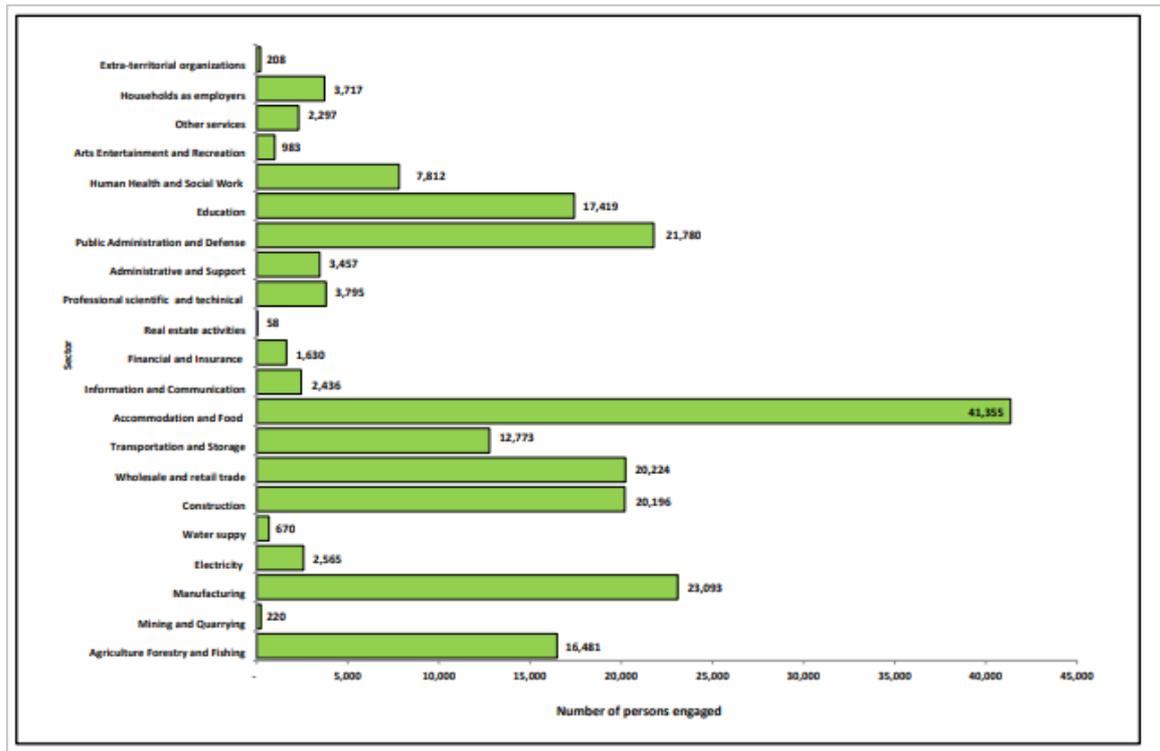


Figure 11 Resident employed population by sector - 2014 Census<sup>12</sup>

### 3.11 ARCHAEOLOGICAL AND CULTURAL HERITAGE

138. There are no cultural heritage elements or archaeological sites in the vicinity of the project sites that would be adversely impacted by the project.

<sup>11</sup> Jana El-Horr and Rohini Prabha Pande (2016) Understanding Gender in Maldives: Toward Inclusive Development  
<sup>12</sup> <http://statistics.maldives.gov.mv/nbs/wp-content/uploads/2016/02/StatisticalReleaseIV-Employment.pdf>

## 4. ENVIRONMENTAL AND SOCIAL RISK ASSESSMENT

### 4.1 ASSUMPTIONS UNDERPINNING THE DEVELOPMENT OF THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

139. The following assumptions have been made in the preparation of this ESMP:
- all legislative requirements and any approval conditions will be met
  - none of the interventions will require the displacement of people;
  - the rainwater harvesting tanks will be installed at brownfield locations where vegetation has already been removed;
  - the installation of the rainwater harvesting tanks will be undertaken during the dry season to reduce erosional impacts;
  - materials will be pre-fabricated to reduce waste and impacts on site;
  - all filters and other items used in the sterilization and purification of groundwater will be stored in a safe place to remove the chance of releasing chemicals into groundwater;
  - none of the interventions will be conducted in protected areas or sensitive locations;
  - brine will not be released into important marine ecosystems;
  - appropriate erosion and sediment control will be undertaken during all stages of the projects (in line with Erosion, Drainage and Sediment Control Plan (EDSCP) ; and
  - there will be no release of pollution and/or chemicals as a result of the projects.

### 4.2 UNDP SOCIAL AND ENVIRONMENTAL STANDARDS AND SCREENING PROCEDURE

140. As this project is supported by UNDP in its role as a GCF Accredited Entity, the project has been screened against UNDP's Social and Environmental Standards (SES) utilizing UNDP's Social and Environmental Screening Procedure (SESP). As part of the initial project development and approval process the Social and Environmental Screening Template was prepared, and the project deemed to be a moderate risk (Category B) project. Discussions on the impact assessment are provided in the Social and Environmental Screening Template, which provided the rationale for the project being classified as a moderate risk. This ESMP provides further discussion below.

### 4.3 IMPACT ASSESSMENT METHODOLOGY

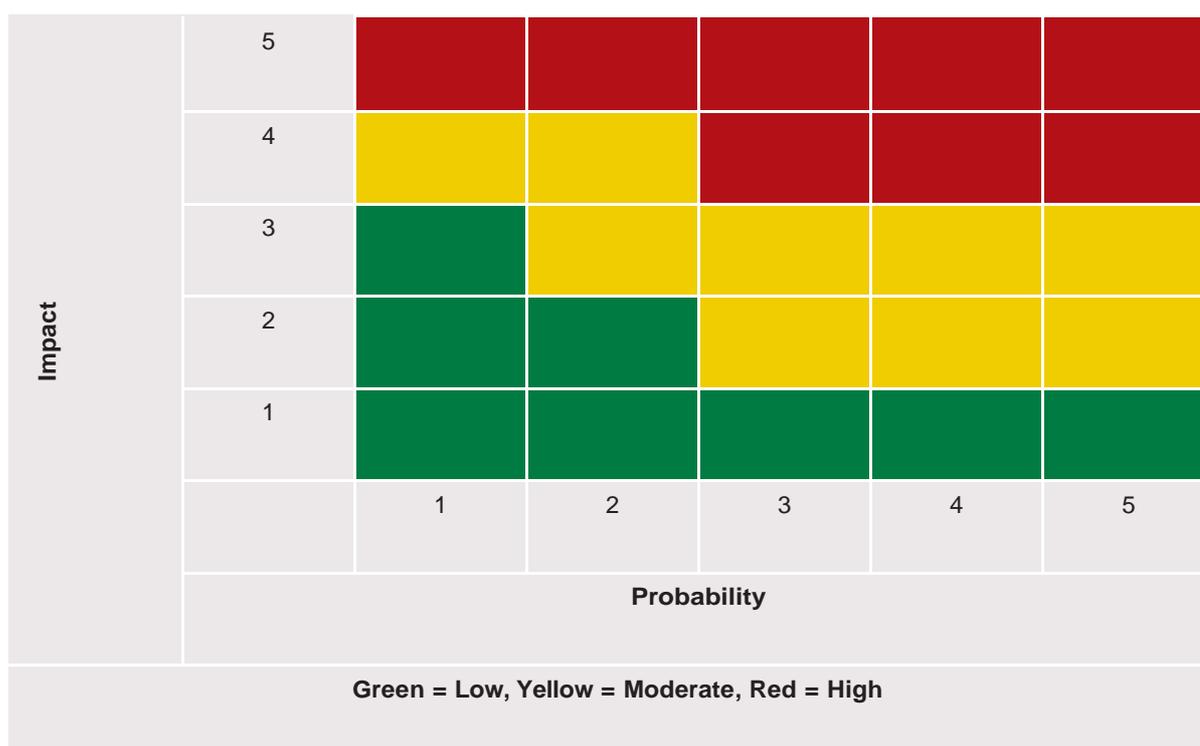
141. An impact risk assessment was undertaken using the UNDP Social and Environmental Screening Procedure to assess the probability (expected, highly likely, moderately likely, not likely) and the impact of the risk (critical, severe, moderate, minor, negligible). From this, a significance value was attributed to identified potential impacts (negligible, low, medium, high and extreme).

Score	Rating
5	Expected
4	Highly Likely
3	Moderately likely
2	Not Likely
1	Slight

Rating of Probability of Risk

Score	Rating	Definition
5	Critical	Significant adverse impacts on human populations and/or environment. Adverse impacts high in magnitude and/or spatial extent (e.g. large geographic area, large number of people, transboundary impacts, cumulative impacts) and duration (e.g. long-term, permanent and/or irreversible); areas impacted include areas of high value and sensitivity (e.g. valuable ecosystems, critical habitats); adverse impacts to rights, lands, resources and territories of indigenous peoples; involve significant displacement or resettlement; generates significant quantities of greenhouse gas emissions; impacts may give rise to significant social conflict
4	Severe	Adverse impacts on people and/or environment of medium to large magnitude, spatial extent and duration more limited than critical (e.g. predictable, mostly temporary, reversible). The potential risk impacts of projects that may affect the human rights, lands, natural resources, territories, and traditional livelihoods of indigenous peoples are to be considered at a minimum potentially severe.
3	Moderate	Impacts of low magnitude, limited in scale (site-specific) and duration (temporary), can be avoided, managed and/or mitigated with relatively uncomplicated accepted measures
2	Minor	Very limited impacts in terms of magnitude (e.g. small affected area, very low number of people affected) and duration (short), may be easily avoided, managed, mitigated
1	Negligible	Negligible or no adverse impacts on communities, individuals, and/or environment

Rating of Impact of Risk



UNDP Risk matrix

142. The following section provides an overview of the likely potential impacts, both direct and indirect as well as highlighting the beneficial impacts from the project. The ESMP outlines the required avoidance and mitigation measures (see Section 0) to ensure that significant adverse impacts are avoided, or where avoidance is not possible, minimized, mitigated and managed so as not to significantly impact on the environment and social fabric of the project areas.

## 4.4 DIRECT IMPACTS

143. The activities will be undertaken in locations that are disturbed both geographically and anthropogenically. The environmental and social impacts envisaged for the project are predominantly temporary in nature with regard to the associated construction activities. All activities are expected to be conducted on government owned land and as such, no form of re-settlement is required for this project.
144. The most significant environmental impacts are likely to be attributed to the construction of the desalination plants/pipelines, borehole drilling process and brine disposal in the four IWRM islands. All other activities are considered to be lower risk level and readily managed.
145. Brine reject concentrate will be treated in a brine well. The treatment includes aeration of the brine reject concentrate. The treated brine will be disposed via a brine reject outfall. The proposed location is expected to have strong ocean currents that will assist flushing and dispersion of the brine concentrate.
146. The following impacts on the natural environment due to brine disposal have been predicted;
- a. The brine concentrate will have adverse effect on the reef ecosystem if not disposed into a mixing zone with great current speeds. However, the proposed location for the brine reject outfall has a high velocity current that will enable adequate flushing of brine.
  - b. The brine concentrate will have adverse effect on the lagoon marine ecosystem and seawater quality if not disposed into a mixing zone with great current speeds. However, the proposed location for the brine reject outfall has a high velocity current that will enable adequate flushing of brine.
147. The boreholes required for the extraction of saline groundwater are expected to generate some environmental and social impacts. As the borehole will be drilled to a depth of 30m, into an area far below the freshwater lens, only saline groundwater will be abstracted. The impact to the freshwater lens will be minimized through adoption of appropriate drilling procedures and adhering to the requirements of the Borehole Drilling Guideline. The vibration, noise pollution and the bentonite clay used in the drilling process will also need to be adequately managed.
148. The majority of construction activities will be undertaken for the construction and operation of the desalination plants, establishing the rainwater harvesting tanks and the piped network where needed. The proper handling of the material for this works, and where possible, recycling and reuse of any local materials will be considered.
149. No protected areas exist within the vicinity of the project sites. Therefore, the proposed works are unlikely to impact on important ecosystems and/or habitats. Nonetheless, appropriate sediment and erosion controls, along with waste management practices, will be put in place to minimise any potential impacts.
150. All construction and operation activities have the potential to cause noise nuisance. Vibration disturbance to nearby residents and sensitive habitats is likely to be caused through the use of vibrating equipment. The use of machinery or introduction of noise generating facilities could have an adverse effect on the environment and residents if not appropriately managed. Potential noise sources during construction may include:
- heavy construction machinery;
  - power tools and compressors;
  - generators; and
  - delivery vehicle
151. Heavy machinery can generate high noise levels within and along the project area and route. All machinery and vehicles used will be restricted to 7am to 5pm.

152. Air quality is unlikely to be affected due to the limited exhaust emissions from construction vehicles and machinery such as concrete mixers, and dust from exposed soils and stock piles. All equipment is to be in good working order with noise and emission reduction equipment as fitted by manufacturers intact.
153. The project is unlikely to result in any significant risk to water pollution from oil, grease and fuel spills, and other materials from vehicles working on site as the management measures outlined in this ESMP are sufficient to minimize these risks. Construction vehicles could affect water quality by accidents from vehicles carrying hazardous substances (chemicals and fuel). Oil and grease from engine leaks can pollute the ground. While it is unlikely that there will be an impact as a result of a chemical, fuel and oil spill, these lubricants need to be handled with caution. In the case of a spill, every effort must be made that it does not enter the marine environment.
154. The project has the potential to generate quantities of waste, although the quantities are unlikely to cause a significant environmental impact. All waste generated through the project, including during the operational phase, will be disposed according to provisions of the waste management regulation, within the island waste management centers or regional waste management facilities where available.
155. With regard to the chemicals used for water treatment and disinfection, these will be handled properly per the management measures of the ESMP so as not to cause any leaching to the ground. In terms of the chemicals used for water testing, while proper handling and care will be critical, given the small quantities used, the likelihood of these resulting in environmental impacts are minimal.

#### 4.5 INDIRECT IMPACTS

156. In terms of the brine reject outfall, there is the potential for an indirect impact on the reef and bait fisheries due to brine disposal. The EIAs conducted for the IWRM islands at the proposed locations for the outfalls indicated that these have high velocity currents and good tidal fluctuations which should significantly reduce any potential impacts.
157. There are other envisaged indirect impacts such as over consumption of potable water for other residential and commercial purposes. This could lead to unsustainable management of water resources available in the island. The project includes training for resource planning and management as well as the creation of volunteer monitoring groups to help minimize this risk.

#### 4.6 CUMULATIVE IMPACTS

158. Given the geographic distance of the island to other inhabited islands, the cumulative negative impact on the environment from this project is expected to be minimal.
159. In the four IWRM islands, the impacts from the brine outfall will need to be considered along with the sewage outfall and how these will impact the local marine environment. The site specific EIAs conducted at these four islands considered the existing sewerage system and local coastal environment dynamics in determining the location of the outfall. Details on these are provided in the site specific ESMPs for these four islands.
160. The RO plants will utilize power from the existing island grid. The additional power demand can be met with the existing infrastructure, however, the additional fuel requirements will also increase the overall GHG emissions. Supplementary solar systems will help to offset the increased power consumption.
161. The increased reliability of water on the target islands may also increase opportunities for local tourism, and with the increase in tourists at these islands, this may put additional pressures on the local environment and services. However, increased opportunities in local tourism will also provide both employment and business opportunities for the island communities.

## 4.7 TRANSBOUNDARY IMPACTS

162. Given the locations of the interventions, there is unlikely to be any transboundary impacts.

## 4.8 BENEFICIAL IMPACTS

163. The project has very significant direct beneficial impacts 32, 000 people in 49 islands (direct high intensity beneficiaries) and will also directly benefit 73, 000 people that are currently faced with water shortages in the dry period (direct, medium intensity beneficiaries).

164. The social and economic impacts of the project will largely be positive, particularly in terms of job opportunities created and the improvement of the overall health and wellbeing of the community with the increased availability to safe drinking water throughout the year without shortage during the dry period.

165. The economic burden on the taxpayer in general will be reduced as currently large sums of taxpayer money are used to provide emergency water during the dry period water shortages.

## 5. AVOIDANCE AND MITIGATION MEASURES

167. There is a range of options to avoid and/or mitigate the environmental and social impacts associated with the proposed interventions. The ESMP contained in Chapter 8 sets out appropriate and comprehensive mitigation measures for the potential impacts. Additional, site specific ESMPs have been prepared for the RO facility sites. Through compliance with the ESMP, the project is unlikely to have any significant impacts/risks.
168. Prior to any activity being carried out, the project will ensure equitable participation of men and women in all project activities. Further, the project will ensure it undertakes an assessment of sex-disaggregated data and the gender analysis.

## 6. STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION

### 6.1 PUBLIC CONSULTATION AND ENVIRONMENTAL AND SOCIAL DISCLOSURE

169. This ESMP includes public consultation as part of the stakeholder engagement plan. The project has been discussed with a wide range of stakeholders including relevant government agencies, NGOs and CSO groups, and island communities where the project activities will take place. Additionally, extensive on the ground consultations have been held at the individual islands during project development and pre-project implementation. These consultations brought together all stakeholders at the island level, including local councils, women, and utility providers. Based on these consultations and the subsequent reflection of these discussions within the project, the project has been fully accepted.
170. The MEE and UNDP will develop and release updates on the project on a regular basis to provide interested stakeholders with information on the project status. These updates will utilise a broad range of tools, including print and social media and reports as necessary. All material will be published in Dhivehi and English as appropriate.
171. The project coordinators at the PMU will be assigned as the nodal points for enquiries, concerns, complaints and/or grievances. Where there is a community issue raised, the following information will be recorded as described in Section 8.5.1.
172. Some enquiries, concern, complaints and/or grievances may require an extended period to address. The complainant(s) will be kept informed of progress towards rectifying the concern. All enquiries, concerns, complaints and/or grievances will be investigated, and a response given to the complainant in a timely manner. A grievance redress mechanism has been included in the ESMP to address any complaints that may not be able to be resolved quickly.
173. Details of stakeholder engagement undertaken as part of the preparation of the ESMP are included in Annexure One.

## 7. FINDINGS AND RECOMMENDATIONS

174. This Environmental and Social Management Plan (ESMP) has been prepared in support of the project titled '*Supporting vulnerable communities in Maldives to manage climate change-induced water shortages*, submitted by the GoM to the Green Climate Fund (GCF). As a project supported by UNDP in its role as a GCF Accredited Entity, the project has been screened against UNDP's Social and Environmental Safeguards Procedure, and is deemed a moderate risk (World Bank/International finance Corporation Category B) project.
175. The MEE as the National Designated Authority and as the implementing agency will lead the project. The MEE will be supported by a Project Management Unit (PMU) for the implementation of the project and compliance with this ESMP.
176. As a result of the project, 45 priority islands will have increased rainwater collection capacities, with four larger islands will additionally have water production systems of water desalination (Reverse Osmosis – RO water production plants), that will secure sufficient water production capacity, enabling a decentralized and timely water distribution across all northern outer atolls during the extended dry periods, when water shortages may occur.
177. The project has very significant direct beneficial impacts to 32, 000 people in 49 islands (direct high intensity beneficiaries) and will also directly benefit 73, 000 people that are currently faced with water shortages in the dry period (direct, medium intensity beneficiaries).
178. The project has the potential to cause moderate environmental and social impacts. These include impacts those arising from the brine generated and released from the desalination process at the selected islands, and the impact of the construction phase including the use of heavy machinery. Appropriate actions are proposed to address and mitigate these issues. Minor impacts include increased waste and noise generated during the construction phase.
179. A Grievance Redress Mechanism is included in this ESMP to address any complaints and issues that may arise as a result of the project. This Grievance Redress Mechanism complies with the laws and current practices of Maldives and UNDP Social and Environmental Standards.
180. The ESMP outlines the required avoidance and mitigation actions that will avoid, and where avoidance is not possible, minimize, mitigate and manage such impacts to acceptable levels. Furthermore, site specific ESMPs have been prepared for the RO facilities to address the specific issues associated with them. Moreover, the project will have significant environmental and social benefits that will be achieved more generally.
181. Budgeting for environmental interventions and the application of mitigation measures to enhance positive impacts for the project is an investment in the future as it will reduce the environmental and social liability at local and national levels. The end result of this project will be the improved water security for the island communities covered under the project and the overall resulting improvement in the quality of life for the communities.

## 8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

183. This section identifies the key environmental and social indicators identified for the project and outlines respective management objectives, potential impacts, control activities and the environmental performance criteria against which these indicators will be judged (i.e. audited).

184. This section further addresses the need for monitoring and reporting of environmental performance with the aim of communicating the success and failures of control procedures, distinguish issues that require rectification and identify measures that will allow continuous improvement in the processes by which the projects are managed.

### 8.1 OVERVIEW AND OBJECTIVES OF THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

185. An ESMP is a management tool used to assist in minimising the social and environmental impacts, and establish a set of environmental and social objectives. To ensure the environmental and social objectives of the projects are met, the ESMP will be used by the project implementers to structure and control the environmental and social management safeguards that are required to avoid or mitigate adverse effects on the environment and communities.

186. The environmental and social objectives of the projects are to:

- Provide potable water to the people of the Maldives whilst reducing the impacts on natural systems that are currently stressed;
- Encourage good management practices through planning, commitment and continuous improvement of environmental practices;
- Minimise or prevent the pollution of land, air and water, particularly with respect to freshwater lens recharge and brine pollution;
- Protect native flora and fauna from the impacts of desalination plants;
- Comply with all applicable laws, regulations and standards for the protection of the environment;
- Adopt the best practicable means available to prevent or minimise environmental impact;
- Describe all monitoring procedures required to identify impacts on the environment; and
- Provide an overview of the obligations of MEE and UNDP staff and contractors with regard to environmental obligations.

187. The ESMP will be updated from time to time by the implementing PMU/contractor in consultation with the UNDP staff and MEE to incorporate changes in the detailed design phase of the project.

### 8.2 OVERVIEW OF INSTITUTIONAL ARRANGEMENTS FOR THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

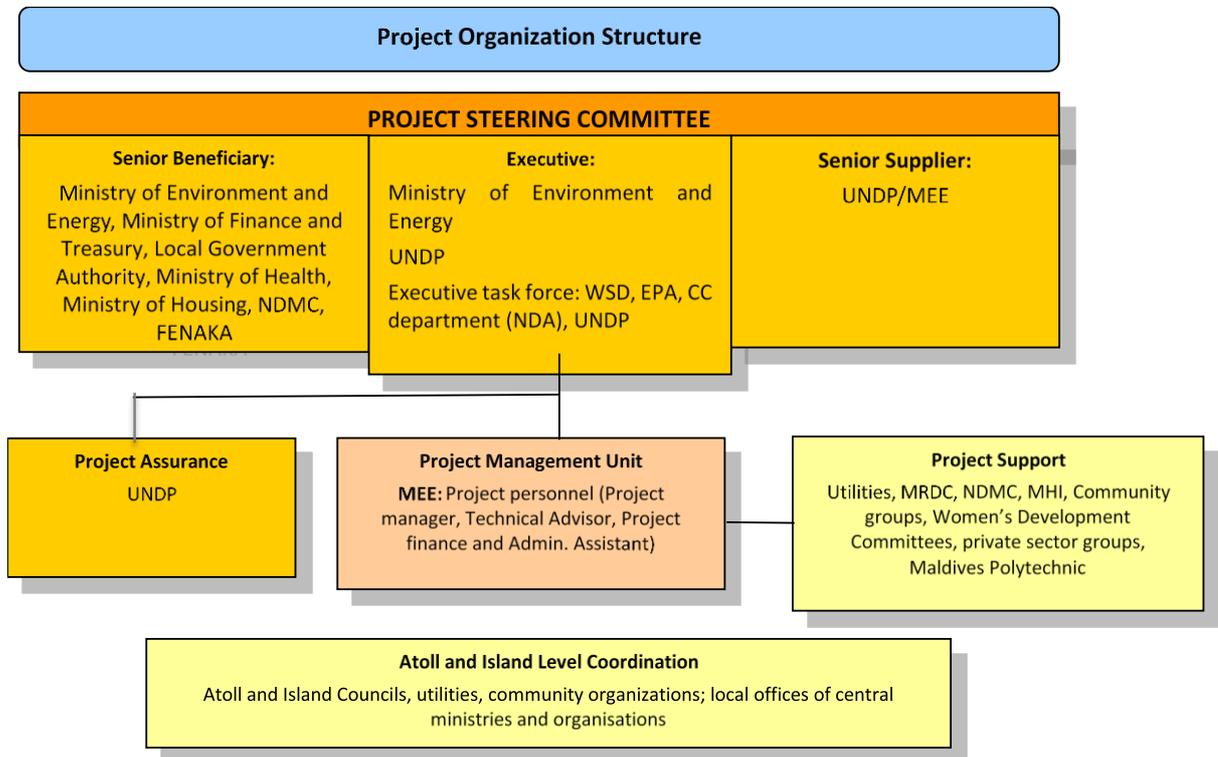
188. The ESMP will be assessed for each sub-project by the MEE and UNDP prior to any works being undertaken. The ESMP identifies potential risks to the environment and social matters from the projects and outlines strategies for managing those risks and minimising undesirable environmental and social impacts. Furthermore, the ESMP provides a Grievance Redress Mechanism for those that may be impacted by the projects that do not consider their views have been heard.

189. The MEE will be responsible for the supervision of the ESMP. The UNDP will gain the endorsement of the MEE and will ensure the ESMP is adequate and followed. The

PMU will ensure timely remedial actions are taken by the contractor where necessary. PMU shall further work closely with the local councils in ensuring timely remedial action.

### 8.3 ADMINISTRATION

190. The MEE will be the implementing agency and will be responsible for the implementation and compliance with the ESMP via the collaborating partners and contractors. The ESMP will be part of any tender documentation. The MEE will be responsible for the revision or updates of this document during the course of work.
191. The site supervisor will be responsible for daily environmental inspections of the construction site. MEE will cross check these inspections by undertaking monthly audits.
192. The contractor will maintain and keep all administrative and environmental records, which would include a log of complaints together with records of any measures taken to mitigate the cause of the complaints. The contractor will be responsible for the day-to-day compliance of the ESMP.
193. The Supervising Engineer/Project Manager will supervise the contractor, while the MEE will be responsible for environment and social issues. The following figure provides the organization structure for the project.



## 8.4 PROJECT DELIVERY AND ADMINISTRATION

194. The project will be delivered on the ground via the MEE. MEE has extensive experience in delivering successful programs in the Maldives. In addition, collaboration with atoll/island councils, existing NGOs and local communities is expected.

### 8.4.1 National Project Management Unit

195. A PMU will be established under the MEE. The PMU will include the key roles identified in the organization chart, in particular the Project Manager.

196. The Project Manager will run the project on a day-to-day basis on behalf of the MEE and within the scope laid down by the Project Steering Committee. The Project Manager's function will end when the final project terminal evaluation report and other documentation required by the GCF and UNDP has been completed and submitted to UNDP. The Project Manager is responsible for day-to-day management and decision-making for the project. The Project Manager's prime responsibility is to ensure that the project produces the results specified in the project document, to the required standard of quality and within the specified constraints of time and cost.

### 8.4.2 Project Assurance

197. The 'project assurance' function of UNDP is to support the Project Steering Committee by carrying out objective and independent project oversight and monitoring functions. This role ensures appropriate project management milestones are managed and completed. Project assurance has to be independent of the Project Manager; therefore, the Project Board cannot delegate any of its assurance responsibilities to the Project Manager. Furthermore, as the Senior Supplier, UNDP provides quality assurance for the project; ensures adherence and compliance with GCF and UNDP policies and procedures.

198. A UNDP Programme Office typically holds the Project Assurance role on behalf of UNDP.

### 8.4.3 Administration of Environmental and Social Management Plan

199. MEE will be responsible for the implementation with the ESMP.

200. The ESMP and/or site-specific plans will be part of any tender documentation. The MEE will be responsible for the revision or updates of this document during the course of work.

201. The UNDP and MEE are accountable for the provision of specialist advice on environmental and social issues to the delivery organizations (eg contractors and/or NGOs) and for environmental and social monitoring and reporting. The MEE or its delegate will assess the environmental and social performance of the delivery organizations (eg contractors) in charge of delivering each component throughout the project and ensure compliance with the ESMP. During operations the delivery organizations will be accountable for implementation of the ESMP. Personnel working on the projects have accountability for preventing or minimizing environmental and social impacts.

202. Field Officers will be responsible for daily environmental inspections of the project/construction sites. Field Officers will provide advice on effective environmental management of the project to all project site personnel. Field Officers are also to ensure the environmental awareness of project personnel is maintained through appropriate training. Compliance reports on mitigation measures will be submitted by the Field Officers

203. The delivery organization (eg contractor) will maintain and keep all administrative and environmental records, which would include a log of complaints together with records of any measures taken to mitigate the cause of the complaints and will be responsible for the day to day compliance with the ESMP during delivery period specified in the contract.

### 8.4.4 Environmental procedures, site and activity-specific work plans/instructions

204. Environmental procedures provide a written method describing how the management objectives for a particular environmental element are to be obtained. They

contain the necessary detail to be site or activity-specific and is required to be followed for all construction works.

205. As part of this ESMP, an Environmental and Social Code of Practice has been included for the Rainwater Harvesting. The Code of Practice includes the construction, operation, maintenance, and as necessary although highly unlikely, the decommissioning of the rainwater tanks. The Code of Practice is included as Annexure Three to the ESMP.

206. Other site-specific work plans will be developed during implementation.

#### **8.4.5 Environmental incident reporting**

207. Any incidents, including non-conformances to the procedures of the ESMP are to be recorded using an Incident Record form and the details entered into a register. For any incident that causes or has the potential to cause material or serious environmental harm, the site supervisor shall notify MEE as soon as possible. The contractor must cease work until remediation has been completed as per the approval of MEE.

208. A daily environmental checklist is to be completed at each work site by the relevant site supervisor and maintained within a register. A weekly environmental checklist is to be completed and will include reference to any issues identified in the daily checklists completed by the Site Supervisors. The completed checklist is forwarded to MEE for review and follow-up if any issues are identified.

#### **8.4.6 Corrective Actions**

209. Any non-conformances to the ESMP are to be noted in weekly environmental inspections and logged into the register. Depending on the severity of the non-conformance, the site supervisor may specify a corrective action on the weekly site inspection report. The progress of all corrective actions will be tracked using the register. Any non-conformances and the issue of corrective actions are to be advised to MEE.

#### **8.4.7 Review and auditing**

210. The ESMP and its procedures are to be reviewed quarterly by UNDP staff and MEE. The objective of the review is to update the document to reflect knowledge gained during the course of construction operations and to reflect new knowledge and changed community standards (values).

211. The ESMP will be reviewed and amendments made if:

- a. There are relevant changes to environmental conditions or generally accepted environmental practices; or
- b. New or previously unidentified environmental risks are identified; or
- c. Information from the project monitoring and surveillance methods indicate that current control measures require amendment to be effective; or
- d. There are changes to environmental legislation that are relevant to the project; or
- e. There is a request made by a relevant regulatory authority; or
- f. Any changes are to be developed and implemented in consultation with UNDP staff and MEE. When an update is made, all site personnel are to be made aware of the revision as soon as possible such as through a tool box meeting or written notification.

#### **8.4.8 Training**

212. The main contractor has the responsibility for ensuring systems are in place so that relevant employees, contractors and sub-contractors are aware of the environmental and social requirements for construction, including the ESMP.

213. All project personnel will attend an induction that covers health, safety, environment and cultural requirements.

214. All workers engaged in any activity with the potential to cause serious environmental harm (e.g. handling of hazardous materials) will receive task specific environmental training.

## 8.5 COMPLAINTS REGISTER AND GRIEVANCE REDRESS MECHANISM

215. During the construction and implementation phases of any project, a person or group of people can be adversely affected, directly or indirectly due to the project activities. The grievances that may arise can be related to social issues such as eligibility criteria and entitlements, disruption of services, temporary or permanent loss of livelihoods and other social and cultural issues. Grievances may also be related to environmental issues such as excessive dust generation, damages to infrastructure due to construction related vibrations or transportation of raw material, noise, traffic congestions, decrease in quality or quantity of private/ public water resources etc.
216. Should such a situation arise, there must be a mechanism through which affected parties can resolve such issues in a cordial manner with the project personnel in an efficient, unbiased, transparent, timely and cost-effective manner. To achieve this objective, a grievance redress mechanism has been included in the ESMP of this project.
217. The project allows those that have a complaint or that feel aggrieved by the project to be able to communicate their concern, complaints and/or grievances through an appropriate process. The Complaints Register and Grievance Redress Mechanism set out in this ESMP are to be used as part of the project and will provide an accessible, rapid, fair, transparent and effective response to concerned stakeholders, especially any vulnerable group who often lack access to formal legal regimes.
218. While recognizing that many complaints may be resolved immediately, the Complaints Register and Grievance Redress Mechanism set out in this ESMP encourages mutually acceptable resolution of issues as they arise. The Complaints Register and Grievance Redress Mechanism set out in this ESMP has been designed to:
- Be a legitimate process that allows for trust to be built between stakeholder groups and assures stakeholders that their concerns will be assessed in a fair and transparent manner;
  - Allow simple and streamlined access to the Complaints Register and Grievance Redress Mechanism for all stakeholders and provide adequate assistance for those that may have faced barriers in the past to be able to raise their concerns;
  - Provide clear and known procedures for each stage of the Grievance Redress Mechanism process, and provides clarity on the types of outcomes available to individuals and groups;
  - Ensure equitable treatment to all concerned and aggrieved individuals and groups through a consistent, formal approach that is fair, informed and respectful to a concern, complaints and/or grievances;
  - To provide a transparent approach, by keeping any aggrieved individual/group informed of the progress of their complaint, the information that was used when assessing their complaint and information about the mechanisms that will be used to address it; and
  - Enable continuous learning and improvements to the Grievance Redress Mechanism. Through continued assessment, the knowledge may reduce potential complaints and grievances.
219. Eligibility criteria for the Grievance Redress Mechanism include:
- Perceived negative economic, social or environmental impact on an individual and/or group, or concern about the potential to cause an impact;
  - Clearly specified kind of impact that has occurred or has the potential to occur; and explanation of how the project caused or may cause such impact; and
  - Individual and/or group filing of a complaint and/or grievance is impacted, or at risk of being impacted; or the individual and/or group filing a complaint and/or

grievance demonstrates that it has authority from an individual and or group that have been or may potentially be impacted on to represent their interest.

220. Local communities and other interested stakeholders may raise a grievance/complaint at all times to MEE. Affected local communities should be informed about the ESMP provisions, including its grievance mechanism and how to make a complaint.

#### **8.5.1 Complaints Register**

221. A complaints register will be established as part of the project to record any concerns raised by the community during construction. Any complaint will be advised to the UNDP and MEE within 24 hours of receiving the complaint. The complaint will be screened. Following the screening, complaints regarding corrupt practices will be referred to the UNDP for commentary and/or advice along with the MEE.

222. Wherever possible, the project team will seek to resolve the complaint as soon as possible, and thus avoid escalation of issues. However, where a complaint cannot be readily resolved, then it must be escalated.

223. A summary list of complaints received, and their disposition must be published in a report produced every six months.

224. Where there is a community issue raised, the following information will be recorded:

- Time, date and nature of enquiry, concern, complaints and/or grievances;
- Type of communication (telephone, letter, personal contact etc);
- Name, contact address and contact number;
- Response and investigation undertaken as a result of the enquiry, concern, complains and/or grievances; and,
- Actions taken and name of the person taking action.

#### **8.5.2 Grievance Redress Mechanism**

225. The Grievance Redress Mechanism has been designed to be a problem-solving mechanism with voluntary good-faith efforts. The Grievance Redress Mechanism is not a substitute for the legal process. The Grievance Redress Mechanism will as far as practicable, try to resolve complaints and/or grievances on terms that are mutually acceptable to all parties. When making a complaint and/or grievance, all parties must act at all times, in good faith and should not attempt to delay and/or hinder any mutually acceptable resolution.

226. In order to ensure smooth implementation of the project and timely and effectively addressing of problems that may be encountered during implementation, a robust Grievance Redress Mechanism, which will enable to the relevant authorities to address the grievances of the stakeholders of the project will be established.

227. All complaints and/or grievances regarding social and environmental issues can be received either orally (to the field staff), by phone, in complaints box or in writing to the UNDP, MEE or the Contractor. A key part of the grievance redress mechanism is the requirement for MEE/PMU and the contractor to maintain a register of complaints and/or grievances received at the respective project site offices. All complainants shall be treated respectfully, politely and with sensitivity. Every possible effort should be made by MEE/PMU and the contractor to resolve the issues referred to in the complaint and/or grievance within their purview. However, there may be certain problems that are more complex and cannot be solved through project-level mechanisms. Such grievances will be referred to the Grievance Redress Committee. It would be responsibility of the MEE to solve these issues through a sound/robust process.

228. The Grievance Redress Mechanism for this project has been designed to ensure that the process of making a complaint and/or grievance does not financially impact an individual and/or group. The Grievance Redress Mechanism will cover any reasonable costs in engaging a suitably qualified person to assist in the preparation of a legitimate complaint and/or grievance. Where a complaint and/or grievance is seen to be ineligible, the Grievance Redress Mechanism will not cover these costs.

229. Information about the Grievance Redress Mechanism and how to make a complaint and/or grievance must be placed at prominent places for the information of the key stakeholders.
230. The Safeguards Officer will be designated as the key officer in charge of the Grievance Redress Mechanism. The Terms of Reference for this position (as amended from time to time) will have the following key responsibilities:
- Coordinate formation of Grievance Redress Committees before the commencement of construction to resolve issues;
  - Act as the focal point at the PMU on Grievance Redress issues and facilitate the resolution of issues within the PMU;
  - Create awareness of the Grievance Redress Mechanism amongst all the stakeholders through public awareness campaigns;
  - Assist in redress of all grievances by coordinating with the concerned parties;
  - Maintain information on grievances and redress;
  - Monitor the activities of MEE on grievances issues; and
  - Prepare the progress for monthly/quarterly reports.
231. A two-tier Grievance Redress Mechanism structure has been developed to address all complaints and/or grievances in the project. The first tier redress mechanism involves the receipt of a complaint and/or grievance at the local island level. The stakeholders are informed of various points of making a complaint and/or grievance (if any) and the PMU will collect the complaints and/or grievances from these points on a regular basis and record them.
232. This is followed by coordinating with the concerned people to redress the grievances. The Safeguards Officer will coordinate the activities at the respective island level to address the grievances and would act as the focal point in this regard. The island council or its designated officer would coordinate with the Safeguards and the gender focal point of the PMU in redressing the grievances. The island council or its designated officer will be provided with sufficient training in the procedure of redress to continue such systems in future.
233. The grievance can be made orally (to the field staff), by phone, in complaints box or in writing to the UNDP, MEE or the Contractor. Complainants may specifically contact the Safeguards Officer and request confidentiality if they have concerns about retaliation. In cases where confidentiality is requested (i.e. not revealing the complainant's identity to UNDP, MEE and/or the Contractor). In these cases, the Safeguards Officer will review the complaint and/or grievance, discuss it with the complainant, and determine how best to engage project executing entities while preserving confidentiality for the complainant.
234. As soon as a complaint and/or grievance is received, the Safeguards Officer would issue an acknowledgement. The island councils or its designated officers receiving the complaint and/or grievance should try to obtain relevant basic information regarding the grievance and the complainant and will immediately inform the Safeguards Officer.
235. The PMU will maintain a Complaint/Grievance Redress register at the island level. Maintaining the records collected from relevant bodies is the responsibility of PMU.
236. After registering the complaint and/or grievance, the Safeguards Officer will study the complaint and/or grievance made in detail and forward the complaint and/or grievance to the concerned officer with specific dates for replying and redressing the same. The Safeguards Officer will contact the affected persons/complainant and then attempt to find a solution to the complaint and/or grievance received. If necessary, meetings will be held with the concerned affected persons/complainant and the concerned officer to find a solution to the problem and develop plans to redress the grievance. The deliberations of the meetings and decisions taken are recorded. All meetings in connection with the Grievance Redress Mechanism, including the meetings

of the Grievance Redress Committee, must be recorded. The Safeguards Officer for the Grievances Redress Mechanism will be actively involved in all activities.

237. A Community Project Implementation Committee will be formed to oversee the first tier of the Grievance Redress Mechanism. The Community Project Implementation Committee would include:

- Vice president of the island council (chair of the committee);
- A representative of the local Women's Development Committee/or women;
- A representative of the local youth associations;
- A representative of the island level NGO/CSO; and
- Safeguards Officer.

238. The resolution at the first tier will normally be completed within 15 working days and the party submitting the complaint and/or grievance will be notified of the proposed response through a disclosure form. The resolution process should comply with the requirements of the Grievance Redress Mechanism in that it should, as far as practicable, be informal with all parties acting in good faith. Further, the Grievance Redress Mechanism should, as far as practicable, achieve mutually acceptable outcomes for all parties.

239. Should the grievance be not resolved within this period to the satisfaction of the complainant, the grievance will be referred to the next level of Grievance Redress Mechanism. If the Safeguards Officer deem that adequate solutions can be established within the next five working days, the officer can decide on retaining the issue at the first level by informing the complainant accordingly. However, if the complainant requests for an immediate transfer to the next level, the matter must be referred to the next tier. In any case, where the issue is not addressed within 20 working days, the matter is referred to the next level.

240. Any grievance related to corruption or any unethical practice should be referred immediately to the Office of Audit and Investigations within the UNDP Office in New York (email: [reportmisconduct@undp.org](mailto:reportmisconduct@undp.org)) or via the following website: <https://secure.ethicspoint.eu/domain/media/en/gui/104807/index.html>).

241. The Grievance Redress Committee formed at the relevant atoll level would address the grievance in the second tier. The president of the Atoll Council will act as chair of the committee constituted at this tier. The membership of the committee will be as follows;

- President of the relevant atoll council
- President of the island council related to the complaint/grievance
- A representative of the atoll/regional level women's association
- A representative of the atoll/regional level NGO/CSOs
- A representative of the atoll/regional level youth associations
- Safeguards Officer.

242. The Safeguard Officer will coordinate with the respective Atoll Councils in getting these Committees constituted and get the necessary circulars issued in this regard so that they can be convened whenever required.

243. The Terms of Reference for the Grievance Redress Committee are:

- Providing support to the affected persons in solving their problems
- Prioritize grievances and resolve them at the earliest
- Provide information to the PMU and MEE on serious cases at the earliest opportunity

- Coordinate with the aggrieved person/group and obtain proper and timely information on the solution worked out for their grievance
- Study the normally occurring grievances and advise PMU and MEE on remedial actions to avoid further occurrences.

244. The Grievance Redress Committee will hold the necessary meetings with the aggrieved party/complainant and the concerned officer and attempt to find a solution acceptable at all levels. The Grievance Redress Committee would record the minutes of the meeting.

245. Grievance Redress Committee will communicate proposed responses to the complainant formally. If the proposed response satisfies the complainant, the response will be implemented, and the complaint and/or grievance closed. In cases where a proposed response is unsatisfactory to the complainant, the Grievance Redress Committee may choose to revise the proposed response to meet the complainant's remaining concerns, or to indicate to the complainant that no other response appears feasible to the Grievance Redress Committee. The complainant may decide to take legal recourse if s/he is not satisfied with the resolutions due to the deliberations at the two tiers of the grievance redress mechanism.

246. Complainants also have the option to access UNDP's Accountability Mechanism, with both compliance and grievance functions. The Social and Environmental Compliance Unit investigates allegations that UNDP's Standards, screening procedure or other UNDP social and environmental commitments are not being implemented adequately, and that harm may result to people or the environment. The Social and Environmental Compliance Unit is housed in the Office of Audit and Investigations and managed by a Lead Compliance Officer. A compliance review is available to any community or individual with concerns about the impacts of a UNDP programme or project. The Social and Environmental Compliance Unit is mandated to independently and impartially investigate valid requests from locally impacted people, and to report its findings and recommendations publicly.

247. The Stakeholder Response Mechanism offers locally affected people an opportunity to work with other stakeholders to resolve concerns, complaints and/or grievances about the social and environmental impacts of a UNDP project. Stakeholder Response Mechanism is intended to supplement the proactive stakeholder engagement that is required of UNDP and its Implementing Partners throughout the project cycle. Communities and individuals may request a Stakeholder Response Mechanism process when they have used standard channels for project management and quality assurance; and are not satisfied with the response (in this case the project level grievance redress mechanism). When a valid Stakeholder Response Mechanism request is submitted, UNDP focal points at country, regional and headquarters levels will work with concerned stakeholders and Implementing Partners to address and resolve the concerns. More details regarding this is available at [www.undp.org/secu-sm](http://www.undp.org/secu-sm). The relevant form is attached at the end of the ESMP (at Annex 2).

## 8.6 STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION

248. The current ESMP includes public consultation as part of the stakeholder engagement plan. The project has been discussed with a wide range of stakeholders including relevant government agencies, NGOs and CSO groups, and island communities where the project activities will take place. These consultations brought together all stakeholders at the island level including local councils, women, and utility providers. Based on these consultations and the subsequent reflection of these discussions within the project, the project is expected to be fully accepted.
249. The MEE and UNDP will develop and release updates on the project on a regular basis to provide interested stakeholders with information on the project status. These updates will utilize a broad range of tools, including print and social media and reports as necessary. All material will be published in Dhivehi and English as appropriate.
250. The project coordinators at the PMU will be assigned as the nodal points for enquiries, concerns, complaints and/or grievances.
251. Where there is a community issue raised, the following information will be recorded as described in Section 8.5.1.
252. Some enquiries, concern, complaints and/or grievances may require an extended period to address. The complainant(s) will be kept informed of progress towards rectifying the concern. All enquiries, concerns, complaints and/or grievances will be investigated and a response given to the complainant in a timely manner. A grievance redress mechanism has been included in the ESMP to address any complaints that may not be able to be resolved quickly.
253. Nominated PMU/contractor staff will be responsible for undertaking a review of all enquiries, concern, complaints and/or grievances and ensuring progress toward resolution of each matter.

## 9. KEY ENVIRONMENTAL AND SOCIAL INDICATORS

254. The ESMP lists the key environmental and social indicators identified for the project and outlines respective management objectives, potential impacts, control activities and the environmental and social performance criteria against which these indicators will be judged (eg audited).
255. This section addresses the need for monitoring and reporting of environmental and social performance with the aim of communicating the success and failures of control procedures, distinguish issues that require rectification and identify measures that will allow continuous improvement in the processes by which the projects are managed.

### 9.1 WATER QUALITY

#### 9.1.1 Background

256. The project involves the construction and operation of two desalination plants, the installation of rainwater harvesting systems and the recharge of freshwater lens that is currently over-utilized and subject to pollution impacts.
257. Water for the desalination plants will be sourced from deep (30m) bores that pass through the freshwater lenses and into the saline groundwater below. As a result, no adverse impacts on the freshwater lenses are expected as a result of water abstraction.
258. The desalination plants will result in the release of highly saline brine into the marine environment. Whilst none of the desalination plants will be constructed in protected and/or pristine environments, there is a necessity to maintain appropriate water quality standards within the relevant sites when undertaking the construction and particularly operation of the desalination plants.
259. The freshwater lens recharge component has the potential to impact/degrade the existing environment if the quality of the water being used for recharge is not of an acceptable standard. As such, it will be necessary to ensure any grey or black water has at least secondary treatment prior to recharge.

#### 9.1.2 Performance Criteria

260. The following performance criteria are set for the construction of the projects:
- No significant decrease in water quality of the coastal marine environment as a result of construction and operational activities;
  - No significant decrease in the quality and quantity of the freshwater lens as a result of construction and operational activities in proximity to the projects;
  - Water being used for recharge will meet international good practice standards prior to recharge;
  - Water quality shall conform to any approval conditions stipulated by UNDP, MEE and/or other government departments, or in the absence of such conditions follow a 'no worsening' methodology;
  - No offsite impact will occur other than through the release of brine into the marine environment; and
  - Effective implementation of site-specific EDSCP where necessary.
261. By following the management measures set out in the ESMP, construction and operation of the desalination plants, rainwater harvesting systems and groundwater recharge will not have a significant impact on water quality across the broader area.

#### 9.1.3 Monitoring

262. A standardised water quality monitoring program has been developed for the project. The program is subject to review and update at least quarterly from the date of issue. The site supervisor will be required to conduct a daily visual inspection for within or adjacent to their work area as a part of the daily site inspection checklist.

263. The contractor will, when undertaking works, compile a monthly report to MEE outlining:

- Any non-conformances to this ESMP;
- Details of the corrective action undertaken.

#### **9.1.4 Reporting**

264. All water quality monitoring results and/or incidents will be tabulated and reported as outlined in the ESMP. The MEE must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to water quality is exceeded.

Table 7: Water quality management measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
<p>W1: Elevated suspended solids, nitrates, phosphates, faecal coliforms, silt content and turbidity in freshwater lens systems.</p>	<p>W1.1: Designated areas for storage of fuels, oils, chemicals or other hazardous liquids should have compacted impermeable bases and measures be taken to avoid spillage</p>	<p>Entire construction and operation phase</p>	<p>All Personnel</p>	<p>Weekly with reporting to MEE and UNDP</p>
	<p>W1.2: Conduct regular water quality monitoring in location where the freshwater lens is likely to be impacted including assessing the changes to freshwater lens quality in terms of salinity, nitrates, phosphate, faecal coliforms and other potential pollutants. Parameters to be monitored include pH; temperature; TDS, mg/l; dissolved oxygen, mg/l; electric conductivity, <math>\mu\text{S/cm}</math>; Turbidity, NTU; salinity, ppm; ammonia; fecal coliform, o/100; H<sub>2</sub>S, mg/l; nitrates; phosphates</p>	<p>Entire construction and operation phase</p>	<p>Contractor</p>	<p>As per the dewatering decision statement</p>
	<p>W1.3: Schedule works in stages to ensure that disturbed areas are revegetated and stabilized progressively and as soon as practicable after completion of works.</p>	<p>Pre-Earthworks - Works not be undertaken during wet season</p>	<p>Contractor and MEE</p>	<p>Maintain records</p>
	<p>W1.4: Construction materials will not be stockpiled in proximity to the shoreline that may allow for release into the marine environment. Construction equipment will be removed from in proximity to the beach at the end of each working day or if heavy rainfall is predicted.</p>	<p>Entire construction and operation phase</p>	<p>Contractor</p>	<p>Maintain daily records</p>
<p>W2: Eutrophication of surrounding water bodies and impacts from elevated nutrient levels.</p>	<p>W2.1 Disturbance of vegetation and drainage lines to be limited to that required for construction works when installing water tanks and construction of the desalination plants.</p>	<p>Entire construction phase</p>	<p>All Personnel</p>	<p>Weekly with reporting to MEE and UNDP</p>
	<p>W2.2 Manage the application of fertilizers (if required during rehabilitation of any site) to ensure that over application does not occur.</p>	<p>Post Construction</p>	<p>Contractor</p>	<p>Maintain records</p>

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
W3: Increase of gross pollutants, hydrocarbons, metals and other chemical pollutants including brine into the freshwater lens or marine environment.	W3.1: Storage for potential contaminates and hazardous goods should be centralised. Designated areas for storage of fuels, oils, chemicals or other hazardous liquids should: <ul style="list-style-type: none"> <li>• Have compacted impermeable bases; and</li> <li>• Surrounded by a bund to contain any spillage.</li> </ul>	All phases	All Personnel	Weekly with reporting to MEE and UNDP
	W3.2: Check all vehicles, equipment and material storage areas daily for possible fuel, oil and chemical leaks.	All phases	All Personnel	Daily and maintain records
	W3.3: Rubbish and waste materials to be placed in suitable facilities to ensure that they do not enter the coastal environment. Ensure all absorbent material is placed in contaminant bags prior to removal.	All phases	All Personnel	Weekly reporting to MEE and UNDP
	W.3.4: Drilling of boreholes shall not contaminate freshwater lenses. Borehole Drilling Guidelines (2011) to be complied with.	Construction	Drilling contractor	Daily during drilling
	W3.5: Drilling fluids are to be biodegradable, non-toxic and contained using appropriate good industry practices.	Construction	Drilling contractor	Daily during drilling
	W3.6: Ensure brine is quickly diluted in the marine environment so as not to cause any adverse impacts by limiting the disposal times to periods of low tidal exchange	Entire operation phase	All personnel	Weekly reporting to MEE and UNDP

## 9.2 NOISE AND VIBRATION

### 9.2.1 Background

265. All construction and operation activities have the potential to cause noise nuisance. Vibration disturbance to nearby residents and sensitive habitats is likely to be caused through the use of vibrating equipment. Blasting is not required to be undertaken as part of this project. Further, the diffusers can create underwater noise via pumps.
266. There are no sensitive receptors in proximity to the projects.
267. Contractors involved in construction activities should be familiar with methods of controlling noisy machines and alternative construction procedures as contained within specific Maldives' legislation or in its absence, international good practice may be used if the legislation has not been enacted.
268. The detail, typical equipment sound power levels, provides advice on project supervision and gives guidance noise reduction. Potential noise sources during construction may include:
- Excavation equipment for all aspects of the projects including for the installation of rainwater harvesting systems and desalination plants;
  - Drill rigs
  - Delivery vehicles;
  - Pumps; and
  - Power tools and compressors.

### 9.2.2 Performance Criteria

269. The following performance criteria are set for the construction of the projects:
- Noise from construction and operational activities must not cause an environmental nuisance at any noise sensitive place;
  - Undertake measures at all times to assist in minimizing the noise associated with construction activities;
  - No damage to off-site property caused by vibration from construction and operation activities; and
  - Corrective action to respond to complaints is to occur within 48 hours.

### 9.2.3 Monitoring

270. A standardized noise monitoring program has been developed for the projects. The program is subject to review and update quarterly from the date of issue. Importantly, the site supervisor will:
- Ensure equipment and machinery is regularly maintained and appropriately operated;
  - Carry out potentially noisy construction activities during daylight hours only; i.e. 7am -5pm

### 9.2.4 Reporting

271. All noise monitoring results and/or incidents will be tabulated and reported as outlined in the ESMP. The MEE must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to noise is exceeded.

Table 8: Noise and vibration management measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
N1: Increased noise levels	N1.1: Select plant and equipment and specific design work practices to ensure that noise emissions are minimized during construction and operation including all pumping equipment.	All phases	Contractor	Maintain records
	N1.2 Minimize the need for and limit the emissions as far as practicable if noise generating construction works are to be carried out outside of the hours: 7am-5pm	Construction phase	All Personnel	Daily and maintain records
	N1.3: Consultation with nearby residents in advance of construction activities particularly if noise generating construction activities are to be carried out outside of the hours: 7am-5pm	Construction phase	All Personnel	Daily and maintain records
	N1.4 The use of substitution control strategies shall be implemented, whereby excessive noise generating equipment items onsite are replaced with other alternatives.	Construction phase	All Personnel	Daily and maintain records
	N1.5 All incidents complaints and non-compliances related to noise shall be reported in accordance with the site incident reporting procedures and summarized in the register.	Construction phase	Consultant	Maintain records
	N1.6 The contractor should conduct employee and operator training to improve awareness of the need to minimize excessive noise in work practices through implementation of measures.	Pre and during construction	Contractor	Maintain records
N2. Vibration due to construction	N2.1: Identify properties, structures and habitat locations that will be sensitive to vibration impacts resulting from construction and operation of the projects.	Pre and during construction	Contractor	Maintain records
	N2.2: Design to give due regard to temporary and permanent mitigation measures for noise and vibration from construction and operational vibration impacts.	Pre-construction	Contractor	Maintain records
	N2.3: All incidents, complaints and non-compliances related to vibration shall be reported in accordance with the site incident reporting procedures and summarized in the register.	Construction phase	Consultant	Maintain records

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
	N2.4: During construction, standard measure shall be taken to locate and protect underground services from construction and operational vibration impacts	Construction phase	Consultant	Maintain records

## 9.3 AIR QUALITY

### 9.3.1 Background

272. No specific air quality assessment has been undertaken in the development of this ESMP. Due to the limited urban development and heavy industry, it is assumed that environmental air quality is relatively good in the relevant project sites.

273. All construction activities have the potential to cause air quality nuisance although this will be reduced for example, through the use of solar infrastructure to operate the desalination plants.

274. There are no sensitive receptors in proximity to the projects.

275. Contractors involved in construction and operation activities should be familiar with methods minimizing the impacts of deleterious air quality and alternative construction procedures as contained in the Maldives' legislation.

### 9.3.2 Performance Criteria

276. The following performance criteria are set for the construction of the projects:

- Release of dust/particle matter must not cause an environmental nuisance;
- Undertake measures at all times to assist in minimizing the air quality impacts associated with construction and operation activities; and
- Corrective action to respond to complaints is to occur within 48 hours.

### 9.3.3 Monitoring

277. A standardized air monitoring program has been developed for the projects. The program is subject to review and update at quarterly from the date of issue. Importantly:

- Ensure all stockpiles are covered so as to not allow dust to generate; and
- The requirement for dust suppression will be visually observed by all personnel daily and by MEE and UNDP staff when undertaking routine site inspections.

### 9.3.4 Reporting

278. All air quality monitoring results and/or incidents will be tabulated and reported as outlined in the ESMP. MEE must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to air quality is exceeded.

Table 9: Air quality management measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
A1: Increase in dust levels at sensitive locations	A1.1: Implement effective dust management measures in all areas during design, construction and operation.	Pre and during construction	All Personnel	Daily and maintain records
	A1.2: Manage dust/particulate matter generating activities to ensure that emissions do not cause an environmental nuisance at any sensitive locations	During construction	Contractor	Daily and maintain records
	A1.3: Construction activities should minimize risks associated with climatic events.	During construction	Contractor	Daily and maintain records
	A1.4: Implement scheduling/staging of proposed works to ensure major vegetation disturbance and earthworks are minimized.	Entire construction	Contractor	Daily and maintain records
	A1.5: Where feasible, ensure that materials to be stockpiled onsite are not ordered and/or purchased until they are required for works.	Entire construction	Contractor	Daily and maintain records
	A1.6: Locate material stockpile areas as far as practicable from sensitive receptors.	During construction	Contractor	Daily and maintain records
	A1.7: Source sufficient water of a suitable quality for dust suppression activities complying with any water restrictions.	During construction	Contractor	Daily and maintain records
	A1.8: Schedule revegetation activities to ensure optimum survival of vegetation species.	During construction	Contractor	Maintain records
	A1.9: Rubbish skips and receptacles should be covered and located as far as practicable from sensitive locations.	During construction	Contractor	Maintain records
	A1.10: Restrict speeds on haul roads and access tracks.	During construction	Contractor	Daily and maintain records
	A1.11: Cover loads of haul trucks and equipment and plant when not in use and in transit.	During construction	Contractor	Daily and maintain records

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
A2. Increase in vehicle emissions (including odors and fumes)	A2.1 Ensure construction vehicles are switched off when not in use.	During construction	Contractor	Daily and maintain records
	A2.2 Ensure only vehicles required to undertake works are operated onsite.	During construction	Contractor	Daily and maintain records
	A2.3 Ensure all construction vehicles, plant and machinery are maintained and operated in accordance with design standards and specifications.	During construction	Contractor	Daily and maintain records
	A2.4 Develop and implement an induction program for all site personnel, which includes as a minimum an outline of the minimum requirements for environmental management relating to the site.	Pre and during construction	Contractor	Daily and maintain records
	A2.5 Direct exhaust emissions of mobile plant away from the ground.	During construction	Contractor	Daily and maintain records
	A2.6 Rubbish skips and receptacles should be covered and located as far as practicable from sensitive locations.	During construction	Contractor	Daily and maintain records

## 9.4 FLORA AND FAUNA

### 9.4.1 Background

279. The majority of the project areas have been previously disturbed although vegetation may still exist. Further, the desalination plants will be located in areas that do not contain important marine habitats.

280. Contractors involved in construction activities should be familiar with methods minimizing the impacts of clearing vegetation to minimize the footprints of all projects to that essential for the works and rehabilitate disturbed areas. By doing these activities, the projects should minimize the impact upon terrestrial and marine flora and fauna wherever practical.

### 9.4.2 Performance Criteria

281. The following performance criteria are set for the construction of the projects:

- Noise from construction and operational activities must not cause an environmental nuisance at any no clearance of vegetation outside of the designated clearing boundaries;
- No death to native fauna as a result of clearing activities;
- No deleterious impacts on marine habitats
- No introduction of new weed species as a result of construction activities;
- No increase in existing weed proliferation within or adjacent to the project sites as a result of construction activities; and
- Successful establishment of rehabilitation works incorporating species native to the local area.

### 9.4.3 Monitoring

282. A flora and fauna monitoring program has been developed for the projects. The program is subject to review and update quarterly from the date of issue. Importantly, the site supervisor will be on site when undertaking clearing works, will compile a weekly report to MEE and UNDP staff outlining:

- Any non-conformances to this ESMP;
- The areas that have been rehabilitated during the preceding week; and
- Details of the corrective action undertaken

### 9.4.4 Reporting

283. All flora and fauna monitoring results and/or incidents will be tabulated and reported as outlined in the ESMP. MEE must be notified immediately in the event of any suspected instances of death to fauna and vegetation.

Table 10: Flora and fauna management measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
FF1. Habitat loss and disturbance of fauna	FF1.1 Limit vegetation clearing and minimize habitat disturbance through adequate protection and management of retained vegetation.	During construction	Consultant	Daily and maintain records
	FF1.2: Minimize noise levels and lighting intrusion throughout construction and operation in the vicinity of any sensitive locations.	During construction	Consultant	Daily and maintain records
	FF1.3: Ensure that all site personnel are made aware of sensitive fauna/habitat areas and the requirements for the protection of these areas.	During construction	Contractor	Daily and maintain records
	FF1.4 Minimize disturbance to onsite fauna and recover and rescue any injured or orphaned fauna during construction and operation.	During construction	Contractor	Daily and maintain records, report to MEE
FF2. Introduced flora and weed species	FF2.1: Implement an EDSCP where necessary to reduce the spread of weeds through erosion	Pre and during construction	Contractor	Maintain records
	FF2.2: Minimize disturbance to mature remnant vegetation	During construction	Consultant	Daily and maintain records
	FF2.3: Small trees and shrubs shall be removed in preference to large trees.	During construction	Contractor	Daily and maintain records
	FF2.4: Vegetation to be removed shall be clearly marked using paint or flagging tape.	During construction	Contractor	Daily and maintain records
	FF2.5: Environmental weeds and noxious weeds within the project footprints shall be controlled.	During and post construction	Consultant	Weekly and maintain records

FF3: Marine ecology	FF3.1: Conduct marine survey on coral cover and species survey in locations affected by brine discharge	Every six months following operations phase	MEE	Maintain records
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## 9.5 WASTE MANAGEMENT

### 9.5.1 Background

284. The MEE advocates good waste management practice. The preferred waste management hierarchy and principles for achieving good waste management is as follows:

- a. Waste avoidance (avoid using unnecessary material on the projects);
- b. Waste re-use (re-use material and reduce disposing);
- c. Waste recycling (recycle material such as cans, bottles, etc.; and
- d. Waste disposal (all putrescible to be dumped at approved landfills).

285. The key waste streams generated during construction are likely to include demolition wastes, this being the removal of any existing structures located in the project footprints and associated works that will have to be demolished. This will include, but not limited to, shrubs/trees, pavements, power poles etc. The wastes to be generated will mostly be vegetation-based and also include:

- Filters etc used in the desalination process;
- Filters used in the treatment of grey and black water for recharging groundwater aquifers;
- The excavation wastes unsuitable for reuse during earthworks;
- Wastes from construction equipment maintenance. Various heavy vehicles and construction equipment will be utilized for the duration of the construction phase. Liquid hazardous wastes from cleaning, repairing and maintenance of this equipment may be generated. Likewise, leakage or spillage of fuels/oils within the site needs to be managed and disposed of appropriately;
- Non-hazardous liquid wastes will be generated through the use of workers' facilities such as toilets; and
- General wastes including scrap materials and biodegradable wastes

286. Contractors involved in construction and operational activities should be familiar with methods minimizing the impacts of clearing vegetation to minimize the footprint to that essential for the works and rehabilitate disturbed areas. By doing these activities, the projects should minimize the impact of waste generated by the project

### 9.5.2 Performance Criteria

287. The following performance criteria are set for the projects:

- No build-up of sediment in the aquatic environments and/or surface and/or groundwater; as a result, waste generation is minimized through the implementation of the waste hierarchy (avoidance, reduce, reuse, recycle);
- No litter will be observed within the project corridor or surrounds as a result of activities by site personnel;
- No complaints received regarding waste generation and management;
- Any waste from on-site portable sanitary facilities will be sent off site for disposal by a waste licensed contractor; and
- Waste oils obtained from the oil separator will be collected and disposed or recycled off-site

### 9.5.3 Monitoring

288. A waste management monitoring program has been developed for the projects. The program is subject to review and update quarterly from the date of issue

### 9.5.4 Reporting

289. The MEE must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to waste is exceeded.

Table 11: Waste management measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
WT1: Production of wastes and excessive use of resources	WT1.1: Preference shall be given to materials that can be used to construct the project that would reduce the direct and indirect waste generated.	Pre and during construction	Contractor	Maintain records
	WT1.2: Consideration shall be given to the use of recycled aggregates and fly-ash cement mixes for construction of the desalination plants.	Pre and during construction	Contractor	Maintain records
	WT1.3: Daily waste practices shall be carried out unless these are delegated to the activities of external waste management bodies.	During construction	Consultant	Daily and maintain records
	WT1.4: The use of construction materials shall be optimized and where possible a recycling policy adopted.	During construction	Consultant	Weekly and maintain records
	WT1.5: Separate waste streams shall be maintained at all times i.e. general domestic waste, construction waste and contaminated waste. Specific areas on site shall be designated for the temporary management of the various waste streams. Adequate signage and color coded bins will be used for each waste streams.	During construction	Consultant	Weekly and maintain records
	WT1.6: Any contaminated waste shall be disposed of at an approved site.	During construction	Contractor	Weekly and maintain records
	WT1.7: Recyclable waste (including oil and some construction waste) shall be collected separately and disposed of correctly.	During construction	Contractor	Weekly and maintain records
	WT1.8: Waste sites shall be sufficiently covered daily to ensure that wildlife does not have access.	During construction	Consultant	Daily
	WT1.9: Disposal of waste including all filters shall be carried out in accordance with the Government of the Maldives' requirements.	During construction and operation	Consultant and MEE	Weekly and maintain records

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
	WT1.10: Fuel and lubricant leakages from vehicles and plant shall be immediately rectified.	During construction and operation	Consultant and MEE	Daily and maintain records
	WT1.11: Where possible, concrete batching plants shall be centrally located to minimize the occurrence of concrete batching at individual construction locations.	Pre and during construction	Contractor	Maintain records
	WT1.12: Major maintenance and repairs shall be carried out off-site whenever practicable.	During construction and operation	Contractor	Weekly and maintain records
	WT1.13: Remnants of concrete shall not be left at any location along the corridor.	During Construction	Contractor	Weekly and maintain records
	WT1.14: Disposal of trees shall be undertaken in accordance with one or more of the following methods: Left in place; Chipped and mulched	During Construction	Consultant	Weekly and maintain records
	WT1.15: Hydrocarbon wastes shall be stored in color coded and labelled drums placed around fueling depots.	During Construction	Contractor	Daily and maintain records
	WT1.16: Where possible, fuel and chemical storage and handling shall be undertaken at central fuel and chemical storage facilities, such as petrol stations.	During Construction	Contractor	Daily and maintain records
	WT1.17: On-site storage of fuel and chemicals shall be kept to a minimum.	During Construction	Contractor	Daily, maintain records and report any incidents
	WT1.18: Any waste oils and lubricants are to be collected and transported to recyclers or designated disposal sites as soon as possible.	During Construction	Contractor	Daily and maintain records

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
	WT1.19: Any dangerous goods stored on site shall be stored in accordance with Maldives' regulations.	During Construction	Contractor	Daily and maintain records

## 9.6 CHEMICAL AND FUEL MANAGEMENT

### 9.6.1 Background

290. The key types of chemicals and fuels likely to be stored on-site during construction include but are not limited to:

- Diesel and unleaded petrol for the refueling of plant equipment and generators;
- Grease etc used during construction;
- Chemicals used during the reverse osmosis process include but are not limited to chlorine, sodium hypochlorite, sodium bisulphate, heavy metals, anti-scalants; coagulants like ferric- or aluminum chloride; antifoaming agents like polyglycols; biocides; and cleaning chemicals; and
- Chemicals used in the treatment of grey and black water for recharge into the groundwater aquifers.

291. If not handled, stored or used appropriately, contamination of land and the marine environment and freshwater lens systems could occur. The accidental discharge of hazardous materials during construction and operation activities is a potential risk to the local environment. Accordingly, all oil, grease, diesel, petrol and chemicals should be stored off site within a bunded area.

292. Potential activities which could result in spills are:

- Use of machinery and vehicles – potential for fuels, oils and lubricant spills;
- Transport, storage and handling of fuels, machinery oils, grease;
- Transport, storage and handling of cement/asphalt(bitumen) and other construction materials;
- Potential release of chemicals used in the desalination process into the surrounding marine environment;
- Potential release of chemicals used in the waste water treatment process into the groundwater aquifers; and
- Impacts associated with hazardous materials will primarily be associated with the storage and handling during the construction and operation phase

### 9.6.2 Performance Criteria

293. The following performance criteria are set for the construction of the projects:

- Ensure a Material Safety Data Sheet (MSDS) Register be developed for all chemicals and fuels retained on site;
- Handling and storage of hazardous material is in accordance with the relevant legislation and best management practices;
- All spills are reported to PMU within one hour of occurrence; and
- No spills enter the marine environment; and
- Prevent the uncontrolled release of oil, grease and diesel to the environment;
- No spills of hazardous materials;
- No chemical spills into the freshwater lens; and
- No contamination of land due to spills of hazardous materials

### 9.6.3 Monitoring

294. A chemical and fuel management program has been developed for the projects. The program is subject to review and update quarterly from the date of issue. Importantly, the site supervisor should:

- Conduct daily chemical and fuel assessments as part of their daily check procedure;
- Manage the selection, purchase, storage, handling and disposal of chemicals to ensure minimal environmental impact;
- Regularly inspect equipment that uses fuel, lubricants and/or hydraulic fluid;
- Regular inspect all equipment used in the desalination process for leaks etc;
- Develop procedures and install equipment to contain, minimize and recover spills; and
- Provide staff with procedures and training in spill prevention and clean up

#### **9.6.4 Reporting**

295. The MEE must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level as a result of a chemical or fuel leak or spill.

Table 12: Chemical and fuel management measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
C1 Poor management of chemicals and fuels	C1.1: Store and handle all chemicals, fuels, oils and potentially hazardous materials as specified in relevant standards and guidelines. All hazardous materials to be approved for use onsite. All hazardous materials and construction fuel will be stored in appropriate storage facilities (e.g. fuel and chemicals will be stored in a bunded area).	During Construction	Contractor	Daily and maintain records
	C1.2: Hydrocarbon wastes shall be stored in color coded and labelled drums placed around fueling depots and disposed of.	During Construction	Contractor	Daily and maintain records
	C1.3: Where possible, fuel and chemical storage and handling shall be undertaken at central fuel and chemical storage facilities, such as petrol stations/site depot.	During Construction	Contractor	Daily and maintain records
	C1.4: Onsite storage of fuel and chemicals shall be kept to a minimum.	During Construction	Contractor	Daily and maintain records
	C1.5: Emergency clean up kits for oil and chemical spills will be available onsite	During Construction	Contractor	Daily and maintain records
	C1.6: Refuelling activities to preferentially occur off site, however, if required onsite ensure refuelling activities occur in designated areas of the site where appropriate temporary protection measures have been designed/located and are no less than 20 meters from drainage lines.	During Construction	Contractor	Daily and maintain records

## 9.7 EMERGENCY RESPONSE PLAN

### 9.7.1 Background

296. In the event of actions occurring, which may result in serious health, safety and environmental (catastrophic) damage, emergency response or contingency actions will be implemented as soon as possible to limit the extent of environmental damage.

297. It is assumed that there are residences located close to the rainwater harvesting system that may be damaged in the event of a fire. By contrast, it is assumed that no residences will be located in proximity to the desalination plants and treatment facilities for freshwater lens recharge.

298. The contractor will need to incorporate construction emergency responses into the project complying with the requirements under the Occupational, Health and Safety Policy of the contractor or relevant government regulation.

### 9.7.2 Performance Criteria

299. The following performance criteria are set for the project:

- No incident of fire outbreak during construction;
- Reduce the risk of fire by undertaking hot works within cleared locations;
- Provide an immediate and effective response to incidents that represent a risk to public health, safety or the environment; and
- Minimize environmental harm due to unforeseen incidents

### 9.7.3 Monitoring

300. An emergency response monitoring program has been developed for the projects. The program is subject to review and update at least quarterly from the date of issue. Importantly, the site supervisor will conduct daily visual inspections and report to MEE and UNDP staff on a weekly basis (minimum) noting any non-conformances to this ESMP

### 9.7.4 Reporting

301. The MEE and UNDP staff must be notified immediately in the event of any emergency, including fire or health related matter including those that have resulted in serious environmental harm

Table 13: Emergency management measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
E1. Fire and Emergency management and prevention strategies implemented	E1.1: Flammable and combustible liquids bunding/storage areas to be designed in accordance with appropriate national/international standards	Pre and during construction	Contractor	Daily and maintain records
	E1.2: No open fires are permitted within the project area	During construction	Contractor	Daily and maintain records
	E1.3: No cigarette butts are to be disposed of onto the ground throughout the project area, all smokers must carry a portable disposal bin to reduce the risk of a spot fire starting and general litter	During construction	All Personnel	Daily and maintain records
	E1.4: Any stockpiles of mulch are not to exceed two meters in height and width and must be turned regularly.	During construction	All Personnel	Daily and maintain records
	E1.5: Train all staff in emergency preparedness and response (cover health and safety at the work site)	During construction	Contractor	Daily and maintain records
	E1.6: Check and replenish First Aid Kits	During construction	Site Supervisor	Daily and maintain records
	E1.7: Use of Personal Protection Equipment	During construction	All Personnel	Daily and maintain records

## 10. BUDGET

302. A budget has been prepared for the implementation of the ESMP as follows:

<b>Item</b>	<b>Cost</b>
ESMP Updating and Auditing	\$10,000
General ESMP Expenses	\$15,000
Marine Biota Monitoring (four IWRM islands with three sites/islands with three replicates/sites – two assessments/year over four years)	\$40,000
Real-time marine water quality monitoring (eight sites/four years)	\$240,000
Real-time freshwater lens water quality monitoring (four islands/four years)	\$240,000
Rainwater harvesting water quality monitoring (45 islands-weekly/four years)	\$180,000
Water quality laboratory analysis (49 sites – quarterly/four years)	\$60,000
Stakeholder engagement workshops	\$20,000
Grievance Redress Mechanism	\$40,000
<b>Total</b>	<b>\$845,000</b>

## Annexure One: Community Consultation and Stakeholder Engagement Information

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Attached in a separate document

## Annexure Two: Guidance for Submitting a Request to the Social and Environmental Compliance Unit and/or the Stakeholder Response Mechanism

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*Empowered lives.  
Resilient nations.*

### Guidance for Submitting a Request to the Social and Environmental Compliance Unit (SECU) and/or the Stakeholder Response Mechanism (SRM)

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#### Purpose of this form

- **If you use this form, please put your answers in bold writing to distinguish text**
- **The use of this form is recommended, but not required. It can also serve as a guide when drafting a request.**

This form is intended to assist in:

- 1 Submitting a request when you believe UNDP is not complying with its social or environmental policies or commitments and you believe you are being harmed as a result. This request could initiate a 'compliance review', which is an independent investigation conducted by the Social and Environmental Compliance Unit (SECU), within UNDP's Office of Audit and Investigations, to determine if UNDP policies or commitments have been violated and to identify measures to address these violations. SECU would interact with you during the compliance review to determine the facts of the situation. You would be kept informed about the results of the compliance review.

and/or

- 2 Submitting a request for UNDP "Stakeholder Response" when you believe a UNDP project is having or may have an adverse social or environmental impact on you and you would like to initiate a process that brings together affected communities and other stakeholders (e.g., government representatives, UNDP, etc.) to jointly address your concerns. This Stakeholder Response process would be led by the UNDP Country Office or facilitated through UNDP headquarters. UNDP staff would communicate and interact with you as part of the response, both for fact-finding and for developing solutions. Other project stakeholders may also be involved if needed.

Please note that if you have not already made an effort to resolve your concern by communicating directly with the government representatives and UNDP staff responsible for this project, you should do so before making a request to UNDP's Stakeholder Response Mechanism.

**Confidentiality** If you choose the Compliance Review process, you may keep your identity confidential (known only to the Compliance Review team). If you choose the Stakeholder Response Mechanism, you can choose to keep your identity confidential during the initial eligibility screening and assessment of your case. If your request is eligible and the assessment indicates that a response is appropriate, UNDP staff

will discuss the proposed response with you, and will also discuss whether and how to maintain confidentiality of your identity.

### **Guidance**

When submitting a request please provide as much information as possible. If you accidentally email an incomplete form, or have additional information you would like to provide, simply send a follow-up email explaining any changes.

### **Information about You**

Are you...

1. A person affected by a UNDP-supported project?

Mark "X" next to the answer that applies to you:                      Yes:              No:

2. An authorized representative of an affected person or group?

Mark "X" next to the answer that applies to you:                      Yes:              No:

*If you are an authorized representative, please provide the names of all the people whom you are representing; and documentation of their authorization for you to act on their behalf, by attaching one or more files to this form.*

3. First name:
4. Last name:
5. Any other identifying information:
6. Mailing address:
7. Email address:
8. Telephone Number (with country code):
9. Your address/location:
10. Nearest city or town:
11. Any additional instructions on how to contact you:
12. Country:

### **What you are seeking from UNDP: Compliance Review and/or Stakeholder Response**

You have four options:

- a. Submit a request for a Compliance Review;
  - b. Submit a request for a Stakeholder Response;
  - c. Submit a request for both a Compliance Review and a Stakeholder Response;
  - d. State that you are unsure whether you would like Compliance Review or Stakeholder Response and that you desire both entities to review your case.
13. Are you concerned that UNDP's failure to meet a UNDP social and/or environmental policy or commitment is harming, or could harm, you or your community? Mark "X" next to the answer that applies to you:              Yes:              No:
  14. Would you like your name(s) to remain confidential throughout the Compliance Review process?

Mark "X" next to the answer that applies to you:              Yes:              No:

If confidentiality is requested, please state why:

15. Would you like to work with other stakeholders, e.g., the government, UNDP, etc. to jointly resolve a concern about social or environmental impacts or risks you believe you are experiencing because of a UNDP project?

Mark "X" next to the answer that applies to you:    Yes:            No:

16. Would you like your name(s) to remain confidential during the initial assessment of your request for a response?

Mark "X" next to the answer that applies to you:    Yes:            No:

If confidentiality is requested, please state why:

17. Requests for Stakeholder Response will be handled through UNDP Country Offices unless you indicate that you would like your request to be handled through UNDP Headquarters. Would you like UNDP Headquarters to handle your request?

Mark "X" next to the answer that applies to you:    Yes:            No:

If you have indicated yes, please indicate why your request should be handled through UNDP Headquarters:

18. Are you seeking both Compliance Review and Stakeholder Response?

Mark "X" next to the answer that applies to you:    Yes:            No:

19. Are you unsure whether you would like to request a Compliance Review or a Stakeholder Response?  
Mark "X" next to the answer that applies to you:    Yes:            No:

**Information about the UNDP Project you are concerned about, and the nature of your concern:**

20. Which UNDP-supported project are you concerned about? (if known):

21. Project name (if known):

22. Please provide a short description of your concerns about the project. If you have concerns about UNDP's failure to comply with its social or environmental policies and commitments, and can identify these policies and commitments, please do (not required). Please describe, as well, the types of environmental and social impacts that may occur, or have occurred, as a result. If more space is required, please attach any documents. You may write in any language you choose

23. Have you discussed your concerns with the government representatives and UNDP staff responsible for this project? Non-governmental organizations?

Mark "X" next to the answer that applies to you:    Yes:            No:

If you answered yes, please provide the name(s) of those you have discussed your concerns with

Name of Officials You Have Already Contacted Regarding this Issue:

First Name	Last Name	Title/Affiliation	Estimated Date of Contact	Response of Individual	from	the
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24. Are there other individuals or groups that are adversely affected by the project?

Mark "X" next to the answer that applies to you:    Yes:            No:

25. Please provide the names and/or description of other individuals or groups that support the request:

First Name	Last Name	Title/Affiliation	Contact Information
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Please attach to your email any documents you wish to send to SECU and/or the SRM. If all of your attachments do not fit in one email, please feel free to send multiple emails.

Submission and Support

To submit your request, or if you need assistance please email: [project.concerns@undp.org](mailto:project.concerns@undp.org)

## ANNEXURE THREE: ENVIRONMENTAL AND SOCIAL CODE OF PRACTICE FOR RAINWATER HARVESTING TANKS

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This Environmental and Social Code of Practice has been established for the purposes of the construction, operation, maintenance and where necessary, although unlikely, the decommissioning of the rainwater tanks.

### Construction of Rainwater Harvesting Tanks

The rainwater tanks will be prefabricated to reduce waste. Any waste that is produced should follow the procedures as established by the Environmental and Social Management Framework.

All rainwater tanks will be constructed on a sand based and/or concrete ring beam footing and/or crusher dust pad. It is imperative to ensure foundations and civil works for the site are adequate and that the civil works do not impact offsite. The preparation of the pad that the rain water tank will be constructed on:

- a. Prepare a sand/cracker dust/concrete pad approximately 2 metres larger in diameter than that of the chosen tank. The pad should be at least 150mm deep. The area should be free of vegetation, tree roots, etc, to ensure there is no possibility of them growing back;
- b. Ensure the sub soil has adequate compaction (minimum 50 kpa). The preferred base material is free draining sand, level over the entire area (to within approximately 10mm) and free of any sharp objects, clay lumps, stones. Important: the pad must be level (within 10mm); and
- c. If the site has been cut into an incline and filled to form the base of the tank, ensure that there is adequate compaction (to a minimum allowable capacity of 50kPa) of the sub soil to avoid subsidence. Adequate drainage must be installed to divert water run off away from the tank.

The water tanks will be engineered for hurricane/cyclonic regions. The water tanks must be tied down thereby reducing the impacts of hurricanes/cyclones and floods moving the tanks. This will also reduce the potential for the release of the water contained within the tanks during an event.

There will be a need to retro fit buildings to accommodate the flow of water to the rainwater tanks. The current buildings have uncontrolled overflow and as such, the roof of each building will need to be retrofitted with gutters and downpipes. Gutters should be fitted with steel mesh to stop leaves entering the gutters. This will have a two-fold benefit. Firstly, accumulated leaves can result in the rusting of the gutters over time. By not allowing the leaves to enter the gutters, this will significantly reduce this impact. Secondly, by not allowing leaves to accumulate in the gutters and decompose, this will provide better quality water into the rainwater tanks.

Within the downpipe at a height easily accessible to a person, first flush diverters will be installed on all guttering to remove residue that might accumulate on roof of buildings over time. To further ensure good quality water, UV sterilization and purification systems will be installed on the final tank thus providing high quality drinking water. Discussion on the operation and maintenance of the first flush diverters and sterilization and purification systems is provided below.

Overflow pipes from the rainwater tanks should drain into existing groundwater wells to recharge groundwater aquifers directly rather than through leaching. This will have a significant beneficial impact on the groundwater ecosystems that are currently stressed.

The tanks must have an internal liner so the water does not heat up as it does in normal concrete tanks. The liner shall have a state of the art food grade, UV treated, multi layered film to provide extra layers of strength and durability.

All tanks will be fitted with filters. The filters would include both a cartridge type approach as well as a an ultra violet sterilization and purification treatment system. Ultraviolet water disinfection systems present

the safest method to sterilize water. Water needs to be free of harmful micro-organisms to safeguard health and the environment. The benefits of having cartridges included in the filtration and sterilization process is that ultraviolet water treatment systems don't use chemicals and don't produce harmful by-products, they are an economical way to eliminate health risks from unsafe drinking water; they will guarantee delivery of safe and clean water; and importantly they deactivate and remove pathogens and parasites such as salmonella, E coli and giardia. The cartridges will then remove any material that the UV systems may not be able to remove (extremely limited). These systems have been used internationally to provide clean safe drinking water.

### **Operation of Rainwater Harvesting Tanks**

The activity will involve the provision of water to households/individuals. To ensure the operation does not have environmental and social impacts, it is necessary to ensure that people collecting water have clean containers. Where necessary, a small amount of water should be placed in a bucket and then poured into the container and the container cleaned. The disposal of this water should be undertaken to ensure there is no release of any chemicals or residue into the environment.

Water should be made available during daylight hours only. This will ensure there is no uncontrolled release of water. When make water available, two people should manage this process. One should control the release of water from the rainwater tank itself and the second person should control the release of water from the sterilization and purification system. By having two people undertake this task, it reduces the potential for an uncontrolled release of water into the environment.

### **Maintenance of Rainwater Harvesting Tanks**

The following maintenance regime has been established for the rainwater harvesting tanks. A register should be established for each location based on that provided below to ensure maintenance is undertaken at the recommended period.

The use of the rainwater tanks has been based on the need for limited maintenance. The maintenance requirements are as follows:

- a. Water quality check;
- b. Cleaning of UV sterilizer and purification systems;
- c. Changing cartridges annually or as required;
- d. Cleaning and checking of guttering and downpipes;
- e. Cleaning of first flush diverters and mesh screen on top of the rainwater tanks;
- f. Periodic inspection of the tank itself, including viewing through the inspection hole; and
- g. Assessment and where necessary, the replacement of sacrificial anodes.

The water within the tank should be visually inspected weekly. A small glass jar should be used to analyse the clarity of the water. Simple water quality testing should also be conducted include pH etc. Water quality should be laboratory tested every three months to ensure it meets appropriate standards.

Once every three months, depending of the final infrastructure, the sterilization and purification system will require cleaning. The UV sterilization and purification system should be dismantled and cleaned every three months. Only mild soap should be used in the cleaning process. Following cleaning, the system should be triple rinsed to ensure it is clean. Seals and o rings should be checked as to whether they are perished, cracked and/or have any breaks. Where a break is found, the seal and/or o ring should be replaced.

Cartridges should be replaced annually months to maintain drinking water standards. It is preferred that a carbon filter be used as the final cartridge before drinking. Funding for the cartridges has been included in the budget.

First flush diverters will need to be periodically checked (weekly). This will require dust, leaves to be removed, if not automatically done so by the first flush diverter. This period may be extended where no rainfall occurs. Likewise, the fine mesh screen should be checked weekly and as required.

Prior to the beginning of the wet season, all gutters and downpipes should be checked. This check will include ensuring there is no damage to gutters including holes that would allow water to escape, and no building up of decomposing matter. Where necessary, the downpipes should be disconnected from the rainwater tanks and the gutters cleaned with fresh water. The water will only contain organic material and therefore can be easily released into the environment. Downpipes should also be checked for any cracks or leaks. Where a crack or leak is observed, depending on the damage, the section of the downpipe can be replaced or bandaged.

Annually, and prior to the wet season, a visual inspection of the whole tank should be undertaken. This should include an internal inspection from the inspection door on top of the tank. When undertaking any inspection, given the height of the tank, appropriate safety procedures should be followed. This should include that anyone undertaking an inspection should have an appropriate safety harness. At no time should a person enter the tank until such time as it has been fully ventilated for a period of twenty four (24) hours to ensure that any lack of oxygen due to the tank being sealed in improved to safe levels.

#### **Decommissioning of Rainwater Harvesting Tanks**

In the unlikely event that a rainwater tank requires decommissioning, the first priority is the controlled release of water. Where practicable, the release of water should be first to groundwater aquifers. Where this is not possible, the water should be released in such a way to not have any environmental and social impacts.

Once the water is released, the tank can be dismantled. Where practicable, all materials should be recycled and where not possible, placed at a licensed landfill. The tank pad should also be removed and the site revegetated.

## Annexure Four: Erosion, Drainage and Sediment Control Management Plan and Contaminated Soil Disposal Management Plan Outline

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### **Project Description**

- a. Provide a comprehensive description of the project; and
- b. Include an overview of the pre-construction, construction, and operational phases of the project.

### **Purpose, Scope and Objective**

The section should include:

- a. Scope of the Erosion, Drainage and Sediment Control Management Plan (EDSCP)
- b. Establish objectives for general EDSCP;
- c. Establish specific objectives for site specific EDSCP;
- d. Relationship to specific mitigation measures

### **Statutory and Regulatory Requirements**

- a. Legislative requirements as prescribed in the Project Environmental and Social Management Plan (ESMP)

### **Potential Impacts**

- a. Overview of impacts identified in the ESMP;

**Erosion and sediment control impacts and mitigations**

Source of Impact	Potential Impact and Relevant Management Plan Objective	Mitigation and Management (Design Feature/ Specific Measure)	Mitigation Measure	Activity/ Monitoring	Frequency	Duration	Responsibility	Evidence

**Project Implementation** (human resources, partners, and organizational responsibilities)

- a. Describe human resources for implementation of the plan and component programs/interventions;
- b. Clearly define roles and responsibilities and organizational structure;
- c. Discuss training that will be provided; and
- d. Describe potential partners (NGOs, government, etc.) and their respective roles and responsibilities.

**Resources**

- a. Equipment requirements including erosion and sediment control devices (sediment fencing, silt curtains, etc) water quality monitoring equipment; and on-site weather monitoring station;
- b. Staff involved including Construction Environmental Officer; Environmental Coordinator; Monitoring Officer; Environmental and Regulatory Manager; and
- c. Registers including water quality monitoring record; and non-conformance register.

**Schedule**

- a. Multi-year schedule of implementation for the component programs/ interventions and the overall plan.

**Monitoring and Evaluation**

- a. Overall monitoring and evaluation framework that integrates the monitoring and evaluation requirements for the component programs/ interventions.

**Reporting and Notification**

- a. Contractor's monthly report including results of the surveys and inspections; and number and results of verification inspections, including but not limited to landform stability inspections, sediment control structure and stockpile inspections and control measures implemented to manage failing sediment control structures and stockpiles.

**Budget**

- a. Budgets for the component programs/ interventions and the total cost of the plan.

## Annexure Five: ESMP Monitoring Plan

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(Attached in a separate document)

## ANNEXURE SIX: STANDARD GENERAL ENVIRONMENTAL CONTRACT CLAUSES

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Generic contract clauses are provided in this annex to assist with environmental and social management works expected to have minor impacts. These mitigation measures are the core of a generic, standardized EMP (Environmental Management Plan) and the associated minor impacts typical of small works which can be routinely addressed with best industry practice. These clauses are general and may be modified to conform to applicable national laws, contract procedures and actual scope and nature of the works anticipated. These clauses are intended to be included as requirements in the works contract and shall remain in force throughout the contract period. These clauses represent the minimum standard of execution for environmental protection and include:

- 1 Permits and Approvals
- 2 Site Security
- 3 Discovery of Antiquities
- 4 Worker Occupational Health and Safety
- 5 Noise Control
- 6 Use and Management of Hazardous Materials, fuels, solvents and petroleum products
- 7 Use and Management of Pesticides
- 8 Use of Preservatives and Paint Substances
- 9 Use of Explosives
- 10 Site Stabilization and Erosion Control
- 11 Traffic Management
- 12 Management of Standing Water
- 13 Management of Solid Wastes -trash and construction debris
- 14 Management of Liquid Wastes

### **Standard Clauses**

#### ***1. Permits and Approvals***

The contractor shall be responsible for ensuring that he or she has all relevant legal approvals and permits required to commence works.

#### ***2. Site Security***

The contractor shall be responsible for maintaining security over the construction site including the protection of stored materials and equipment. In the event of severe weather, the contractor shall secure the construction site and associated equipment in such a manner as to protect the site and adjacent areas from consequential damages. This includes the management of onsite, construction materials, construction and sanitary wastes, additional strengthening of erosion control and soil stabilization systems and other conditions resulting from contractor activities which may increase the potential for damages.

#### ***3. Discovery of Antiquities***

If, during the execution of the activities contained in this contract, any material is discovered onsite which may be considered of historical or cultural interest, such as evidence of prior settlements, native or historical activities, evidence of any existence on a site which may be of cultural significance, all work shall stop and the supervising contracting officer shall be notified immediately. The area in which the material was discovered shall be secured, cordoned off, marked, and the evidence preserved for examination by the

local archaeological or cultural authority. No item believed to be an artefact must be removed or disturbed by any of the workers. Work may resume, without penalty of prejudice to the contractor upon permission from the contracting officer with any restrictions offered to protect the site.

#### **4. Worker Occupational Health and Safety**

The contractor shall ensure that all workers operate within a safe environment. Sanitation facilities shall be provided for all site workers. All sanitary wastes generated as a result of project activities shall be managed in a manner approved by the contracting officer and the local authority responsible for public health. The contractor shall ensure that there are basic medical facilities on site and that there are staff trained in basic first aid. Workers must be provided with the necessary protective gear as per their specific tasks such as hard hats, overalls, gloves, goggles, boots, etc. The contractor shall provide the contracting officer with an occupational health and safety plan for approval prior to the commencement of site activities.

The contractor must ensure that all workers operate within a safe environment. All relevant Labor and Occupational Health and Safety regulations must be adhered to ensure worker safety. Sanitary facilities must be provided for all workers on site. Appropriate posting of information within the site must be done to inform workers of key rules and regulations to follow.

#### **5. Noise Control**

The contractor shall control noise emissions generated as a result of contracting activities to the extent possible. In the case of site locations where noise disturbance will be a concern, the contractor shall ensure that the equipment is in good working order with manufacturer supplied noise suppression (mufflers etc.) systems functioning and in good repair.

Where noise management is a concern, the contractor shall make reasonable efforts to schedule activities during normal working hours (between 8 am and 5 pm). Where noise is likely to pose a risk to the surrounding community either by normal works or working outside of normal working hours or on weekends, the contractor shall inform the contracting officer and shall develop a public notification and noise management plan for approval by the contracting officer.

#### **6. Use and Management of Hazardous Materials, fuels, solvents and petroleum products**

The use of any hazardous materials including pesticides, oils, fuels and petroleum products shall conform to the proper use recommendations of the product. Waste hazardous materials and their containers shall be disposed of in a manner approved by the contracting officer in accordance with national laws. A site management plan will be developed by the contractor if the operation involves the use of these materials to include estimated quantities to be consumed in the process, storage plans, spill control plans, and waste disposal practices to be followed. Any plans required shall be approved by the contracting officer.

Elements of the hazardous materials management shall include:

- a. Contractor must provide temporary storage on site of all hazardous or toxic substances in safe containers labelled with details of composition, properties and handling information;
- b. Hazardous substances shall be placed in a leak-proof container to prevent spillage and leaching
- c. Wastes shall be transported and disposed of in a manner approved by the contracting officer compliant with national laws and policies

#### **7. Use and Management of Pesticides**

Any use of pesticides shall be approved by the contracting officer and shall conform to the manufacturers' recommendations for use and application. Any person using pesticides shall demonstrate that they have read and understood these requirements and are capable of complying with the usage recommendations to the satisfaction of the contracting officer. All pesticides to be used shall conform to the list of acceptable pesticides that are not banned by the relevant local authority.

If termite treatment is to be utilized, ensure appropriate chemical management measures are implemented to prevent contamination of surrounding areas, and use only licensed and registered pest control professionals with training and knowledge of proper application methods and techniques.

#### **8. Use of Preservatives and Paint Substances**

All paints and preservatives shall only be used with the approval of the contracting officer. Information shall be provided to the contracting officer who describes the essential components of the materials to be used so that an informed determination can be made as to the potential for environmental effects and suitability can be made.

Storage, use, and disposal of excess paints and preservatives shall be managed in conformance with the manufacturers' recommendations and as approved by the contracting officer. The contractor shall provide the contracting officer with a list of materials and estimated quantities to be used, storage, spill control and waste disposal plans to be observed during the execution of the contract. This plan is subject to the approval of the contracting officer.

### **9. Use of Explosives**

Use of explosives shall be at the approval of the relevant local authority and shall be supervised and undertaken by a qualified explosives technician. Blasting will be limited to between the hours of 9:00 am and 4:00 pm unless specifically approved by the local authority and the contracting officer. Any use of explosives shall be permitted only after an explosives management and blasting plan has been approved by the relevant local authority and the contracting officer.

This plan shall include:

1. Description of the explosive agent, charge description, intended use.
2. Site safety plan including:
  - a. Storage of initiators, booster charges and principal blasting agents
  - b. Handling precautions to be observed
  - c. Transport to and from site
  - d. Security of stored materials
  - e. Disposal of excess or damaged explosive materials.
3. Analysis of risk to surrounding area and mitigation measures to be employed including:
  - a. Over-pressure event
  - b. Noise
  - c. Flying debris
  - d. Seismic transmission
  - e. Accidental detonation
4. Name and qualifications for all persons responsible for handling explosive agents

### **10. Site Stabilization and Erosion Control**

The Contractor shall implement measures at the site of operations to manage soil erosion through minimization of excavated area and time of exposure of excavated areas, preservation of existing ground cover to the extent possible, provision of approved ground cover and the use of traps and filtration systems. Where excavations are made, contractor shall implement appropriate stabilizing techniques to prevent cave-in or landslide. Measures shall be approved by the contracting officer.

The contractor must ensure that appropriate erosion control measures such as silt fences are installed. Proper site drainage must be implemented. Any drain clogged by construction material or sediment must be unclogged as soon as possible to prevent overflow and flooding. The use of retaining structures and planting with deep rooted grasses to retain soil during and after works must be considered. The use of bio-engineering methods must be considered as a measure to reduce erosion and land slippage. All slopes and excavated areas must be monitored for movement.

The contractor will establish appropriate erosion and sediment control measures such as hay bales, sedimentation basins, and / or silt fences and traps to prevent sediment from moving off site and causing excessive turbidity in nearby streams, rivers, wetlands, and coastal waters.

An erosion management plan will be required where the potential exists for significant sediment accumulation in wetlands, lakes, rivers and marine systems. This plan shall include a description of the potential threat, mitigation measures to be applied, and consideration for the effects of severe weather and an emergency response plan.

If works are along coastal marine areas or near major streams and river, water quality monitoring must be done before construction, and at regular intervals to determine turbidity levels and other quality parameters.

Construction vehicles and machinery will be washed only in designated areas where runoff will not pollute natural surface water bodies.

### **11. Air Quality**

When appropriate, the contractor shall provide an air quality management plan for contracting officer approval. This plan will include provisions for the management and control of dust and unnecessary emissions resulting from construction activities. The plan shall include control measures to be implemented including the management of dust generated from transportation and site construction activities as well as excess emissions from vehicles and equipment. Under no circumstances shall site or roadway dusts be managed using oil spray techniques.

### **12. Traffic Management**

In the event that construction activities should result in the disruption of area transportation services, including temporary loss of roadways, blockages due to deliveries and site related activities, the contractor shall provide the contracting officer with a traffic management plan including a description of the anticipated service disruptions, community information plan, and traffic control strategy to be implemented so as to minimize the impact to the surrounding community. This plan shall consider time of day for planned disruptions, and shall include consideration for alternative access routes, access to essential services such as medical, disaster evacuation, and other critical services. The plan shall be approved by the contracting officer.

Elements of the traffic management plan to be developed and implemented by contractor shall include:

- a. Alternative routes will be identified in the instance of extended road works or road blockages;
- b. Public notification of all disturbance to their normal routes;
- c. Signage, barriers and traffic diversions must be clearly visible, and the public warned of all potential hazards;
- d. provision for safe passages and crossings for all pedestrians where construction traffic interferes with their normal route;
- e. Active traffic management by trained and visible staff at the site or along roadways as required to ensure safe and convenient passage for the vehicular and pedestrian public;
- f. Adjustment of working hours to local traffic patterns, e.g. avoiding major transport activities during rush hours or times of livestock movement.

### **13. Management of Standing Water**

Under no circumstances shall the contractor permit the collection of standing water as a consequence of contractor activities without the approval of the contracting officer and consultation with the relevant local environmental health authority. Recommendations from that local authority on how to manage and treat the standing water must be implemented. The condition of the standing water must be monitored by the contractor to ensure that it does not present itself as a breeding ground for any pests such as mosquitoes.

### **14. Management of Solid Wastes and Construction Debris**

The contractor shall provide a solid waste management plan that conforms to the national solid waste management policies and regulations for approval by the contracting officer. The site waste management plan shall include a description of waste handling procedures including collection, storage and disposal through the national waste management system. There will be no open burning of waste material and the contractor shall endeavor to recycle wastes as appropriate through the national waste management system.

Under no circumstances shall the contractor allow construction wastes to accumulate so as to cause a nuisance or health risk due to the propagation of pests and disease vectors.

#### **15. Management of Liquid Wastes**

The contractor shall provide the contracting officer with a liquid waste management plan as part of a site waste management plan that conforms to the waste management policies and regulations of the relevant Saint Vincent and the Grenadines authority. Under no circumstances shall the contractor allow construction related liquid wastes to accumulate on or off the site, or to flow over or from the site in an uncontrolled manner or to cause a nuisance or health risk due to its content. The site waste management plan shall include a description of how these wastes will be stored, collected and disposed of in accordance with current law. Additionally, the contractor shall provide for the regular removal and disposal of all site wastes and provide the contracting officer with a schedule for such removal.

Specific elements of the contractor's liquid waste management plan shall include: contractor to abide by all pertinent waste management and public health laws; waste collection and disposal pathways and sites will be identified for all major waste types expected from demolition and construction activities; construction and demolition wastes will be stored in appropriate bins; liquid and chemical wastes will be stored in appropriate containers separated from the general refuse; all waste will be collected and disposed of properly in approved landfills by licensed collectors; the records of waste disposal will be maintained as proof for proper management as designed; whenever feasible the contractor will reuse and recycle appropriate and viable materials (except asbestos); construction related liquid wastes must not be allowed to accumulate on or off the site, or to flow over or from the site in an uncontrolled manner or to cause a nuisance or health risk due to its contents.

## Annexure Seven: EIA Decision Statements

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(attached as a separate file)