

# Initial Environmental Examination

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**MLD: Greater Malé Environmental Improvement and Waste Management Project**  
– Improvement of Waste Handling and Processing Facilities for Thilafushi Island  
(Construction and Demolition Waste Plant, End-of-Life Vehicle Dismantling Workshop, Waste Vessel Harbor Improvements, and Administration Building)

Prepared by the Ministry of Environment and Energy of the Republic of Maldives for the Asian Development Bank.

## CURRENCY EQUIVALENTS

(as of 15 March 2018)

Currency unit	–	Rufiyaa (Rf)
Rf1.00	=	\$0.065
\$1.00	=	Rf15.449

## ABBREVIATIONS

ADB	-	Asian Development Bank
BPEO	-	best practicable environmental option
CDTA	-	capacity development technical assistance
C&D	-	construction and demolition
dB L <sub>eq</sub>	-	continuous noise equivalent level, expressed in decibels
DMS	-	detailed measurement survey
ELV	-	end of life vehicle
EMP	-	Environmental Management Plan
EPA	-	Environmental Protection Agency
EPPA	-	Environmental Protection and Preservation Act of 1993
GOM	-	Government of the Republic of Maldives
GRC	-	grievance redress mechanism
GRM	-	grievance redress mechanism
IEE	-	initial environmental examination
IMO	-	independent monitoring organization
IRC	-	Inter-Ministerial Resettlement Committee
IWMC	-	Island Waste Management Centre
MEE	-	Ministry of Environment and Energy
MPW/100ml	-	most probable number (of bacteria) per 100 milliliters of water
NAPA	-	National Action Programme of Action (for climate change)
O&M	-	operation and maintenance
PMDSC	-	project management, design and supervision consultants
PMU	-	project management unit
RWMF	-	regional waste management facility
WAMCO	-	Waste Management Corporation

## NOTE

In this report, "\$" refers to US dollars.

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## EXECUTIVE SUMMARY

1. The Greater Malé Environmental Improvement and Waste Management Project will establish a sustainable solid waste management (SWM) system in the Greater Malé capital region and its inhabited outer islands by (i) establishing a modern waste collection, transfer, and disposal system, (ii) improving community-based outer island waste management systems, (iii) building institutional capacity for sustainable services delivery, and (iv) raising public awareness in reduce, reuse, recycle (3R) behaviors. Physical and non-physical investments are designed to curb climate change and disaster impacts while creating a cleaner environment in Maldives. The executing agency is the Ministry of Finance and Treasury (MOFT). The implementing agency is Ministry of Environment and Energy (MEE) who will establish a project management unit (PMU) comprising officials from MEE and Waste Management Corporation Limited (WAMCO). The PMU will have responsibility for overseeing project management, with support from Project Management, Design and Supervision Consultants (PMDSC).

2. The Project will have three outputs: (i) Output 1: Waste collection, transfer, and disposal systems improved and made climate and disaster resilient, (ii) Output 2: Community-based outer island waste management systems targeting poor and women enhanced, and (iii) Output 3: Institutional capacity and public awareness in sustainable waste management strengthened.

3. Output 1: Waste collection, transfer, and disposal systems improved and made climate and disaster resilient. This will include (i) an efficient waste collection strategy designed and applied in Malé and Hulhumalé in consultation with local communities targeting women; (ii) waste collection and transport equipment (trucks, bins, containers) for Malé, Hulhumalé and Villimalé provided; (iii) transfer stations in Malé and Villimalé constructed and transfer station in Hulhumalé designed; (iv) construction and demolition (C&D) waste processing plant and end of life vehicle (ELV) dismantling workshop constructed; (v) waste vessel harbor at Thilafushi rehabilitated; (vi) 3 vessels for waste transport from outer islands to Thilafushi provided; (vii) heavy equipment (bulldozers, excavators, roll trucks) for controlled dumpsite management at Thilafushi provided; and (viii) construction of 2 administrative buildings for WAMCO at Malé transfer station and Thilafushi waste vessel harbor. All facilities designed will consider climate change and disaster resilient features.

### **A. Description of the Subproject**

4. The planned works comprise improvements to the waste vessel harbor and waste processing facilities on Thilafushi Island, including a C&D waste processing plant, and end-of-life vehicle (ELV) dismantling workshop. The improvements are to take place on the southern part of Thilafushi Island, allocated to the regional waste management facility (RWMF). The waste vessel harbor and waste handling area will be fenced and storm water drainage will be improved with the fence demarcating the newly rehabilitated area from the surrounding area. The concept design recommends a green belt, to improve working conditions in the waste handling area. Site drainage will be achieved by incorporating an overall 1% gradient sloping toward the sea and surface water ditches. Existing docking facilities, which are in very poor condition, will be substantially improved to enable handling of containers to be used on the transfer vessels. Rehabilitation works will include widening, extending and paving to increase vessel handling capacity, docking for the full fleet of barges, boats, landing craft and Dhonis; a surface that can be regularly swept, sluiced and drained to create a clean working area, sound foundations for buildings, cranes and other sessile plant, roads and parking to ensure good circulation of trucks and mobile equipment and adequate storage area of different types of separated waste.

5. A single storey steel structure administration building with a floor area of approximately 320 m<sup>2</sup> will also be constructed and will include office rooms, changing rooms, a kitchen, wash facilities, an area for storage of hazardous waste and a sales area to handle marketable reusable waste. Two weighbridges will be included, one for incoming waste from sources on the island, and one for incoming and processed waste from the waste vessel harbor and the C&D waste processing area. A plant will be built to handle a throughput of 600 t/day involving initial sorting, pre-crushing, pre-screening, sorting, further crushing of concrete components, magnetic separation of ferrous metal components and final separation. Wood and plastics will eventually be sent to the treatment plant that will be built under a new project in the future, while stone and concrete fragments and scrap metal will be re-used and/or sold. The plant will be housed in an open shed.

6. The ELV dismantling workshop will comprise a small workshop building fitted with ramps, drains for the collection of waste oil, and equipment for dismantling of the mechanical components as well as a crusher, or press, for the vehicle body once the chassis and other main components have been removed.

## **B. Policy Legal and Administrative Framework**

7. The law governing the protection of the environment in the Republic of the Maldives is the Environmental Protection and Preservation Act (EPPA) of 1993 (Act No 4/93) and responsibilities and procedures for conducting environmental assessments, together with the requirements for environmental monitoring of projects, are set out in the EIA Regulations of 2012. Completion of EIAs is the responsibility of project proponents and all EIA work must be carried out by registered consultants. The EIA regulations require all landfills, waste incinerators and large scale waste storage projects to have full EIAs. The Environmental Management Plan, prepared following either the IEE or the EIA process, is prepared on a specified format and reviewed for compliance by MEE.

8. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all ADB investments and sets out the requirements for different categories (category A requiring an EIA, category B requiring an IEE, category C requiring a review of environmental implications and category F1 relating to investments through a financial intermediary). The SPS further requires the development of an environmental management plan (EMP) specifying the required mitigation and monitoring and who is responsible for implementation and public disclosure. Emphasis is placed on pollution prevention and control technologies to be incorporated during the design, construction, and operation of the project and adhering to recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines.

9. For the project, all statutory clearances will be obtained prior to commencement of civil works. IEEs will be prepared for each package involving civil works and EMP to be attached in the bid and contract documents. IEE will be submitted to ADB for review and approval prior to issuance of bid documents. Monitoring of EMP implementation by the EA is reported to ADB.



## **C. Description of the Environment**

### **1. Physical Resources**

10. The islands of the Maldives are reef islands formed from calcium carbonate deposits from coral colonies. Underlying rock is variable in consistency, reflecting the growth patterns of the coral, which forms dense colonies (coral heads) and large voids between the heads. Thilafushi Island is “artificial” having been reclaimed between 1992 - 1994 by placing dredged material on the lagoon, piling it to a sufficient height to overtop the water level. Thilafushi Island was made to form a landfill to cope with solid waste generated in the Greater Malé area and also to create land for industrial use.

11. The climate is tropical maritime featuring two monsoon seasons, the southwest monsoon between May and September (Halhangu), and the drier northeast monsoon between December and February (Iruvai). The southwest monsoon is the stronger and monthly rainfall typically exceeds 200mm towards the end of the southwest monsoon period. Cyclones are a regular occurrence in the Indian Ocean, occurring mainly between April and December, although those that have affected the Maldives occur between October and January.

12. Temperatures are relatively constant and range between 25oC and 30oC, with the hottest period occurring in March/April and the coolest, December/January. Monthly rainfall fluctuates between around 20mm in February to over 300mm in May, and is over 200mm for most of the year, the annual average in the Greater Malé area is 2,200mm. Prevailing winds are predominantly westerly for much of the year, influenced by the monsoon patterns.

13. The tidal regime is semi-diurnal – two high and two low tides a day. The range between high and low reaches approximately 1m and for neap tides. Surface currents follow the monsoon pattern, with westward currents dominant from January to March, and the reverse between April and December.

14. Freshwater sources are rainwater collected from roofs and groundwater that accumulates through infiltration of rainwater into a freshwater lens that forms in underlying strata. In the Greater Malé area however, these sources do not suffice for the large domestic and commercial demand and the islands of Malé, Villingilli and Hulhumalé are heavily dependent on salt water reverse osmosis plants for the supply of freshwater.

15. Marine waters around the islands are used extensively for fishing and recreational diving. The quality of water both in and around the islands is influenced by sewerage discharge, illegal dumping of solid waste and industrial activity.

16. Pollutants from industrial activity and waste, particularly hazardous waste, can accumulate in the sediment on the lagoon or sea floor. Thilafushi is the site of both industrial and waste deposit facilities and therefore a potentially significant source of pollution.

17. Air pollution sources include vehicle emissions, emissions of other plant and machinery including diesel power generators, and construction activity, and industrial activity and is readily dispersed by winds. Smoke from burning waste on Thilafushi affects nearby islands and is a concern.

18. Noise pollution occurs from the operation of vehicles and machinery of various kinds, but ambient levels of wind and wave noise are high.

## **2. Ecological Resources**

19. Coral ecosystems are extensive throughout the Maldives and have strong conservation significance. A review of survey work undertaken on benthic communities in the vicinity of proposed infrastructure improvements found predominantly rock, rubble and sandy cover, with live corals accounting for up to 20% and significant algal cover. Pelagic fish form an important part of the local economy, both through commercial fishing activities and game fishing. A review of fish population surveys undertaken around Greater Malé shows that fish life is abundant, with over 35 indicator species representing 11 families, none of which are of conservation significance, the highest diversity being found at Villingilli. The Maldives have a diverse avifauna, including a significant seasonal population of migratory birds as the islands are important wintering grounds for many species that follow the Central Asian Flyway. Within Greater Malé, bird populations are influenced by urbanization, and birds (largely non migratory) common to urban areas in South Asia, such as crows and sparrows, are commonplace. Waste is a common attractant to birds and a risk to birdlife when toxic or otherwise dangerous waste is ingested, and also when it causes habitat damage. Thus reducing uncontrolled dumping of waste or losses during transfers will reduce the risk on bird life. Present day vegetation cover on the islands is substantially influenced by human habitation and has little biodiversity conservation significance

20. There are 42 protected areas in the Maldives to prevent over exploitation, and improve conservation and preservation. Two protected areas occur in the vicinity of Thilafushi, both designated by the Government on 1 October 1995 and listed by the IUCN as dive sites. The IUCN has not set a category for either of the sites.

## **3. Socio-Economic Factors**

21. At the time of the most recent census, in 2014, there were 2,052 people resident on Thilafushi Island, almost exclusively male (99.8%) and consisting mainly of overseas workers (84%). There are no schools or hospitals on the island.

22. Tourism and fishing dominate the national economy, with the contribution to GDP of 17% and 15% respectively, and the tourism sector growing rapidly in recent years, with a sharp increase of visitor arrivals. Outside these areas, agriculture provides about 1.0% of GDP and manufacturing around 4%. While the economic outlook is generally positive, the economic base, reliant on tourism and fishing, is narrow and diversification is a challenge. The country has a shortage of labor and relies on workers from Bangladesh, Sri Lanka and elsewhere for manual labor, work on construction and service in the resorts. Access to education in the national as a whole is good, with enrolment in primary education close to 100% and literacy rates at about 98%. The health sector has shown significant improvement over recent decades with key indicators such as infant and maternal mortality rates declining rapidly and eradication of a number of infectious diseases.

## **D. Anticipated Environmental Impacts and Mitigation Measures**

### **4. Method of Assessment**

23. The potential impacts and mitigation measures have been identified through review of the Feasibility Study prepared for the project, discussion with the designers and stakeholder consultation. Design is to be finalized and this will require corresponding updating of the IEE.

## **5. Environmental Impacts Related to Location**

24. Key considerations in assessing impacts related to location on Thilafushi are (i) the fact that the island was formed by reclamation, specifically to create land for waste management and industry, (ii) the sensitivity of the surrounding marine ecosystem and (iii) the critical role of the island in containing waste, enabling solid waste to be safely managed, provided it can be reliably transported to Thilafushi.
25. The effect on marine water quality will be long term, positive and significant, due to the reduced losses of waste through improved handling and processing. However, the waste vessel harbor and ELV workshop will handle harmful waste which could escape into nearby waters if these facilities are not properly operated and maintained.
26. Vegetation on the island will benefit from the provision of planting of trees in the concept design. No clearance of trees will take place. The effect is significant, positive and long term.
27. Birds attracted to the island as well as waterbirds that frequent surrounding waters will benefit from both the improved handling and treatment to remove hazardous fractions onto the landfill or into surrounding waters. The effect will be positive, significant and long term.
28. No private property will be affected and land acquisition will be required and there is therefore no impact.

## **6. Environmental Impacts Related to Construction**

29. The methods to be used for site preparation, fabrication, construction and commissioning, as well as associated arrangements to ensure sound environmental management and safety at all times, are to be defined by the Contractor in a Contractor's Environmental Management Plan submitted to the PMDSC for approval. These will cover the following areas of impact which are potentially significant but can be mitigated by the adoption of good practice: (i) waste generation (ii) release of silt from excavations, (iii) water pollution, (iv) air and dust pollution, (v) community health and safety risks, and (viii) occupational health and safety. Impedance of traffic and noise/vibration effects are not likely to be significant as few people live in the vicinity.

## **7. Environmental Impacts Related to Operation**

30. The proposed improvements are designed specifically to address the current poor condition of the waste vessel harbor at Thilafushi, the lack of separation and treatment of C&D waste, and improved collection of hazardous waste and separation of recyclable fractions of waste from end of life vehicles. The proposed improvements are necessary for achieving the planned further improvements to the entire SWM. Impacts will include (i) reduced loss of waste during handling, due to more efficient waste vessel harbor infrastructure; (ii) improved collection of liquid waste, avoiding discharge of untreated leachate and wastewater into the sea ; (iii) removal of C&D waste for re-use and sale as feasible; (iv) improved containment of hazardous waste; (v) separation of waste fractions from end of life vehicles including hazardous and recyclable fractions, and appropriate treatment of these; and (vi) improved site hygiene, reducing the extent to which pests such as birds and rodents are attracted to the site.

## **8. Global, Transboundary and Cumulative Impacts**

31. The proposed improvements will occur within the Zone 3 area. However, the improvements in collection, treatment and disposal of waste, which will be facilitated by the improvements to the RWMF, will reduce the discharge of waste from these islands into the surrounding ocean waters. Capacity building for the EPA will assist in the build-up of capabilities required to further improve and manage waste management facilities throughout the Maldives.

### **E. Analysis of Alternatives**

32. The proposed improvements examined in this IEE all relate to expanding the capacity and developing greater efficiency of the RWMF on Thilafushi. The improvement of the waste vessel harbor necessary to reduce losses of waste during handling, while the administration building also includes facilities that are required but not yet present including the store for hazardous waste, space for handling sale of marketable fractions and sanitary facilities for workers. Similarly, the C&D waste and the ELV plant are not yet present but are required to ensure separation of hazardous and marketable fractions from incoming waste.

33. The “no project” scenario is the exclusion of the improved waste vessel harbor, administration building, C&D waste plant and ELV plant. As these are pre-requisites for RWMF development, the RWMF would also not be developed. In this scenario, the existing practices of inefficient waste handling, which entails significant loss of waste to the sea, burning of waste on Thilafushi (and on other islands) and, most significantly, no means of expansion to handle growing volumes of waste. This scenario would have serious and growing consequences on the populated islands of Greater Malé and elsewhere in the country and the wider marine environment.

### **F. Information Disclosure, Consultation and Participation**

34. During feasibility study preparation, the design team worked with key stakeholders such as MEE and WAMCO, and stakeholders are identified in a stakeholder analysis, including consultations with NGOs and residents of Thilafushi in relation to dredging and land reclamation on Thilafushi. This draft IEE and a Dhivehi translation of the executive summary will be provided to commune officials for public disclosure. Stakeholders will be kept informed of the construction program, including activities and made aware of the grievance redress mechanism. Consultations will take place regularly to gain feedback and ensure that impacts are being adequately managed.

### **G. Grievance Redress Mechanism**

35. A grievance redress mechanism (GRM) will be established at two levels, one at the project site level and another at the level of the Project Management Unit (PMU), to receive, evaluate and facilitate the resolution of concerns, complaints and grievances of all affected persons. The GRM will aim to provide a time bound, transparent and thereby trusted way to voice and resolve concerns linked to the project, including environmental concerns, and to be an effective way to address affected the concerns of affected persons without allowing it to escalate and cause delays in project implementation. The GRM will operate on two levels, the first level handled on the island where the work is to take place, via a committee and the second level by the project steering committee.

### **H. Environmental Management Plan**

36. The Executing Agency is the Ministry of Finance and Treasury and the implementing agency is the Ministry of Environment and Energy (MEE) who will establish a project management unit (PMU) comprising officials from MEE and WAMCO and consultant support. The PMU will have responsibility for overseeing project management, with support from project management, design and supervision consultants (PMDSC). These functions will include overseeing EMP implementation.

37. The IEE incorporates an EMP which sets out the needs for environmental management of transfer station improvements within the project in terms of institutional responsibilities to ensure mitigation and monitoring takes place during the pre-construction, construction and operation phases, meeting the requirements of the Government of the Maldives and the ADB Safeguard Policy Statement (SPS), 2009. A copy of the EMP will be kept on work sites at all times for reference and will be included in the bid documents for procurement of the works to ensure obligation for compliance. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

38. For civil works, the contractor will be required to (i) establish an operational system for managing environmental impacts (ii) carry out all of the monitoring and mitigation measures set forth in the EMP; and (iii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and EMP. The contractor shall allocate a budget for compliance with these EMP measures, requirements and actions.

39. The EPA has few trained technical staff and relies on external consultants for functions such as environmental monitoring for projects. The EPA will therefore be provided with support from the PMDSC for overseeing EMP implementation.

40. An environmental monitoring system has been designed, based on an analysis of the key environmental performance issues associated with each stage of the project. Two areas of environmental monitoring are identified: compliance monitoring and community feedback, which are in addition to monitoring measures in the Design and Monitoring Framework for the project. These provide a means of gauging whether the stations operate more efficiently and with less loss of waste into the sea.

41. EMP compliance monitoring will be undertaken by the PMU, with support of the PMDSC. Effects will be monitored by means of community feedback and laboratory testing. Consistent with reporting requirements set out in the Project Administration Manual (PAM). The PMU will prepare reports to be sent to ADB on a semi-annual basis. To facilitate monitoring and enable responses to emerging issues, monthly reports will be prepared by the PMU.

## **I. Conclusion**

42. The overall finding of the IEE is that the Project will result in significant environmental benefits, as it is conceived and designed to address major environmental issues associated with existing difficulties in waste handling and transfer and the rapidly growing volumes of waste that are projected in coming decades. It will not have significant adverse environmental impacts and potential adverse impacts are manageable through the effective implementation of the EMP. No further environmental assessment is therefore required, beyond the issues to be reviewed during detailed design. The works will be carried out as a design-build contract and the IEE and EMP will be updated to reflect detailed design. The classification of Category B is confirmed.



## I. INTRODUCTION

1. The Greater Malé Environmental Improvement and Waste Management Project will establish a sustainable regional solid waste management (SWM) system in Greater Malé by (i) improving collection, transfer, disposal, treatment, recycling, and dumpsite rehabilitation; (ii) strengthening institutional capacities for solid waste services delivery and environmental monitoring; and (iii) improving public awareness and behaviors in reduce-reuse-recycle (3R).<sup>1</sup> The Project will be designed to reduce disaster risk and improve climate change resilience while creating a cleaner environment and reducing greenhouse gas emissions.

2. The Project will establish a sustainable SWM system in the Greater Malé capital region and its inhabited outer islands by (i) establishing a modern waste collection, transfer, and disposal system, (ii) improving community-based outer island waste management systems, (iii) building institutional capacity for sustainable services delivery, and (iv) raising public awareness in 3R behaviors.<sup>2</sup> Physical and non-physical investments are designed to curb climate change and disaster impacts while creating a cleaner environment in Maldives, one of the world's lowest-lying nations.<sup>3</sup>

3. The Greater Malé capital region (classified as Zone 3 in the National Solid Waste Management Policy and the most populated in the country),<sup>4</sup> suffers from severe environmental pollution and deteriorating livability due to inadequate collection and haphazard disposal of solid waste. Open dumping and burning of garbage at the 30-year-old 10-hectare dumpsite on Thilafushi Island (6 km from Malé) creates a significant environmental and public health hazard. Plumes of smoke visible from the capital city Malé, the international airport, and surrounding resorts compromise air quality and pose a daily nuisance to residents and tourists, while toxic leachate contaminates soil and groundwater. Greater Malé and its 32 inhabited outer islands lack an organized and sustainable waste management system for the 774 tons of mixed solid waste generated per day (tpd).<sup>5</sup> With rapid urbanization and tourism development in the region, waste generation is expected to grow to 924 tpd by 2022. This increasing pressure on an already stressed waste management system poses a significant threat to tourism and fisheries, both of which rely heavily on the country's pristine environment and are cornerstones to the Maldives economy.<sup>6</sup> Poor communities in outer islands suffer from accumulated garbage with limited awareness and capacity to effectively manage solid waste.

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<sup>1</sup> ADB. 2016. *Country Operations Business Plan: Maldives, 2017–2019*. Manila. The project is confirmed via letter dated 17 July 2016.

<sup>2</sup> The project area encompasses the inhabited islands of the Malé Atoll, North Ari Atoll, South Ari Atoll, and Vaavu Atoll with a total population of 216,000 inhabitants (51% of Maldives). It comprises the capital city of Malé, and 35 inhabited islands. There are 76 resorts in the project area. The Greater Malé capital region within the project area consists of seven islands (Thilafushi, Gulhifalhu, Villimalé, Malé, Funadhoo, Hulhulé and Hulhumalé) and is the most populated.

<sup>3</sup> ADB. 2017. *Technical Assistance to Maldives for Preparing the Greater Malé Environmental Improvement and Waste Management Project*. Manila.

<sup>4</sup> The National Solid Waste Management Policy (2015) divided the country into 7 regional waste management zones (map) each with a regional waste management facility and system for safe transfer to those facilities.

<sup>5</sup> Breakdown of solid waste by type: household = 149 tpd (19%), commercial = 27 tpd (3%), resort = 48 tpd (6%), C&D waste = 530 tpd (68%), market = 2.5 tpd (0.3%), airport = 9.3 tpd (0.3%), hazardous = 1.5 (0.2%), end of life vehicles = 0.65 tpd (0.1%), industrial = 6 tpd (0.8%). Waste composition: organic (53%), paper and cardboard (12%), plastic (11%), hazardous (medical) waste (8%), metal (3%), glass (3%), and others (11%). *Source: Project Feasibility Study final report (2017)*.

<sup>6</sup> Tourism and fisheries account for a quarter of total employment in the country (2014 Census). Tourism being the most rapidly expanding industry and being the highest contributing sector to the Maldivian gross domestic product.

4. **Existing waste collection, transfer, and disposal system.** High population density and narrow streets present unique challenges for waste collection in Malé. Waste collection is operated by the Waste Management Corporation Limited (WAMCO), a state-owned operator created in 2015 to collect and transport waste and manage the regional waste management facilities throughout the country.<sup>7</sup> WAMCO has limited professional experience in modern and efficient waste collection systems. The lack of technical and managerial skills is a key issue affecting sector performance.<sup>8</sup> While WAMCO is trying various initiatives to improve collection, the company received nearly 150 complaints per day (as of September 2017) on its hotline mostly related to non-collection. Collection equipment includes a fleet of aging vehicles unable to access narrow streets. There are no uniform refuse bins or formal transfer stations. Waste is transported to Thilafushi Island in open non-containerized vessels resulting in significant spillage into the ocean.<sup>9</sup> Since 2008, fires have been deliberately set at the dumpsite to reduce growing mounds. On-site equipment and poor site logistics are severely inadequate to efficiently manage incoming waste and maximize use of limited space. There is no separate collection and processing of construction and demolition (C&D) waste and end-of-life vehicles (ELV).<sup>10</sup> Household surveys in the project area show a high demand for 3R awareness and education programs.<sup>11</sup>

5. **Impact and Outcome.** The Project is aligned with the following impact: a healthy living environment created in the Greater Malé capital region and its outer islands. The Project will have the following outcome: climate and disaster resilient SWM services improved.<sup>12</sup>

6. **Outputs.** The Project will have three outputs.

7. **Output 1: Waste collection, transfer, and disposal systems improved and made climate and disaster resilient.** This will include (i) an efficient waste collection strategy designed and applied in Malé and Hulhumalé in consultation with local communities targeting women; (ii) waste collection and transport equipment (trucks, bins, containers) for Malé, Hulhumalé and Villimalé provided; (iii) transfer stations in Malé and Villimalé constructed and transfer station in Hulhumalé designed; (iv) C&D waste processing plant and end of life vehicle (ELV) dismantling workshop constructed; (v) waste vessel harbor at Thilafushi rehabilitated; (vi) 3 vessels for waste transport from outer islands to Thilafushi provided; (vii) heavy equipment (bulldozers, excavators, roll trucks) for controlled dumpsite management at Thilafushi provided; and (viii) construction of 2 administrative buildings for WAMCO at Malé transfer station and Thilafushi waste vessel harbor. All facilities designed will consider climate change and disaster resilient features.

8. **Output 2: Community-based outer island waste management systems targeting poor and women enhanced.**<sup>13</sup> This output will provide comprehensive support to strengthen sustainable solid waste management in poor outer island communities. It includes (i) a minimum of 22 island waste management centers (IWMCs) with processing equipment (balers, glass crushers, metal presses) developed or upgraded in consultation with community targeting women

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<sup>7</sup> WAMCO does not operate collection within the outer islands. This is the responsibility of island councils.

<sup>8</sup> Current collection coverage is estimated to be 89% in Malé, 89% in Villimalé, and 84% Hulhumalé though highly inefficient resulting in waste piles.

<sup>9</sup> Government of Maldives, Ministry of Environment and Energy. 2016. *State of the Environment*. Malé.

<sup>10</sup> The project will extend the life of the existing dumpsite in the medium term (8-11 years).

<sup>11</sup> Around half of TRTA household survey respondents highlighted increasing awareness and education is important. ADB. 2017. *TA-9327. Socioeconomic survey for Preparing the Greater Malé Environmental Improvement and Waste Management Project*. Manila

<sup>12</sup> The design and monitoring framework is in Appendix 1.

<sup>13</sup> There are 32 outer islands in the project area eligible for support under Output 2.



and incorporating climate and disaster risk measures;<sup>14</sup> (ii) collection equipment for outer islands (bins, refuse collection vehicles, dump trucks) provided; (iii) capacity building of eligible island councils targeting women in waste collection, segregation, composting, recycling, and O&M; and (iv) community awareness and behavior change campaigns in 3R targeting women in outer islands delivered. As subprojects under Output 2 will be prepared after Board approval, each island is required to meet minimum eligibility and selection criteria, including safeguards, to receive support from the Project.<sup>15</sup> The criteria are intended to ensure sustainability and are outlined in the Project Administration Manual (PAM).<sup>16</sup> Output 2 will be partially funded by a Trust Fund grant focusing on poverty reduction, which will support islands in the following areas:<sup>17</sup> (i) IWMCs constructed in a minimum of 11 eligible islands, (ii) skills and capacity building in eligible islands targeting women provided, and (iii) awareness campaigns in 3R delivered in all outer islands.<sup>18</sup>

**9. Output 3: Institutional capacity and public awareness in sustainable waste management strengthened.** This will include (i) capacity building support to eligible WAMCO staff (including all eligible women staff) in waste collection, controlled dumpsite management, strategic and financial planning (tariffs, diversified revenue stream), and disaster risk management provided;<sup>19</sup> (ii) a recycling market study conducted;<sup>20</sup> (iii) public awareness and behavior change campaigns in 3R targeting the poor and women in Greater Malé delivered;<sup>21</sup> and (iv) project management, design, and supervision consultant support provided.

10. This initial environmental examination (IEE) relates to the improvements to the waste vessel harbor and waste processing facilities on Thilafushi Island including (i) waste vessel harbor improvements and construction of a C&D waste processing plant, (ii) an ELV dismantling workshop, and (iii) an administration building. This IEE has been prepared in accordance with ADB's Safeguard Policy Statement (SPS), 2009 and the appropriate legislations of the Republic of the Maldives, such as the Environmental Protection and Preservation Act (EPPA) of 1993 and the EIA Regulations (pursuant to the act) of 2007 (as amended in 2012). The examination is based on preliminary design undertaken by Water Solutions Ltd (Maldives) in association with Kocks Ingenieure (Germany), consultants to the Ministry of Environment and Energy (MEE).

11. This IEE has been prepared based on preliminary designs of the subproject and will be finalized based on the final detailed design. This IEE shall be attached in the bid and contract documents. The civil works package of the subproject will be awarded under a design-build (DB) contract. As such, the DB Contractor shall update this IEE based on the final detailed design and submit the final IEE to the executing agency through the project management unit (PMU). Subsequently, the PMU shall submit the final IEE to ADB for final review and disclosure.

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<sup>14</sup> Out of 32 outer islands, some have existing facilities but are not operational due to inadequate design and insufficient equipment which would be upgraded under the project.

<sup>15</sup> All 32 outer islands will be screened through the selection criteria outlined in the PAM and EARF. Appraisal and safeguard reports will be approved by ADB prior to start of any project-related physical activities. Subprojects having resettlement impacts will not be included. IWMCs consist of concrete platforms, small covered sheds, segregated waste processing and storage areas, small office, fencing.

<sup>16</sup> Project Administration Manual (accessible from the list of linked documents in Appendix 2.)

<sup>17</sup> Additional selection criteria for Trust Fund supported islands includes climate change vulnerability, and women participation in island councils, and is outlined in the Project Administration Manual (accessible from the list of linked documents in Appendix 2.)

<sup>18</sup> Upon confirmation from the government and the approval of Trust Fund.

<sup>19</sup> Disaster risk management capacity building will include preparation of a SWM disaster action plan outlining prevention, preparedness, response and recovery tasks. DRM risk awareness activities will include first responders (police, fire fighters) on Thilafushi.

<sup>20</sup> The recycling market study will cover plastics, construction and demolition waste, and other primary recyclables.

<sup>21</sup> Public awareness and behavior change activities under Outputs 2 and 3 will be implemented through a Public Awareness and Community Capacity Building consultant recruited by the PMU.

## II. DESCRIPTION OF THE PROJECT

12. The proposed infrastructure improvements are to form part of an improved integrated system of waste management in Zone 3, one of seven zones into which the country is divided for waste management purposes and consisting of the atolls of Alifu Alifu, Alifu Dhaalu, Kaafu, and Vaavu). This description is based on a concept design, prepared by Water Solutions in association with Kocks Ingenieure, which uses a 30-year planning horizon, from 2017 to 2047.

13. The planned works comprise the following:

- (i) general site improvements to drainage and site security;
- (ii) rehabilitation of the waste vessel harbor and waste handling area to improve the docking facilities and the condition of the adjoining area;
- (iii) construction of administration building;
- (iv) construction of weigh bridges;
- (v) construction of C&D waste processing plant; and
- (vi) construction of ELV dismantling workshop.

14. The improvements are to take place on the southern part of Thilafushi island, allocated to the regional waste management facility (RWMF).

15. As part of the feasibility study for the RWMF<sup>22</sup>, a preliminary layout design has been prepared. Figure 1 below indicates the location of the proposed facilities and improvements, which are to the east of the area allocated to the RWMF. The locations of the C&D waste plant, ELV workshop, and administration building to the eastern end of the RWMF are shown in Figure 2. The existing quay, to be improved, is at the top (north) edge of the area.

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<sup>22</sup> Consultancy Services for Feasibility Study for an Integrated Solid Waste Management System for Zone III (including Greater Malé) and Preparation of Engineering Design of the Regional Waste Management Facility at Thilafushi. Feasibility Report. Ministry of Environment and Energy, Republic of Maldives. December 2017.

Figure 1: Area on Thilafushi Island allocated to the Regional Waste Management Facility



Figure 2: Aerial view showing approximate proposed locations of the facilities



**Figure 3: Proposed layout of the eastern end of the RWMF showing locations of the proposed facilities**



### A. General Site Improvements

16. The waste vessel harbor and waste handling area will be fenced and storm water drainage will be improved. The fence, to be constructed in PVC coated mesh or metal panels supported by GI pipes (or similar) are required to demarcate the newly rehabilitated area from the surrounding area, and to serve as a barrier to windblown litter. The concept design recommends a green belt, to improve working conditions in the waste handling area.

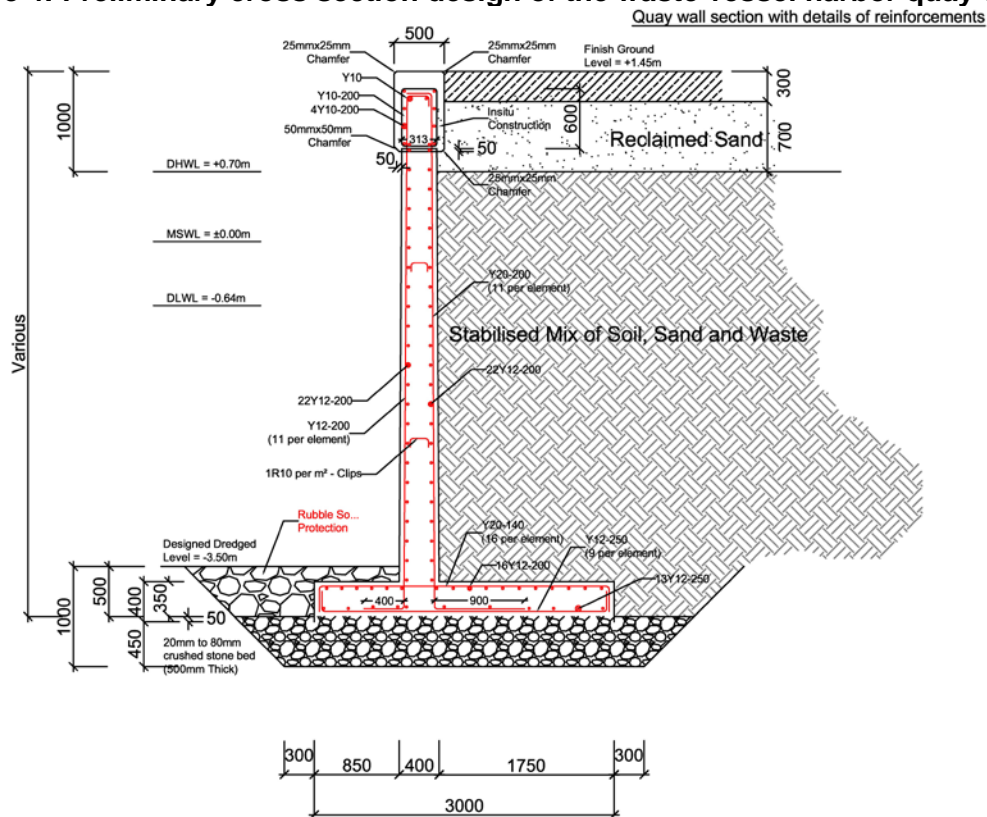
17. Site drainage is to be achieved by incorporating an overall gradient (minimum 1%) sloping toward the sea and surface water ditches are to be included in the detailed design. It is envisaged that a 30m wide buffer zone will be allocated around the processing and recycling sites, to be incorporated in the land use plans to be drawn up during detailed design.

## B. Waste vessel harbor Improvements

18. The existing docking facilities are in poor condition. The discharge of waste from the vessels is haphazard and large mounds of waste are left surrounding the docking area, creating a safety hazard as well as attracting pests and insect vectors of disease. The area is to be substantially improved to enabling handling of the 25 cubic meters ( $m^3$ ) containers to be used on the transfer vessels. Approximately 53 containers will need to be offloaded and emptied each day to handle waste from Greater Malé, rising to 77 by 2030 and 112 by 2047 and the waste vessel harbor has to handle this volume as well as waste from elsewhere in Zone 3.

19. Rehabilitation of the waste vessel harbor and waste handling area will including widening, extending and paving to increase vessel handling capacity, docking for the full fleet of barges, boats, landing craft and Dhonis; a surface that can be regularly swept, sluiced and drained to create a clean working area, sound foundations for buildings, cranes and other sessile plant, road and parking layout to ensure good circulation of trucks and mobile equipment and adequate storage area of different types of separated waste. The layout shown in Figure 2 is preliminary and is to be finalized by detailed design. A preliminary design cross section of the quay wall is given in Figure 4.

**Figure 4: Preliminary cross section design of the waste vessel harbor quay wall**



## C. Administration Building

20. The design of the administration has been undertaken by Water Solutions/Kocks Ingenieure and takes into account the scarcity of land on Thilafushi. It is a single storey mainly steel building with a floor area of approximately 320 square meters ( $m^2$ ) and consists of:

- (i) office rooms for the control of acceptance and overall administration;

- (ii) essential facilities: changing rooms, a kitchen, showering and toilet facilities;
- (iii) a small area for the storage of hazardous waste (security and safety features remain to be added); and
- (iv) a sales area to handle sales of fractions of waste for which there is a market.

#### **D. Weigh Bridge**

21. Two weighbridges will be provided, one for incoming waste from sources on the island, and one for incoming and processed waste from the waste vessel harbor and the C&D waste processing area. These will be situated adjacent to the administration building.

#### **E. Construction and Demolition Waste Plant**

22. C&D waste is currently placed on the along with general waste. With rapid development taking place in Greater Malé, (particularly on Hulhumalé), the generation of C&D waste is likely to rise from a present level of 530 tons/day to 634 tons/day in 2020 and 731 tons/day in 2040. C&D waste is composed mainly of inert material such as aggregates and dust, making up 91.8% of the total by weight, while most of the rest is wood, making up 7.1%, paper and plastic film material make up a further 1% and the final 0.2% is metal waste. The design of the C&D waste plant envisages a through put of 600 t/day and consists of the following components:

- (i) a sorting plate to receive waste from the containers. The material is roughly presorted by using a wheel loader. Coarse concrete and stone chunks are removed and pre-crushed either using an excavator or by hand using chisels;
- (ii) A feeding hopper (minimum volume 15 m<sup>3</sup>);
- (iii) a pre-screening plant fed by a vibrating chute, fitted with flaps that can be manually adjusted to handle grain sizes of 0-10 and 10-60 millimeters (mm);
- (iv) a sorting station;
- (v) a pre-crusher for coarse concrete fragments, capable of handling material with a grain size of up to 300mm to reduce to between 150 mm approximately;
- (vi) a toggle jaw crusher;
- (vii) a separator fitted with magnets to remove magnetic metal waste;
- (viii) a sorting station using a vibrating screen, where wood, plastics and metals are sorted by hand and rejected materials are collected in containers;
- (ix) a power supply; and
- (x) belt conveyors and discharge shafts.

23. Wood and plastics removed by the process will be transported to the WTE plant for incineration.

24. Coarse material separated out at the sorting place with material from the pre-crushing process, together with material from the coarse fraction of the screening process are fed to the crusher, following which magnetic separation takes place, extracting scrap metal which will be sold, along with non-magnetic metals.

25. Following the magnetic separation, the material will be divided up in the following fractions:

- (i) 37.5 – 63 mm,
- (ii) 20 – 37.5 mm,
- (iii) 3.35 – 20mm, and
- (iv) < 3.35 mm.

26. The individual fractions will be stockpiled and then transported in containers to the site of re-use.

27. The plant will be housed in an open shed for protection against heavy rainfall and allowing air circulation to dissipate dust. The design is flexible, allowing for further screens and chutes to produce material of a different size range, should there be demand for it.

#### **F. End-of-Life Vehicle dismantling workshop**

28. While land is allocated in the layout design to an ELV workshop, the preliminary design and detailed designs remain to be done. The components envisaged are:

- (i) a small workshop building fitted with ramps, drains for the collection of waste oil, and equipment for dismantling of the mechanical components; and
- (ii) a crusher, or press, for the vehicle body once the chassis and other main components have been removed.

### **III. POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK**

#### **A. Applicable National Laws, Rules and Regulations**

29. The law governing the protection of the environment is the EPPA of 1993 (Act No 4/93). The law is brief and sets out the principles for sustaining and extending the benefits of the environment of the Maldives for the people and coming generations. The EPPA confers powers on the MEE to issue regulations and formulate policies for environmental protection and preservation. Such regulations include:

- (i) EIA regulations of 2007, updated in 2012 (Regulation No. 2012/R-27);
- (ii) By-law on Uprooting, Cutting and Transportation of Plants and Trees (2006);
- (iii) Regulation on Stone, Coral and Sand Mining (undated);
- (iv) Regulation for the Protection and Conservation of the Natural Life and character of Old Plants and Trees in the Maldives;
- (v) Dewatering Regulation (213/R-R1697);
- (vi) Environmental Damage Liabilities Regulation (2011/R-9); and
- (vii) Waste Management Regulation (2013-R58).

#### **1. National Solid Waste Management Policy of 2008 and 2015**

30. The National Solid Waste Management Policy was developed in 2008, by the Ministry of Environment, through consultations with the community and evaluation of existing waste management practices and scope for improved efficiency. The policy was then revised and adapted, and a new policy formulated and adopted in 2015.

31. The policy is in line with government commitment to provide the resources required for waste management in all inhabited islands of the Maldives and is founded on the following 10 principles:

- (i) Each person should be responsible for waste generated at the individual level and should comply with rules and regulations established locally;
- (ii) All household waste should be managed in accordance with the requirements of the local council;
- (iii) Each inhabited island should prepare and submit an island waste management plan for the island;
- (iv) Waste collection should be undertaken on a fee based system for all waste producers, including households and industries;

- (v) Agreements with government agencies in different inhabited islands to ensure management of waste in the islands;
- (vi) Establishment of a waste management system in each inhabited island that is appropriate for the needs of the population and quantity and type of waste generated;
- (vii) Establishment of regional waste management facilities (RWMF) in each waste management zone;
- (viii) Establishment of arrangements to transport all residual waste to a RWMF
- (ix) Promote adoption of waste management practices that generate revenue and to apply revenue to waste management at the island level; and
- (x) Undertake waste management training and awareness campaigns at the national level.

## 2. Waste Management Regulation

32. The Waste Management Regulation of the Maldives was enacted under Article 3 of the EPPA in 2013 and is implemented by the Environmental Protection Agency. The regulation focuses on the following five areas:

- (i) Waste management standards: Defines standards for waste collection, transfer, treatment, storage, waste site management, landfills and managing hazardous waste;
- (ii) Waste management Permits: Defines approval procedures for waste management sites;
- (iii) Waster transfer: Defines standards and permits required for waste transport on land and sea, including trans-boundary movements;
- (iv) Reporting: Defines reporting and monitoring requirements and procedures; and
- (v) Enforcement: Defines procedures to implement the regulations and penalties for non-compliance.

## 3. Other relevant legislation

33. **Cultural Heritage.** Items of cultural heritage significance are protected under the Law of Historical and Cultural Properties of the Republic of Maldives of 1979 (Law number 27/29) and its implementation is currently under the Ministry of Education. UNESCO state that there is a lack of rules and regulations, constraining the implementation of the law and that there is also no national inventory of heritage properties (no site has yet been inscribed under the World Heritage List). A new law is under preparation and awaiting completion as of June 2017.

34. **Health and Safety.** Legislation covering occupational health and safety is currently included in the Employment Act (2008), Chapter 8 "Work Place Safety and Employer Health". This requires employers to implement measures for the safety and protection of employees at the work place, including safe work place, procedures, safe equipment and materials, provision of protective equipment, safety training to employees, conducting health checks where work involves chemical or biological materials that may cause a hazard, providing medical care as well as first aid for employees injured while at work. The law also sets out employee's obligations with regard to safety at work.

35. **Land use and acquisition.** The Land Act (2002) covers matters relating to land including land use, land ownership, and permissible uses of land belonging to island councils, which includes environmental protection. The land act and processes relating to the project are described in the Resettlement Framework (RF).



## **B. Environmental Assessment Requirements**

36. Responsibilities and procedures for conducting environmental assessments, together with the requirements for environmental monitoring of projects, are set out in the EIA Regulations of 2012. All projects that may have an impact on the environment are referred to the Minister of Environment and Energy (EPPA 5(a)).

37. The EIA Regulations assign primary responsibility for undertaking environmental assessment of projects to the project proponent and set out procedures, rights and responsibilities for the preparation and approval of environmental impact assessments (EIAs). The MEE undertakes review and approval of environmental assessment reports.

38. Project proponents are defined in the EIA regulations as a person, department or agency that is seeking to carry out or proposes to carry out the development proposal and in this case is the MEE, as implementing agency for the project. EIA work must be carried out by registered consultants, and the procedures and requirements for registration are set out in Part V of the regulations.

39. The EIA regulations include a schedule (Schedule D) of investment project types that require an EIA. These include landfills, waste incinerators and large-scale waste storage projects. However, some of these project types may be classified as environment Category A as per ADB SPS, 2009, and therefore, will not be considered under this subproject.

40. For schedule D projects and those identified by the IEE as requiring an EIA, a scoping meeting is convened by the MEE to determine the specific Terms of Reference for the EIA. On completion of investigations and reporting, the EIA report is subject to review by MEE, which invites comments from other relevant ministries and the public following which an environmental decision is made. Schedule D includes large scale waste storage and separation facilities. The C&D waste and ELV plants are large scale waste management facilities and as such may qualify as schedule D projects under the EIA regulations. Similarly, schedule D lists construction and dredging of waste vessel harbors. However, as the works involve rehabilitation of the existing waste vessel harbor area, confirmation should be provided by MEE that improvement works do not qualify as a schedule D project.

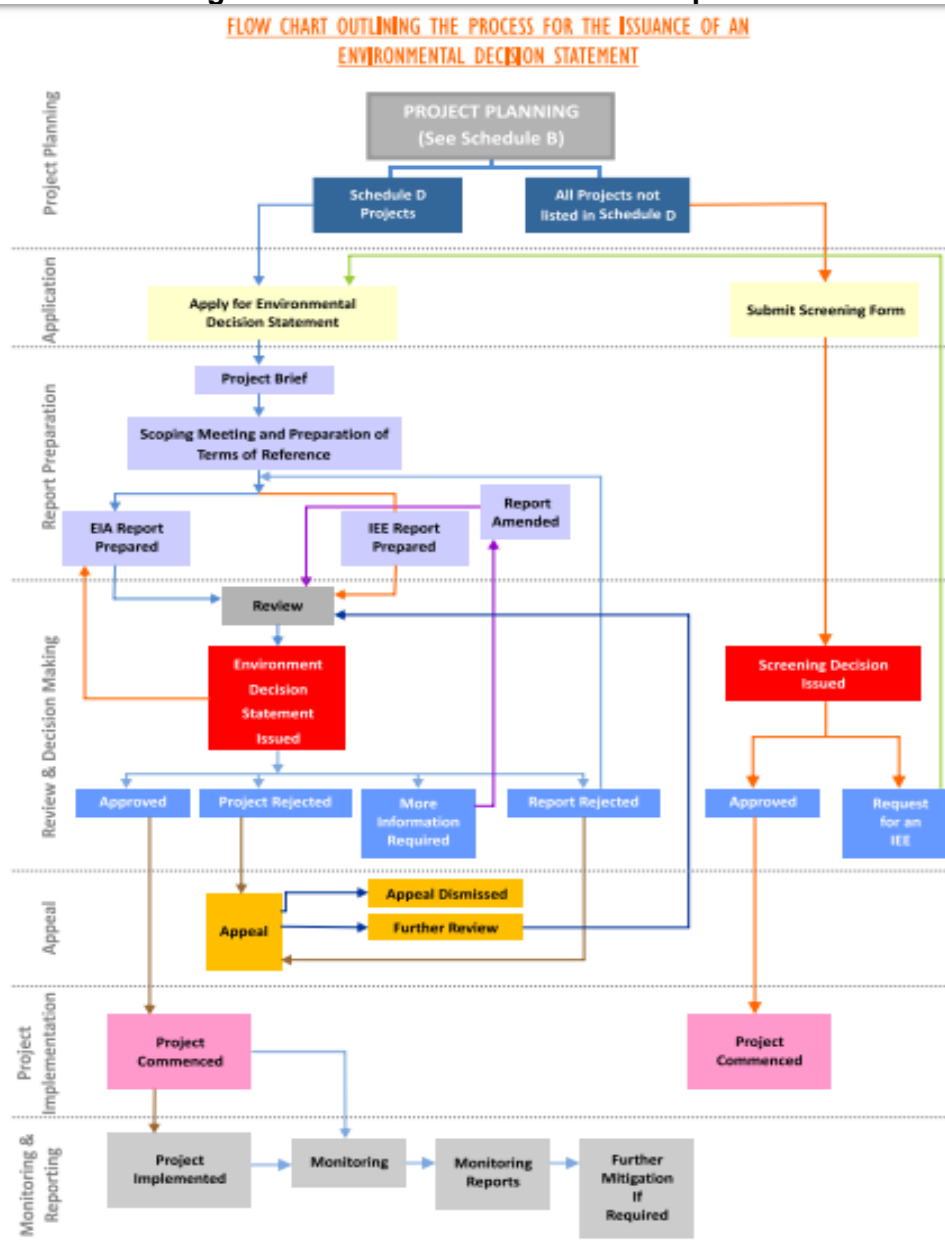
41. For project types not included schedule D, a screening form is submitted in a specified format on the basis of which the MEE decides whether an Environmental Management Plan is required or if further information is required, in which case an IEE will be carried out. The IEE is completed according to a specified format. If the IEE finds that the project may cause a significant environmental impact, a full EIA is required, prior to preparation of an environmental management plan (EMP). If an EIA is not required, an EMP is then prepared to address the impacts identified in the IEE.

42. The Environmental Management Plan, prepared following either the IEE or the EIA process, is prepared on a specified format and reviewed for compliance by MEE.

43. The MEE issues the decision in the form of a decision note issued to the proponent, which sets out specific binding requirements for the conduct of the project on the basis of review of the EIA report.

44. Summary of application stages and steps is outlined in Figure 3 below.

**Figure 5: Flow chart of Maldives EIA process<sup>23</sup>**



45. The timelines for clearance and approvals are as follows:
- (i) On completion of a screening form for non-schedule D projects – 10 working days for a screening decision from MEE
  - (ii) For review of compliance of an EMP by MEE – 7 working days
  - (iii) For review of a project brief on Schedule D projects – 5 days to confirm the date of a scoping meeting
  - (iv) For consideration of Terms of Reference drafted by the project proponent following the scoping meeting – 10 days to confirm the Terms of Reference.
  - (v) For the review of a completed EIA report for completeness – 2 working days.

<sup>23</sup> Source: EIA Regulations (2007) Schedule A

- (vi) For circulation of an EIA report to other ministries and to the public for comment – 10 working days
- (vii) For issuance of a decision or to request revisions, following circulation of the EIA report and receipt of comments – 28 working days.

### C. Applicable International Environmental Agreements

46. In addition to national laws, rules and regulations, the government of Maldives is also a signatory to various applicable international conventions, as follows:

- (i) UN Convention on the Law of the Sea – UNCLOS (1982);
- (ii) International Convention for the Prevention of Pollution of the Sea by Oil (1982);
- (iii) Vienna Convention for the Protection of the Ozone Layer (1985);
- (iv) Montreal Protocol on Substances that Deplete the Ozone Layer (1987);
- (v) Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal (1989);
- (vi) The London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1990);
- (vii) Agenda 21 and the Rio Declaration of the United Nations Conference on Environment and Development (1992);
- (viii) Convention on Biological Diversity (1992);
- (ix) United Nations Framework Convention on Climate Change (1992);
- (x) The Copenhagen Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1992);
- (xi) The Montreal Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1997);
- (xii) The Beijing Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (1999);
- (xiii) Washington Declaration on Protection of the Marine Environment from Land-Based Activities;
- (xiv) Kyoto Protocol to the United Nations Framework Convention on Climate Change (1998);
- (xv) Cartagena Protocol on Biosafety (Maldives acceded on 2 September 2002); and
- (xvi) United Nation Convention to Combat Desertification (2002).

### D. ADB Policy

47. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all ADB investments.

48. **Screening and categorization.** The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts, and are assigned to one of the following four categories:

- (i) **Category A.** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
- (ii) **Category B.** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of Category A projects. These

impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.

- (iii) **Category C.** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- (iv) **Category FI.** A proposed project is classified as category FI if it involves investment of ADB funds to or through a financial intermediary (FI).

49. **Environmental management plan.** ADB SPS, 2009 further requires the development of an environmental management plan (EMP) specifying the required mitigation and monitoring and who is responsible for implementation.

50. **Public disclosure.** ADB will post the following safeguard documents on its website so affected people, other stakeholders, and the general public can provide meaningful inputs into the project design and implementation:<sup>24</sup>

- (i) final or updated IEE upon receipt; and
- (ii) environmental monitoring reports submitted by the project management unit (PMU) during project implementation upon receipt.

51. **Pollution Prevention and Control Technologies.** During the design, construction, and operation of the Project the PMU will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of Maldives regulations differ from these levels and measures, the PMU will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

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<sup>24</sup> As per ADB SPS, 2009, prior to disclosure on ADB website, ADB reviews the "borrower's/client's social and environmental assessment and plans to ensure that safeguard measures are in place to avoid, wherever possible, and minimize, mitigate, and compensate for adverse social and environmental impacts in compliance with ADB's safeguard policy principles and Safeguard Requirements 1-4."

Table 1: Applicable WHO Ambient Air Quality Guidelines<sup>25</sup>

Table 1.1.1: WHO Ambient Air Quality Guidelines <sup>7, 8</sup>		
	Averaging Period	Guideline value in $\mu\text{g}/\text{m}^3$
Sulfur dioxide (SO <sub>2</sub> )	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minute	500 (guideline)
Nitrogen dioxide (NO <sub>2</sub> )	1-year	40 (guideline)
	1-hour	200 (guideline)
Particulate Matter PM <sub>10</sub>	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter PM <sub>2.5</sub>	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

<sup>7</sup> World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99<sup>th</sup> percentile.

<sup>8</sup> Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

Table 2: World Bank Group's Noise Level Guidelines

Table 1.7.1- Noise Level Guidelines <sup>54</sup>		
Receptor	One Hour L <sub>Aeq</sub> (dBA)	
	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational <sup>55</sup>	55	45
Industrial; commercial	70	70

<sup>54</sup> Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, World Health Organization (WHO), 1999.

<sup>25</sup> World Bank Group's General Environmental, Health, and Safety Guidelines: [www.ifc.org/ehsguidelines](http://www.ifc.org/ehsguidelines).

52. Requirements for the Project. All statutory clearances will be obtained prior to commencement of civil works. IEEs will be prepared for each package involving civil works and EMP to be attached in the bid and contract documents. IEE will be submitted to ADB for review and approval prior to issuance of bid documents. Monitoring of EMP implementation by the executing agency is reported to ADB.

#### **IV. DESCRIPTION OF THE ENVIRONMENT**

53. To establish specific baseline values for indicators of ambient air and water quality and noise levels at the proposed subproject site, measurements will be taken by the Contractor prior to construction.

##### **A. Physical Resources**

###### **1. Geology, Topography and Soils**

54. The Maldives archipelago comprises 22 atolls which are peaks of a vast submarine mountain range in the Indian Ocean, the Chagos-Maldives-Laccadive Ridge. The atolls collectively contain over 1,192 reef islands that have formed atop former peaks of former submarine mountains of the Chaagos-Maldives-Laccidive range, which is slowly subsiding. The reef islands form mainly at the periphery of each atoll, with the inner area, the eroded former mountain peak, occupied by a lagoon. Formation takes place by the deposition of shallow-water carbonates and successive coral deposits at the tidal level which gradually rise as a rock base forms from the calcium carbonate deposits of dead coral. Underlying rock is variable in consistency, reflecting the growth patterns of the coral, which forms dense colonies (coral heads) and large voids between the heads. The coral heads form hard rock, while the voids fill with coral derived fragments that form a softer rock. Thilafushi island is “artificial” having been reclaimed between 1992–1994 by placing dredged material on the lagoon, piling it to a sufficient height to overtop the water level. Thilafushi island made to form a landfill to cope with solid waste generated in the Greater Malé area and also to create land for industrial use.

###### **2. Climate**

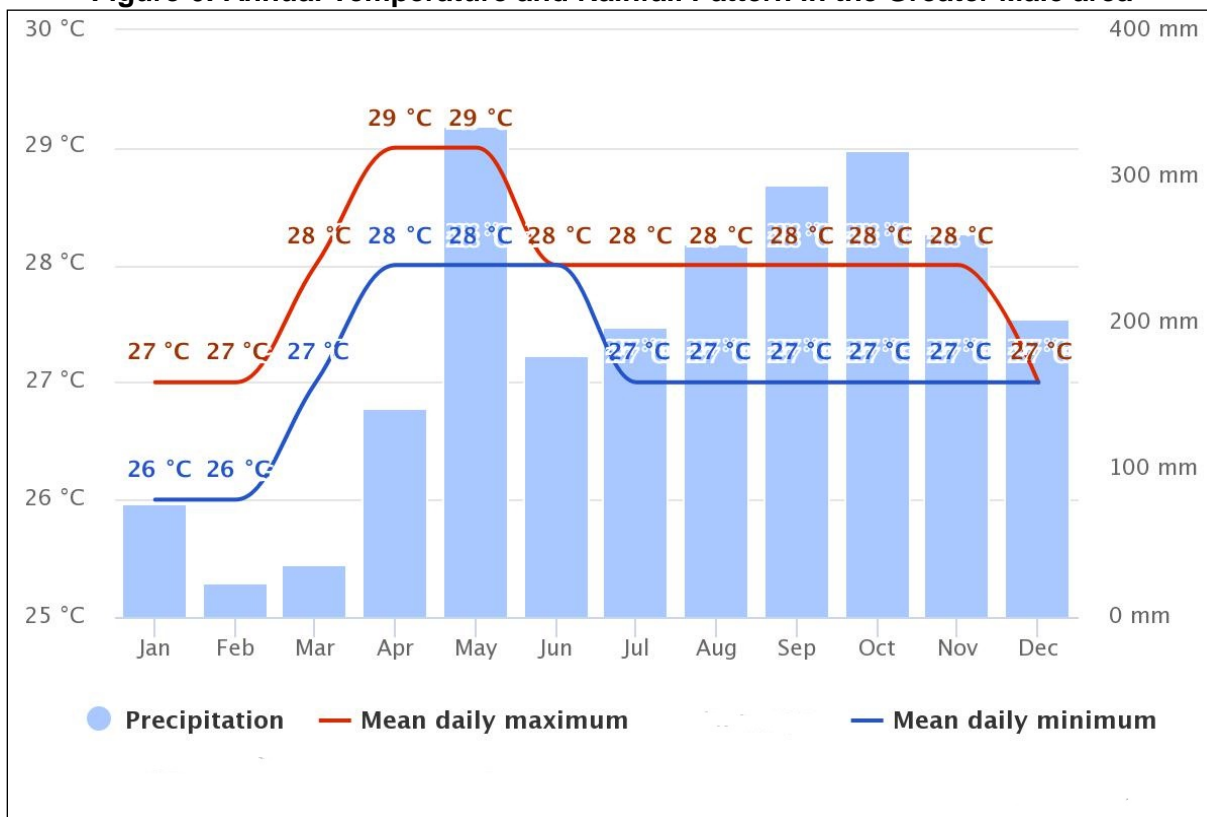
55. The Maldives have a maritime tropical climate featuring two monsoon seasons, originating over the Indian Ocean to the southwest between May and September (Halhangu), and the Bay of Bengal to the drier northeast between December and February (Iruvai). The southwest monsoon is the stronger and monthly rainfall typically exceeds 200mm towards the end of the southwest monsoon period and is lowest in February after the cessation of the northeast monsoon rains. Cyclones are a regular occurrence in the Indian Ocean, occurring mainly between April and December, although those that have affected the Maldives occur between October and January. These are more common either side of India, further north of the Maldives, though damage from “edge effects” of the larger cyclones is not uncommon. Cyclone Ockhi occurred in late November/early December 2017 and caused capsizing of vessels and damage to homes, including on Kaafu Atoll. The United Nations (2007)<sup>26</sup> estimate that there is a 10% probability of a level one storm on the Saffir-Simpson scale occurring over Kaafu Atoll in a 10-year period. Storms in the level one category are described as being “very dangerous” with wind speeds likely in the range of 119–153 kilometers per hour (kph), and pressures below 100 hectopascals (hPa), but not lower than 980 hPa.

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<sup>26</sup> United Nations Office for the Coordination of Humanitarian Affairs - Regional Office for Asia and the Pacific (OCHA ROAP) (2007) Maldives: Composite Hazard Map.

56. Temperatures are relatively constant and range between 25 degrees Celsius (°C) and 30°C, with the hottest period occurring in March/April and the coolest, December/January. Monthly rainfall fluctuates between around 20mm in February to over 300mm in May, and is over 200mm for most of the year, the annual average in the Greater Malé area is 2,200mm. Figure 4 below shows the annual temperature and rainfall pattern in the Greater Malé area.

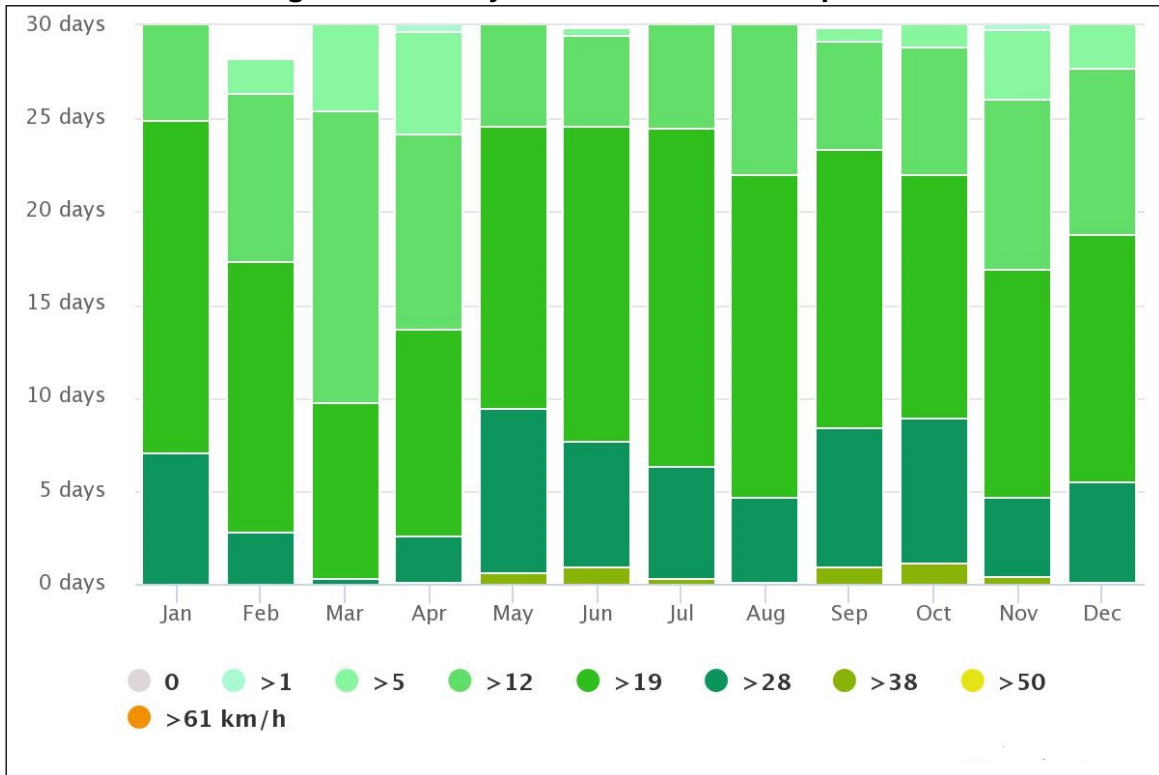
**Figure 6: Annual Temperature and Rainfall Pattern in the Greater Malé area**



Source: meteoblue.com.

57. The prevailing winds are predominantly westerly for much of the year, with easterly winds rare and southeasterly winds almost nonexistent. Winds are influenced by the monsoon patterns. Figure 5 below shows the monthly distribution of wind speeds, and Figure 6 is a rose diagram, showing the prevailing direction of winds over an annual period.

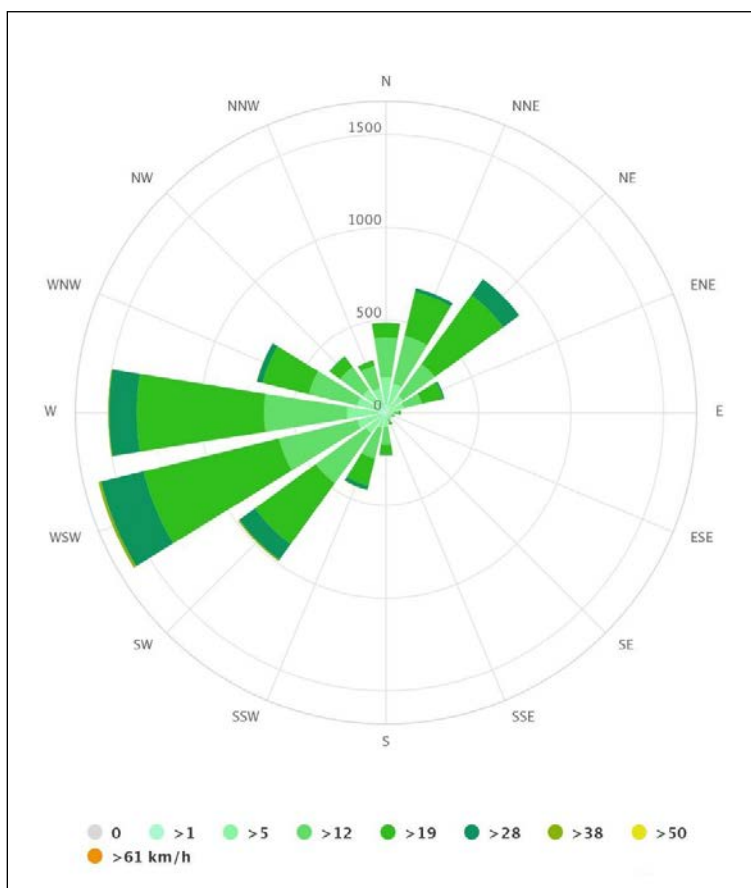
**Figure 7: Monthly Distribution of Wind Speeds**



Source: meteoblue.com.



**Figure 8: Rose Diagram of Prevailing Wind Direction over an Annual Period**



Source: meteoblue.com.

58. The tidal regime is semi-diurnal – two high and two low tides a day. The range for spring tides is approximately 1m and for neap tides, 0.3 meters (m) while the extreme range between highest high water and lowest low water is 1.32m at the tidal gauge for the Malé area, on Hulhulé Island. Table 3 below gives the average tide levels at the station at Hulhulé which is approximately 13 kilometers (km) from Thilafushi.

**Table 3: Average tide levels at Hulhulé<sup>27</sup>**

Tidal level	Water level from mean sea level (m)
Highest High Water (HHW)	0.62
Mean Highest High Water (MHHW)	0.34
Mean High Water (MHW)	0.33
Mean Low Water (MLW)	-0.36
Mean Lowest Low Water (MLLW)	-0.37
Lowest Low Water (LLW)	-0.72

<sup>27</sup> Source: University of Hawaii Sea Level Center Database, quoted in the Second National Communication of the Maldives to the United Nations Framework Convention on Climate Change. Ministry of Environment and Energy, 2016.

59. Wave heights are also influenced by variations in atmospheric pressure and strong winds. Atmospheric pressure at sea level at Malé typically varies between 1011 and 1017 hPa, and an increase in air pressure of 1 hPa typically lowers the water level by 1 centimeter (cm). Lower pressures can occur in storm events, and may drop below 1000 hPa, entailing an increase of around 10cm or more, adding to effective storm wave heights.

60. Surface currents reflect tides and wind, and generally follow the monsoon pattern, with westward currents dominant from January to March, and the reverse between April and December. Current direction and velocity at any one time depends on the interaction between the wind induced prevailing currents and tidal currents. Measurements taken around Thilafushi during June 2017<sup>28</sup> found current velocities around the island to range between 0.2 –0.4 meter per second (m/s) – though this gives only a “snapshot” indication.

### 3. Freshwater Resources

61. Thilafushi is reliant on rainwater collected from the roofs of industrial and other buildings for freshwater sources.

### 4. Marine Resources

62. Marine waters around the islands are used extensively for fishing and recreational diving.

63. The quality of water both in and around the islands is influenced by sewerage discharge, illegal dumping of solid waste and industrial activity. Marine water quality testing carried out by Water Solutions for the Reclamation of 15 hectares at Thilafushi (2017) provided the following results in Table 4. Table 5 compares the averaged results against international standards. Sample sites are indicated in Figure 6:

**Table 4: Results of Marine Water Quality Testing at Thilafushi**

Test	Unit	sw1 (M1)	Sw2 (M3)	Sw3 (M3)	Sw4 (M4)	Sw5 (M5)	Sw6 (M6)
Salinity	(‰)	34.2	33.3	33.2	27.2	33.9	33.6
Electrical Conductivity at 25°C	mS/cm	52.0	50.7	50.7	42.3	51.6	51.2
Turbidity	mg/l	ND	ND	ND	ND	ND	ND
pH at 25°C		8.15	8.08	7.86	8.12	8.16	8.17
Total Suspended Solids	mg/l	1	1	1	24	1	-
Phenolic Compound (as C6H5OH)	mg/l	ND	ND	ND	ND	ND	ND
Total Dissolved Solids	mg/l	38,735	38,120	37,085	28,830	38,297	38,112
Hexavalent Chromium (as Cr6+)	mg/l	ND	ND	ND	ND	ND	ND
COD	mg/l	70	-	67	1,460	85	-
Iron (Fe)	mg/l	ND	0.11	0.11	0.22	0.1	0.19
Boron (as B)	mg/l	2.9	2.8	2.7	2.5	2.7	2.4
Zinc (as Zn)	mg/l	ND	ND	ND	ND	ND	ND
Cadmium (as Cd)	mg/l	ND	ND	ND	ND	ND	ND
Arsenic (as As)	mg/l	0.001	0.001	0.001	0.004	0.001	-
Lead (as Pb)	mg/l	ND	ND	ND	ND	ND	ND

<sup>28</sup> Water Solutions Pvt Ltd (2017) Environment Impact Assessment: Reclamation of 15 hectares of land at Thilafushi for development of the Regional Waste Management Facility for Zone 3. Submitted to the Ministry of Environment and Energy.

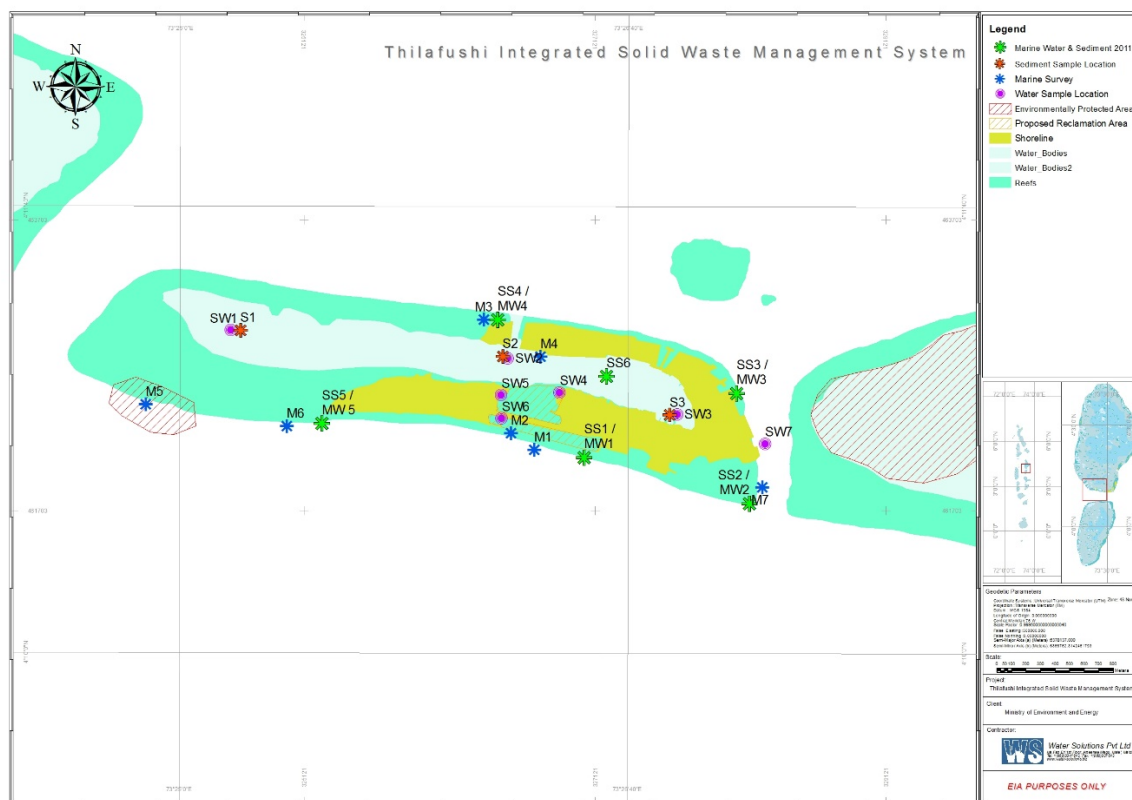
Test	Unit	sw1 (M1)	Sw2 (M3)	Sw3 (M3)	Sw4 (M4)	Sw5 (M5)	Sw6 (M6)
Mercury (as Hg)	mg/l	ND	ND	ND	ND	ND	ND
Chromium (as Cr)	mg/l	ND	ND	ND	ND	ND	ND

**Table 5: Summary of Marine Water Quality Testing Results and comparison with international standards**

Test	Unit	Average result from six sites	Comparable international standards <sup>a</sup>
Salinity	(‰)	32.6	-
Electrical Conductivity at 25°C	mS/cm	49.75	-
pH at 25°C		8.09	6.5 – 8.5
Total Dissolved Solids	mg/l	36,529.83	-
COD	mg/l	420.5	-
Iron (Fe)	mg/l	0.15	0.3
Boron (as B)	mg/l	2.67	1
Arsenic (as As)	mg/l	0.0016	0.05

<sup>a</sup> The figures used for this comparison are those of recreational water quality standards of the Australian and New Zealand Environment and Conservation Council. Recreational water standards which apply to situations where users have body contact with water. Other standards for marine water quality relate to primary production are more stringent and would not apply to this situation.

**Figure 9: Location of sampling sites for the assessment of the Reclamation of 15 hectares at Thilafushi (2017)**



Source: Water Solutions / Kocks Ingenieure, Environmental Impact Assessment Reclamation of 15 hectares of land at Thilafushi for development of the Regional Waste Management Facility for Zone 3

64. The report states that biological oxygen demand (BOD) values and values for phosphate exceed the levels given in Maldivian Water Quality standards, but that temperature and turbidity are within the limits. For heavy metals, chromium, mercury, lead, cadmium and zinc were not detected, and nor were phenolic compounds. No values for these are given however. In comparison to international standards, none of the above values exceed trigger values above which damage to the marine ecosystem is expected. Turbidity, total Suspended solids, phenolic compounds, zinc, cadmium, lead, mercury and chromium, but not detected. The level of boron found significantly exceeds international standards.

## 5. Marine Sediment

65. Pollutants from industrial activity and waste, particularly hazardous waste, can accumulate in the sediment on the lagoon or sea floor. These can include heavy metals, organometallic compounds and aromatic benzene compounds. Samples of sediment taken by Water Solutions in 2017 and tested for a set of contaminants by a recognized international laboratory in Sri Lanka found some traces of copper and lead but did not detect other contaminants. Results are presented in. A comparison of the levels of copper and lead, which reached 31.3 and 2.7 mg/kg, respectively, against international standards<sup>29</sup> were below trigger values of 65 and 50 mg/kg,

<sup>29</sup> Australian and New Zealand Environment and Conservation Council (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. P 3.5-4 Table 3.5.1 Recommended Sediment Quality Guidelines

respectively. An earlier set of tests carried out in 2011 by CDE consultants for a greater range of contaminants on six sites detected ten heavy metals in the samples, but levels were below trigger values given in international standards.

**Table 6: Results of sediment quality testing at Thilafushi**

Site	Unit	S1	S2	S3
Lead	mg/kg	0.1	2.7	0.1
Cadmium	mg/kg	not detected	not detected	not detected
Copper	mg/kg	not detected	31.3	1.0
Mercury	mg/kg	not detected	not detected	not detected
Hexavalent Chromium	mg/L	not detected	not detected	not detected
Hexavalent Chromium	mg/kg	not detected	not detected	not detected

Source: Water Solutions / Kocks Ingenieure, Environmental Impact Assessment Reclamation of 15 hectares of land at Thilafushi for development of the Regional Waste Management Facility for Zone 3

## 6. Air Quality

66. Air quality on Thilafushi is heavily compromised by the practice of constantly burning solid waste on the landfill area. The island also has industrial sources of air pollution. The smoke is rapidly dissipated by wind action and is strongly apparent on neighboring islands where they are a constant concern to tourism operators.

67. Quantitative monitoring on the neighboring islands including Malé is not done. Air quality monitoring equipment and data logging had been set up for Malé but was discontinued due to a lack of suitably qualified technical staff.

68. Ambient air quality was studied by AECOM in 2010 on Malé, Hulhulé and Hulmumalé and compared with World Health Organization (WHO) standards for ambient air. Focusing on the main pollutants of potential concern, namely particulate matter of between 2.5 and 10 microgram ( $\mu\text{g}$ ) in size, particulate matter of less than 2.5  $\mu\text{g}$ , sulphur dioxide ( $\text{SO}_2$ ), oxides of nitrogen ( $\text{NO}_x$ ) and carbon monoxide (CO), none were found to exceed WHO guideline levels in terms of the average 24-hour mean. Levels of particulate matter were relatively constant for each island, though CO,  $\text{NO}_x$  and  $\text{SO}_2$  levels were markedly higher in Malé than in the other islands. The most prominent factor in relation to emissions is much denser traffic on Malé compared to the other islands. On Thilafushi island, there are fewer vehicles, a much lower population and traffic is limited.

## 7. Noise

69. Industrial installations and movements of heavy equipment on Thilafushi generate noise though mainly during working hours. There are few vehicles on the island and therefore very little traffic noise. The island has relatively few residents (2,100 approximately).

## B. Ecological Resources

### 1. Marine Ecosystems

70. Coral ecosystems have significant ecological significance and occur within lagoon waters and on the periphery of the islands. A survey of the status of the corals, using an established coral survey method, established by the international nongovernment organization (NGO) Reef

Check<sup>30</sup> to assess the coverage of coral and other substrates on the sea bed. Seven sites around Thilafushi island were surveyed, finding predominantly rock, rubble and sandy cover, with live corals accounting for up to 20% of cover in one location, to the south of the island.

71. Pelagic fish form an important part of the local economy, both through commercial fishing activities and game fishing. Fishing activity focuses on areas known to be abundant and these occur throughout the Maldives waters, usually distant to the coast. Fish populations in inshore waters around Thilafushi were assessed by Water Solutions in 2017, again using a method developed by Reef Check employing a transect method, undertaken by a diver travelling on a transect and stopping at 5m intervals, to count fish of indicator species. The transect was undertaken at three locations and identified 20 indicator species belonging to 7 families. None of the observed species are of conservation significance, as rated by the International Union for the Conservation of Nature (IUCN).

72. One transect was taken in the lagoon waters adjoining the waste vessel harbor (see site M4 on Figure 6). Based on the transect survey, the following description, indication of lagoon floor coverage and photographs of the site are given in the Water Solutions / Kocks report:

*Site 4 was chosen from inside the deep lagoon area. Marine environment of this area was sourced from EIA for Undertaking Reclamation and Quay wall Construction at ALIA Thilafushi Site (Water Solutions Pvt Ltd, 2017). Bottom substrate of this area is dominated with sand. No live coral were observed on the site. During the survey, a lot of waste dumped in this area was observed. No IUCN listed critically endangered (CE) or endangered (EN) coral species were encountered within the survey area.*

<b>Live reef cover</b>	<b>Mean % per segment</b>	<b>SE</b>
HC (Living Coral)	0%	0%
SC (Zoanthids but not anemones)	0%	0%
NIA (macro algae)	0%	0%
SP (erect/encrusting sponges)	0%	0%
OT (other sessile organisms)	0%	0%
<b>Non-living reef cover</b>	<b>Mean % per segment</b>	<b>SE</b>
RKC (Coral with structures still recognizable)	0%	0%
RC (hard substrate including dead coral)	0%	0%
RB (reef rocks)	3%	1%
SD (sediment of particles < 0.5mm in diameter; falls quickly when dropped)	97%	1%
SI (sediment that remains in suspension when disturbed)	0%	0%

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<sup>30</sup> Hodgson, G., W. Kiene, J. Mihaly, J. Liebeler, C. Shuman, L. Maun and J. Hill (2006). Reef Check Instruction Manual: A Guide to Reef Check Coral Reef Monitoring Published by Reef Check, Institute of the Environment, University of California at Los Angeles.



## 2. Avifauna

73. The Maldives has a diverse range of birds, including a significant seasonal population of migratory birds. The islands are important wintering grounds for a large number of migratory species that follow the Central Asian Flyway, a flyway covering a large continental area of Eurasia between the Arctic Ocean and the Indian Ocean, and comprising several important migration routes, extending from the northernmost breeding grounds in Siberia to the southernmost non-breeding wintering grounds in West and South Asia and the Indian Ocean Territory including the Maldives. Within Greater Malé, bird populations are influenced by urbanization, and birds (largely nonmigratory) common to urban areas in South Asia, such as crows and sparrows, are commonplace. The landfill at Thilafushi attracts significant numbers of birds. Uncollected waste, particularly floating waste, is a known hazard to birdlife in Greater Malé and is particularly abundant around Thilafushi on sea lane routes used by barges to transport waste to the island. The waste is hazardous to wildlife when toxic waste is ingested or when articles such as plastic bags and string can cause birds to be debilitated or where they cause damage to the digestive system, or when it damages a natural habitat. The habitat of the white-breasted waterhen (*Amaurornis phoenicurus*) is known to be threatened by floating, uncollected solid waste.<sup>31</sup>

## 3. Terrestrial Ecosystems

74. As an artificial island, the vegetation cover, which is sparse, has formed by weed colonization and some tree planting.

## 4. Protected Areas

75. There are 42 protected areas in the Maldives designated under the EPPA and covering around 24,500ha, or 0.2% of national territory totaling more than 24,494 hectares (0.2% of the national territory) designated under the Environment Protection and Preservation Act 4/93 (EPPA 4/93) to prevent over exploitation, and improve conservation and preservation, including banning of export of important baitfish as aquarium fish, protection of threatened marine species such as sharks, sea turtles, giant clams and black coral and also to enhance and sustain dive tourism.

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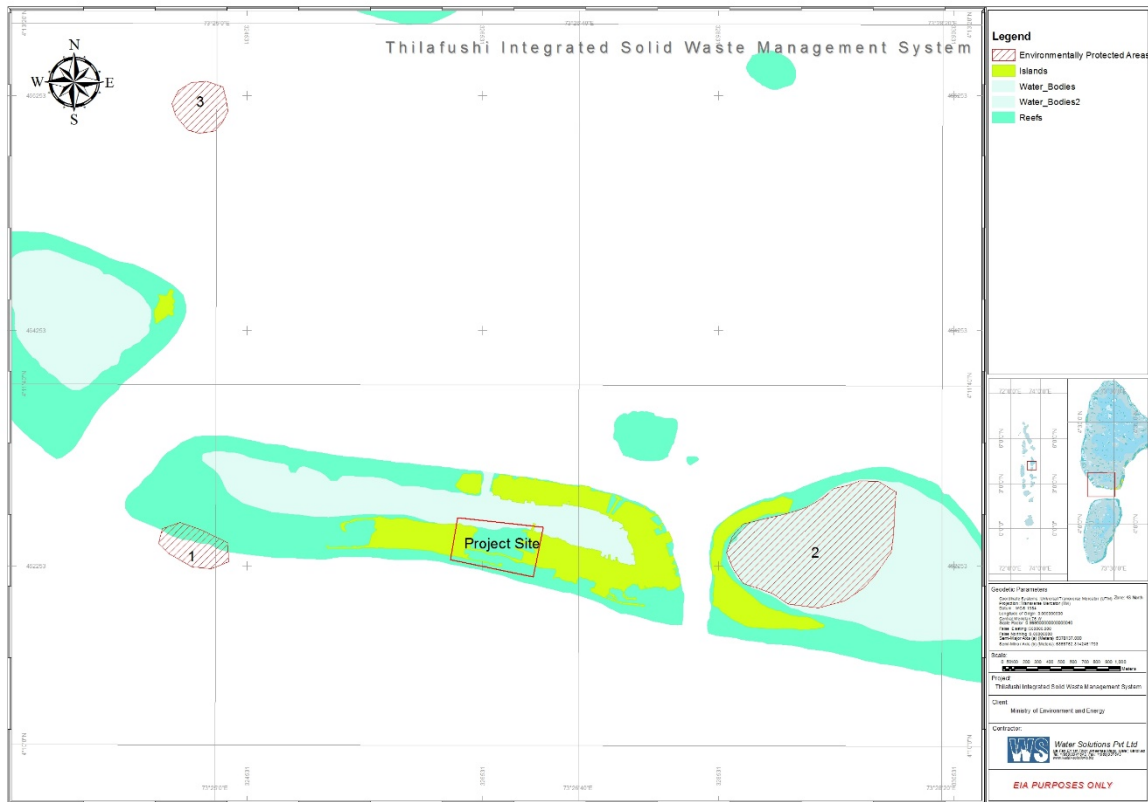
<sup>31</sup> Common Birds of the Maldives. Live & Learn Environmental Education. [www.livelearn.org](http://www.livelearn.org).

76. Four protected areas occur in the vicinity of Thilafushi, all designated by the Government on 1 October 1995 and listed by the IUCN as dive sites. The IUCN has not set a category for any of the sites.

**Table 7: Protected areas in the vicinity of Thilafushi**

Name	Type	Area	Notes	Location relative to Greater Malé project area
Dhekunu Thilafalhuge Miayaruvani (Lions Head)	Reef	142	Situated on a reef face, favored as a dive site for shark viewing. Overhanging reef features.	Immediate Southwest of Thilafushi Island
Gulhee Falhu Kollavaani (Hans Hass Place)	Reef	102	Deep lagoon area	East of Gulhifalhu Island, itself 0.4km to the East of Thilafushi Island
Giraavaru Kuda Haa	Reef	200	Isolated reef approx. 30m above lagoon floor	4km North of Thilafushi island

**Figure 10: Location of nearest protected areas**



Source: Water Solutions / Kocks Ingenieure, Environmental Impact Assessment Reclamation of 15 hectares of land at Thilafushi for development of the Regional Waste Management Facility for Zone 3



## **C. Socio-Economic Factors**

### **1. Population Levels**

77. At the time of the most recent census, in 2014, there were 2,052 residents on Thilafushi Island, almost exclusively male (99.8%) and consisting mainly of overseas workers (84%).

78. There are no schools or hospitals on the island.

### **2. Economy**

79. Tourism and fishing dominate the national economy, with the contribution to gross domestic product (GDP) of 17% and 15% respectively, and the tourism sector growing rapidly in recent years, with a sharp increase of visitor arrivals.

80. The manufacturing sector, for which Thilafushi is an important site, provides less than 4% of GDP, the larger areas of activity being boat building and handicrafts, while modern industry is limited to a few tuna canneries, bottling plants, and limited manufacturing industries (PVC pipe, soap, furniture, and some food products).

81. While the economic outlook is generally positive, the economic base, reliant on tourism and fishing, is now and diversification is a challenge. The country has a shortage of labor and relies on workers from Bangladesh, Sri Lanka and elsewhere for manual labor, work on construction, for service on the resorts and are a vital resource for industry and waste management activity on Thilafushi.

82. Access to education in the national as a whole is good, with enrolment in primary education close to 100% and literacy rates at about 98%.

### **3. Public Health**

83. In the health sector, indicators also show improvements over recent decades. The Infant and maternal mortality rate has declined rapidly. With international assistance, authorities have succeeded in eradicating or heavily reducing the incidence of a number of infectious diseases including leprosy, measles and lymphatic filariasis, though tuberculosis, hepatitis, HIV/AIDS cases continue and dengue and the zika virus are emergent threats. Noncommunicable diseases including addictions and nutrition related conditions are also a current focus of health authorities.

## **V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**

### **A. Method of Assessment**

84. The potential impacts and mitigation measures have been identified through review of the Feasibility Study prepared for the Project, discussion with the designers and stakeholder consultation. The feasibility study presents the preliminary design. Initial screening and categorization was done using ADB Rapid Environmental Assessment Checklist and the assessment shows that the subproject is unlikely to cause significant adverse impacts. See Appendix 1. As such, the subproject is classified as environment category B as per ADB SPS, 2009. This IEE is based on this rapid environmental assessment, and on the preliminary design. Therefore, this EE will be updated based on the final detailed design, due for completion by quarter 3, 2020, and the classification will be reassessed or reconfirmed accordingly.

## B. Environmental Impacts Related to Location

85. Key considerations in assessing impacts related to location on Thilafushi are (i) the fact that the island was formed by reclamation, specifically to create land for waste management and industry, (ii) the sensitivity of the surrounding marine ecosystem and (iii) the critical role of the island in containing waste, enabling solid waste to be safely managed, provided it can be reliably transported to Thilafushi.

86. **Effects on the surrounding seawater and marine ecosystems.** Thilafushi island plays a vital role in solid waste management in Greater Malé and more widely in Zone 3 and beyond. Improved management of the waste facility on Thilafushi increases its effectiveness in this role, without which risks of greater release of waste to the marine environment will significantly increase. At present however, waste is lost to the sea at the waste vessel harbor area due to inadequate docking facilities and infrastructure. Further, toxic components of general waste and particularly of ELVs are poorly managed and risks of contaminating surrounding waters are high. Improvements to the waste vessel harbor and facilities, enabling handling of large containers carrying waste from within Greater Malé and around Zone 3, will reduce this risk. The potential impact is long term, positive, significant and will cover both the immediate area around the islands and the wider marine environment in Zone 3 and beyond.

87. **Effects on vegetation.** The limited vegetation on Thilafushi comprises mainly weed growth with some trees. No clearance of trees is expected, while the concept design envisages the provision of a buffer zone in which the planting of trees and shrubs can take place. The impact will be positive, significant and long term.

88. **Effects on birdlife.** Birds attracted to the island as well as water birds that frequent surrounding waters will benefit from both the improved handling and treatment to remove hazardous fractions onto the landfill or into surrounding waters. The effect will be positive, significant and long term.

89. **Loss of land and effects on property.** No private property will be affected and no land acquisition will be required and there is therefore no impact.

90. Table 6 summarizes the impacts related to location.

**Table 8: Summary of impacts related to location**

Potential Impact	Assessment
Surrounding seawater and marine ecosystems	Long term, positive, significant
Vegetation	Long term, positive, significant
Birdlife	Long term, positive, significant
Loss of land and effects on property	Nil

## C. Environmental Impacts Related to Construction

91. **Construction method.** The methods to be used for site preparation, fabrication, construction and commissioning, as well as associated arrangements to ensure sound environmental management and safety at all times, are to be defined by the Contractor in a Contractor's Environmental Management Plan submitted to the PMDSC for approval. The CEMP

must adhere to EHS general guidelines 1 to 4 (environmental, occupational health and safety, community health and safety and for construction and decommissioning).

92. **Impedance of traffic.** As there are few vehicles on Thilafushi, there will be no significant traffic impact.

93. **Noise pollution and vibration.** Construction operations, particularly excavations and compaction will cause noise and vibration. However, given the small population on Thilafushi and the fact that most residents are engaged in industrial activity, noise and vibration will not be a significant nuisance.

94. **Waste Generation.** Construction waste will include packaging of equipment, fuels, lubricants, materials, equipment and food and some rubble where existing structures need to be demolished. Some specialist lubricants and paint for marking may be hazardous. These will be disposed of at the appropriate locations on the island and therefore there is no significant risk to nearby waters or other islands. For toxic materials however, approval from the PMDSC must be obtained prior to importing materials rated as hazardous under the Globally Harmonized System of Classification and Labeling of Chemicals.

95. **Existing stored waste and contaminated sites.** Waste that is piled around the waste vessel harbor site and over the work area generally, must be separated according to C&D waste, organic and hazardous waste fractions and deposited at the existing dumpsite. Where land at construction sites is found to be contaminated, risk screening, detailed assessment of risks to the environment must be carried out and appropriate treatment, removal or containment measures identified and carried out, in accordance with EHS general guidelines for contaminated land.

96. **Release of silt.** Excavations to form foundations for structures will involve making temporary stockpiles of material that will either be removed or re-used. To prevent the release of silt into drains or the sea contractors will be required to ensure that (i) excavated areas are rapidly refilled on completion of works, (ii) to place silt fences around temporary piles of excavated material and (iii) avoid excavation in wet weather to the extent practicable.

97. **Water pollution.** The use of vehicles and plant can cause risks of water pollution, in the event of leaks and spills of fuel, lubricants, hydraulic fluid or other fluids used for vehicle operation. To reduce risks and limit impacts the contractor will be required to ensure that vehicles and plant are maintained in sound operable condition, free of leaks and that the condition of vehicles and equipment is regularly checked. The contractor will prepare and submit a plan for spill management, including provision of spill kits, training/briefing of workers on procedures on handling spills and allocation of responsibility within the contractor's team for ensuring that spill kits are available and that workers know how to use them.

98. **Air and dust pollution.** Vehicles and plant used for construction will release exhaust and cause dust, however ambient levels of air pollution are high.

99. **Community health and safety risks.** The use of plant and machinery, use of compressed air lines and cables and excavations are potentially hazardous but most work sites are within the RWMF area on Thilafushi island where public access is restricted. Furthermore, residents of Thilafushi are primarily those working on the island. However, the contractor will be required ensure that restrictions to access are enforced and will provide notices to the public identifying hazards and erect safety barriers/covers for areas of open excavation.

100. The Contractor shall establish its community health and safety plans following international best practices and the World Bank EHS guidelines on construction and decommissioning activities.<sup>32</sup> As a minimum and whichever is applicable, the community health and safety plan shall ensure the following:

- (i) Implement risk management strategies to protect the community from physical, chemical, or other hazards associated with sites under construction and decommissioning;
- (ii) Restricting access to the site, through a combination of institutional and administrative controls, with a focus on high risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community;
- (iii) Removing hazardous conditions on construction sites that cannot be controlled affectively with site access restrictions, such as covering openings to small confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials; and
- (iv) Implement measure to prevent proliferation of vectors of diseases at work sites.

101. **Occupational Health and Safety.** To reduce day to day risks associated with working with heavy equipment in trafficked areas, contractors will be required to appoint health and safety officers for each site and to ensure regular briefing of the construction workforce on health and safety issues. The Contractor shall establish its health and safety plan to be adopted at each site following international best practices and the World Bank EHS guidelines on construction and decommissioning activities. As minimum, the health and safety plan shall ensure the following, whichever are applicable:

- (i) Communication and Training
  - (a) Training of all workers on occupational health and safety prior to construction works;
  - (b) Conduct of orientation to visitors on health and safety procedures at work sites;
  - (c) Signages strategically installed to identify all areas at work sites, including hazard or danger areas;
  - (d) Proper labeling of equipment and containers at construction and storage sites; and
  - (e) Suitable arrangements to cater for emergencies, including: first aid equipment; personnel trained to administer first aid; communication with, and transport to, the nearest hospital with an accident / emergency department; monitoring equipment; rescue equipment; firefighting equipment; and communication with nearest fire brigade station.
- (ii) Physical Hazards
  - (a) Use of personal protective equipment (PPE) by all workers such as earplugs, safety shoes, hard hats, masks, goggles, etc. as applicable, and ensure these are used properly;
  - (b) Avoidance of slips and falls through good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths, cleaning up excessive waste

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<sup>32</sup> <http://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES>

- debris and liquid spills regularly, locating electrical cords and ropes in common areas and marked corridors, and use of slip retardant footwear;
- (c) Use of bracing or trench shoring on deep excavation works;
  - (d) Adequate lighting in dark working areas and areas with night works;
  - (e) Rotating and moving equipment inspected and tested prior to use during construction works. These shall be parked at designated areas and operated by qualified and trained operators only;
  - (f) Specific site traffic rules and routes in place and known to all personnel, workers, drivers, and equipment operators; and
  - (g) Use of air pollution source equipment and vehicles that are well maintained and with valid permits.
- (iii) General Facility Design and Operation
- (a) Regular checking of integrity of workplace structures to avoid collapse or failure;
  - (b) Ensuring workplace can withstand severe weather conditions;
  - (c) Enough work spaces available for workers, including exit routes during emergencies;
  - (d) Fire precautions and firefighting equipment installed;
  - (e) First aid stations and kits are available. Trained personnel should be available at all times who can provide first aid measures to victims of accidents;
  - (f) Secured storage areas for chemicals and other hazardous and flammable substances are installed and ensure access is limited to authorized personnel only;
  - (g) Good working environment temperature maintained;
  - (h) Worker camps and work sites provided with housekeeping facilities, such as separate toilets for male and female workers, drinking water supply, wash and bathing water, rest areas, and other lavatory and worker welfare facilities; and
  - (i) Maintain records and make reports concerning health, safety and welfare of persons, and damage to property. Take remedial action to prevent a recurrence of any accidents that may occur.

102. Table 7 summarizes the impacts related to construction. As all can be mitigated by consistent application of the mitigation measures described, none are significant.

**Table 9: Summary of impacts related to construction**

Potential Impact	Assessment
Impedance of traffic	Minimal, not significant
Noise pollution and vibration	Minimal, not significant
Waste generation	No impact
Release of silt	Minimal, not significant
Water pollution	Negative, temporary, not significant
Air and dust pollution	No impact
Community health and safety risks	Minimal, not significant
Occupational health and safety	Negative, temporary, not significant

#### D. Environmental Impacts Related to Operation

103. **General.** The package of improvements to the waste vessel harbor and initial waste handling and processing facilities on Thilafushi are integral to the overall project and are necessary for achieving the planned improvements to the RWMF. The improvements will have both direct impacts in terms of greater capacity and efficiency in handling waste, and indirect impacts in terms of enabling the further WTE plant to function by removing non-combustible and hazardous fractions. Summary of impacts is in Table 8 below.

104. **Losses of waste during handling.** The upgrading of the waste vessel harbor will enable offloading of 25 m<sup>3</sup> containers and transfer of waste to the landfill in trucks, avoiding the substantial losses that currently take place, resulting in a build-up of waste in the docking area and unsanitary conditions (illustrated in Figure 6 below). The impact is significant, long term and positive.

**Figure 11: Build-up of discharged at the existing waste vessel harbor on Thilafushi**



105. **Liquid waste.** During handling of the containers, it will not be practical to contain all the leachate from the waste, which will collect in the dock area. The concept design provides for two septic tanks, which can also accept and treat waste from toilet facilities used by workers at the facility, avoiding discharge of untreated leachate and wastewater into the sea. Effluent from the

septic tanks must comply with General Liquid Effluent Quality standards given in the EHS General Guidelines.

106. **C&D waste plant operation.** Separate handling of C&D waste will help ensure that a minimum of non-combustible waste goes to the final disposal facility that will be developed under a new project in the future. Processing of the C&D waste will separate out fractions that can be sold and/or re-used. The separation process however involves several stages of crushing and screening, which will generate dust, posing a hazard to workers. The impact of operating the C&D waste plant will be positive, significant and long term. The health hazard posed by the dust can be mitigated by ensuring that where feasible, all operators work inside cabins separated from air in the C&D waste plant by transparent screens, that masks fitted with particulate filters and exhalation valves are issued for any work that has to take place within the C&D waste plant outside the cabins and allocating responsibility to ensure that these masks are kept in good condition and worn whenever necessary.

107. **Hazardous waste.** The facilities provide for separation of hazardous waste from vehicles, C&D waste and other fractions, and separate handling, including a secure storage facility within the administration building. To be effective, workers and managers require established procedures for handling hazardous waste and training in their implementation.

108. **ELV plant operation.** The ELV plant remains to be designed. The process must involve (i) removal of vehicle parts likely to contain heavy metals such as the catalytic converter, (ii) de-pollution by removing fluids including lubricant oil, brake oil and fuel residues, and proper storage and removal of the fluids, (iii) separation of body panels from the chassis, and plastic/vinyl parts, (iv) processes such as crushing of body panels to allow transport to appropriate locations for recycling or landfilling. Due to the removal of toxic components and improved scope for recycling, the impact is positive, significant and it is long term.

109. **Handling of hazardous materials.** Hazardous materials, recovered from the dismantling of ELVs and those received from the transfer stations and IWMCs in Zone 3, are to be assessed, treated and stored. Plans provided in the Feasibility Study for the Integrated Solid Waste Management System for Zone III provides for storage of hazardous waste. Plans for operation of the RWMF need to identify procedures and resources for identifying, classifying, processing, storing or disposing of hazardous waste, such that air, water and land pollution is prevented.

110. **Pests.** Although improvements will enable cleaner conditions for waste handling, the area will still be subject to pests such as birds and rodents. Numbers of these can be kept down by improved operation regimes, including site hygiene and regular cleaning of surfaces and minimizing time that putrescible waste is stored.

111. **Occupational health and safety.** Improved site cleanliness and provision of facilities such as toilets and food preparation facilities in the administration building will reduce exposure to toxins and disease and improve the existing level of occupational health and safety for workers, including workers at the C&D waste and ELV plants. In the case of the C&D waste plant, dust will continually be produced by the crusher operations. Dismantling of ELVs will include release of dust and fumes from batteries and fuel tanks. The operators of these facilities and plants shall implement measures following international best practices and the World Bank EHS industry sector guidelines on waste management facilities and on ports, harbors and terminals.

**Table 10: Summary of impacts related to operation of the improved facilities**

Potential Impact	Assessment
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General	Positive, significant, long term
Losses of waste during handling	Positive, significant, long term
Liquid waste	Positive, significant, long term
C&D waste plant operation	Positive, significant, long term
Pests	Positive, significant, long term
Occupational health and safety	Positive, significant, long term

## **E. Global, Transboundary and Cumulative Impacts**

112. The proposed improvements will occur within the Zone 3 area. However, the improvements in collection, treatment and disposal of waste, which will be facilitated by the improvements to the RWMF, will reduce the discharge of waste from these islands into the surrounding ocean waters. Improvements to the waste vessel harbor at Thilafushi will enable more efficient handling and removal of waste from the harbor area. Processing of C&D waste, removal of the wood fraction and preparation of components of C&D waste that can be re-sold will both reduce the burden of the landfill and increase the quantity and quality of combustible waste fed to the waste to energy plan. Similarly, improved dismantling of end of life vehicles and separation of their components will improve efficiency of disposal and recycling of vehicle components. The improved handling and processing of waste, the improvements to the dumpsite and the installation of a waste to energy plant in a separate project in the future will therefore have a cumulative, positive impact.

113. Capacity building for the EPA will assist in the build-up of capabilities required to further improve and manage waste management facilities throughout the Maldives.

## **VI. ANALYSIS OF ALTERNATIVES**

114. The Feasibility Study prepared by Water Solutions and Kocks Ingenieure discusses the best practicable environmental option (BPEO) for the RWMF, with a focus on technologies for waste treatment – identifying WTE as the preferred option. The Feasibility Study also reviews further aspects such as options for transportation of waste, including the use of containers and transfer stations. The proposed improvements examined in this IEE all relate to expanding the capacity and developing greater efficiency of the RWMF on Thilafushi. The improvement of the waste vessel harbor is necessary to reduce losses of waste during handling, while the administration building also includes facilities that are required but not yet present including the store for hazardous waste, space for handling sale of marketable fractions and sanitary facilities for workers. Similarly, the C&D waste and the ELV plants are not yet present but are required to ensure separation of hazardous and marketable fractions from incoming waste.

115. For this IEE therefore, the “no project” scenario is considered, but not alternatives to the improved waste vessel harbor, administration building, C&D waste plant and ELV plant.

### **A. The no project alternative**

116. This scenario envisages not only the exclusion of the improved waste vessel harbor, administration building, C&D waste plant and ELV plant but also of other project components, including the RWMF. In this scenario, the existing practices of inefficient waste handling, which entails significant loss of waste to the sea, burning of waste on Thilafushi (and on other islands) and, most significantly, no means of expansion to handle growing volumes of waste. This without doubt entails increased risk to the living environment for residents of Greater Malé and elsewhere in Zone 3 and to the surrounding marine environment.



## VII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

### A. Consultations and information disclosure during design

117. During feasibility study preparation, the design team worked with key stakeholders such as MEE and WAMCO, and stakeholders are identified in a stakeholder analysis, including consultations with NGOs and residents of Thilafushi in relation to dredging and land reclamation on Thilafushi.

118. Consultations relating to facility improvements on Thilafushi took place during July 2017 with NGOs and members of the community living on Thilafushi Island. This documented in the Environmental Impact Assessment Report for Reclamation of 15 hectares of land at Thilafushi for development of the Regional Waste Management Facility for Zone 3, prepared by Water Solutions / Kocks Consult. While these consultations were not undertaken in relation to the proposed waste vessel harbor improvements, C&D waste processing plant, ELV workshop and administration building, they do represent the views of key stakeholders and the resident community on improvements to solid waste management on the island which is approximately 2,000 in number and comprises almost exclusively workers, largely from overseas, who reside temporarily to work on the island.

Stakeholder	Views / concerns expressed	Responses / Appropriate Action
Parley Maldives	Very concerned about existing situation, including considerable losses of waste and pollution of the sea  The group's primary interest is in recycling to reduce the burden on the solid waste management facility	Increased scope for recycling due to dismantling and separating components from ELVs, and improved waste vessel harbor operations.  Reduced losses of waste to the sea at the harbor site through improved facilities and operations.
Bluepeace Maldives	Highly concerned about environmental and health situation associated with the waste management facility, including high levels of waste floating near the island and on routes to it. The organization feel a solution to the waste situation calls for a national framework for solid waste management. They support proposed improvements to the regional solid waste management facility	Reduced losses of waste at sea expected from the use of containers for loading/offloading at RWMF and transfer stations. Improvements to the RWMF under Phase 1 and Phase 2 to be carried out addressing key areas of waste disposal and treatment, arresting open burning and improved dumpsite management.
Members of the Diving Community	Dive customers tend not to favor the dive site (Lions Head) near Thilafushi island owing to its status as a waste facility, smoke from waste burning and abundant floating waste which dispel the appeal of the dive sites.	Improvements to include dumpsite remediation, including fire fighting and measures to prevent fires; waste vessel harbor improvements and transfer station improvements to increase efficiency of waste transportation and reduce incidence of floating waste.

Resident community	<p>Concern that waste is not being treated properly by the authorities.</p> <p>Concern that the area allocated to waste management is small, resulting in rising heights of piled waste.</p> <p>Major concern over the level of smoke and mosquitos.</p> <p>Concern over general low hygienic condition of the island</p> <p>Some businesses are able to make money from valuable waste fractions, when these can be separated.</p>	<p>Improvements in phase 1 and phase 2 include improved waste treatment, increased space for waste management, arresting of burning and improved sanitary conditions.</p> <p>Island sanitary conditions not addressed by improvements per se.</p> <p>C&amp;D waste plant to increase availability of waste fractions that can be recycled.</p>
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## B. Further Information Disclosure and Public Consultation

119. This IEE, once updated on the basis of detailed design, and a Dhivehi translation of the executive summary will be provided to commune officials for public disclosure. Similarly, the updated IEE based on detailed design will be shared with stakeholders, as will results of monitoring. Stakeholders will be kept informed of the construction program including activities that are likely to entail hazards and will be made aware of the grievance redress mechanism and consultations will take place regularly to gain feedback and ensure that impacts are being adequately managed.

120. **Information, Education and Communication (IEC).** The IEC component will address perceptions on solid waste management, communication channels within the island communities, the role of women and scope for public involvement in improved solid waste management activity, in line with the “3 Rs”. This will potentially include adopting practices at the household level that reduce waste generation (including in particular reduced use of disposable plastics) and the separation of compostable and recyclable waste, and eliciting participation in community level activity.

121. The IEC will also support island councils in the management of solid waste, particularly through partnerships with resorts, NGOs or other islands to support initiatives to manage solid waste safely and sustainably. Resorts could provide technical training to islands, help in repair of SWM equipment, joint transport of waste to treatment centers, and carry out joint awareness programs on SWM. Strategies may include:

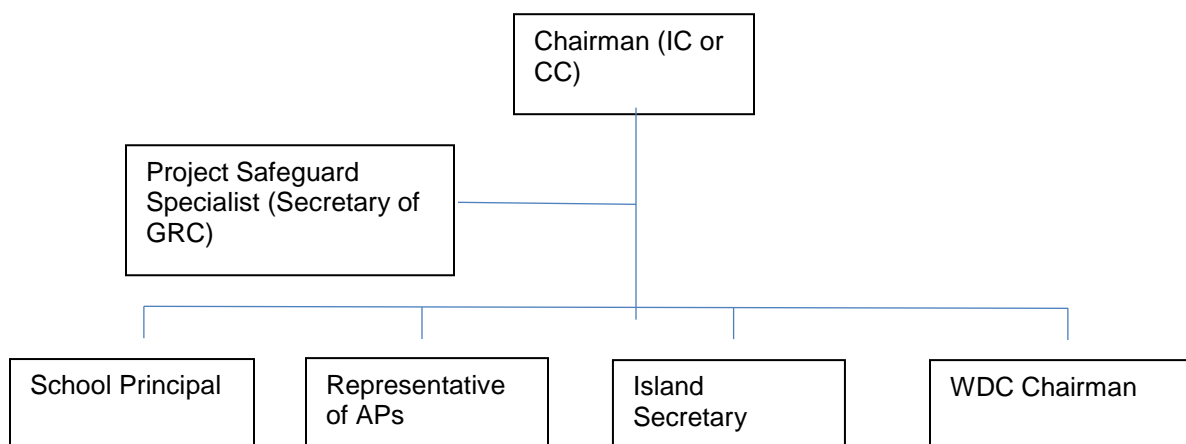
- (i) Involvement of environmental clubs that have been formed in schools;
- (ii) Use of social media, particularly those in common use already such as “facebook” and “viber”;
- (iii) Setting up a dynamic knowledge portal;
- (iv) Sharing information on the project, its activities and roll out schedule of the project components;
- (v) Partnerships between resorts and neighbouring islands on sustainable waste management;
- (vi) Promoting 3R practices, including reduction of plastic water bottles through use of reusable glass bottles and/or large, reusable bottles for drinking water; and
- (vii) Encouraging use of locally produced compost.

## VIII. GRIEVANCE REDRESS MECHANISM

122. A grievance redress mechanism (GRM) will be established to receive and facilitate the resolution of affected persons (AP's) concerns, complaints, and grievances on negotiated/voluntary land donation or involuntary land acquisition, relocation, income restoration, environmental management and other construction and operation related issues. The GRM is accessible to all APs to address their concerns, grievances and issues effectively and swiftly, in accordance with ADP SPS, 2009.

123. **First Tier:** City Council/Island Council – grievances will be registered informally by contacting the city/island councils. If the grievance cannot be resolved informally then the APs can register a formal complaint. The council must screen the grievance to determine whether the concerns raised in the grievance are within the scope of the project. The council will determine solutions to the issues either by (i) discussing internally, or (ii) joint problem solving with aggrieved parties, or (iii) a combination of both options. If the complaint is resolved within a week, the council must communicate the decision to the aggrieved party formally or informally. Should matter be unresolved and/or the AP be unhappy with the result, the complaint will be referred to the next tier. The grievance redress committee (GRC) includes the island's representatives as well as project officers related to each island, as shown in the figure below.

**Figure 12: Grievance Redress Committee (GRC) Composition for First Tier**



124. **Second Tier:** The AP can elevate the grievance to the second tier, and submit a complaint on a letter addressed to MEE. MEE will forward the letter to the PMU. The PMU will be responsible to resolve the complaint within 15 days and communicate the decision to the aggrieved party. The PMU screens the grievance and determines if it is related to the project. If unrelated, the AP is notified in writing. If it is relevant to the project, the PMU will hold discussions with the MEE on the matter and if necessary, (i) arranges visit the site and hold on-site discussions and/or (ii) refers the matter to the project steering committee. The PMU then decides on the action that will be taken by the project to address the grievance, and the decision will be conveyed to the AP in writing.

125. The affected persons can also direct contact (in writing) the ADB Project Officer at ADB headquarters. The complaint can be submitted in any of the official languages of ADB's

Developing Member Countries. This may be done at any time by sending the written complaint to the following address:

Project Officer – Greater Malé Environmental Improvement and Waste Management Project  
 South Asia Urban Development and Water Division  
 South Asia Regional Department  
 Asian Development Bank  
 6 ADB Avenue, Mandaluyong City 1550  
 Metro Manila, Philippines

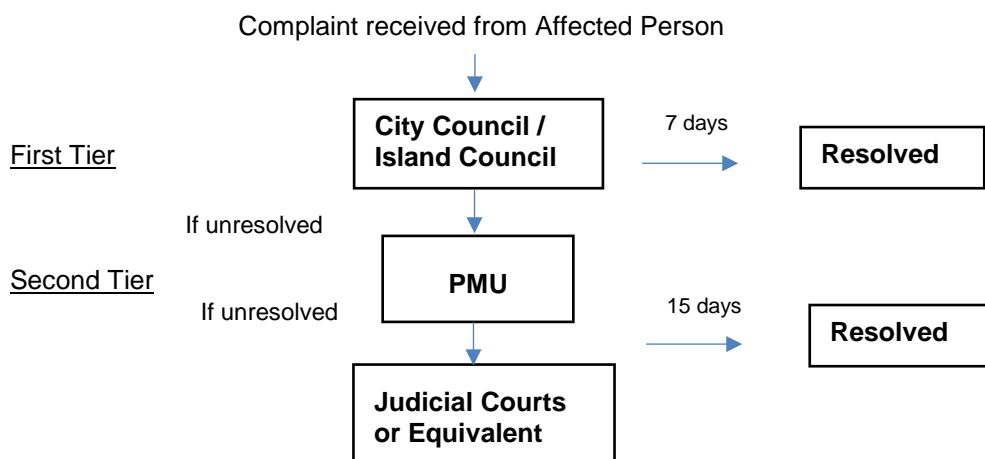
126. The APs can also use the ADB Accountability Mechanism (AM) through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB. The complaint can be submitted in any of the official languages of ADB's DMCs. The ADB Accountability Mechanism information will be included in the Project Information Document to be distributed to the affected communities, as part of the project GRM.

127. The legal system is accessible to all the APs. APs can seek legal redress through Maldives judicial or appropriate administrative system at any stage of the matter or issue concerned. The APs can also use the ADB Accountability Mechanism (AM) through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB. The complaint can be submitted in any of the official languages of ADB's DMCs. The ADB Accountability Mechanism information will be included in the PID to be distributed to the affected communities, as part of the project GRM.

128. The GRM notwithstanding, an aggrieved person shall have access to the country's legal system at any stage through the Maldives judicial or appropriate administrative system. This can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

129. The flow diagram of resolving complaints under the GRC is shown in Figure below.

**Figure 13: GRM Diagram for Complaints Resolution**



130. The GRM will include group meetings and discussions with APs to address general and common grievances. These meetings and discussions will be announced in advance, conducted at the time of day agreed on with APs (based on their availability), and facilitated by the PMU and PMDSC at least are assisted to understand the grievance redress process, to register complaints and with follow-up actions at different stages in the process. Records will be kept by the PMU to

keep track of all grievances received, both informal and formal, including contact details of complainant, date when the complaint was received, nature of grievance, agreed corrective actions and the date when these were effected, and final outcome. A Sample Grievance Registration Form is attached in Appendix 2.

131. All costs involved in resolving the complaints (meetings, consultations, communication and reporting, and information dissemination) will be borne by the PMU.

## **IX. ENVIRONMENTAL MANAGEMENT PLAN**

### **A. Objectives**

132. This EMP sets out the needs for environmental management of waste handling and processing improvements on Thilafushi within the project in terms of institutional responsibilities to ensure mitigation and monitoring takes place during the pre-construction, construction and operation phases, meeting the requirements of the Government of the Maldives and the ADB's SPS.

133. A copy of the EMP must be kept on work sites at all times. This EMP will be included in the bid documents and will be further reviewed and updated during implementation. The EMP will be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

134. For civil works, the contractor will be required to (i) establish an operational system for managing environmental impacts (ii) carry out all of the monitoring and mitigation measures set forth in the EMP; and (iii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and EMP. The contractor shall allocate a budget for compliance with these EMP measures, requirements and actions.

### **B. Institutional Arrangement**

135. **Implementation arrangements.** The executing agency is the Ministry of Finance and Treasury (MOFT). The implementing agency is the Ministry of Environment and Energy (MEE) who will establish a project management unit (PMU) comprising officials from MEE and WAMCO. The PMU will be strengthened with external experts in the areas of finance, procurement, technical areas, and contract management. The project steering committee chaired by Minister, MEE will provide overall guidance and strategic directions to the project. Consultant firms will be recruited under the project to support engineering designs, supervision, project management, institutional capacity strengthening, and community awareness.

136. **Project Management Unit.** The Director General of the Solid Waste Department of MEE proposed that a dedicated full-time PMU for the ADB Zone 3 waste management project will be established (pending approval by MOFT) with eight staff as follows: (i) Project Director (part-time, Director General of Department), (ii) Project Manager (full time), (iii) Procurement Specialist, (iv) Finance Specialist, (v) Safeguard Specialist, (vi) Civil Engineer, (vii) IEC Specialist, and (viii) administrative assistant. The Project Director is a government official empowered to take official decisions, while remaining PMU staff are contracted staff recruited from the market. The PMU will be supported by consultants for project management, capacity building, monitoring, and technical

design and supervision support. The proposed PMU contract staff are to be recruited competitively without further delay in phases.

**137. Terms of Reference for PMU Environment Officer.** Key tasks and responsibilities of the PMU environment officer are as follows:

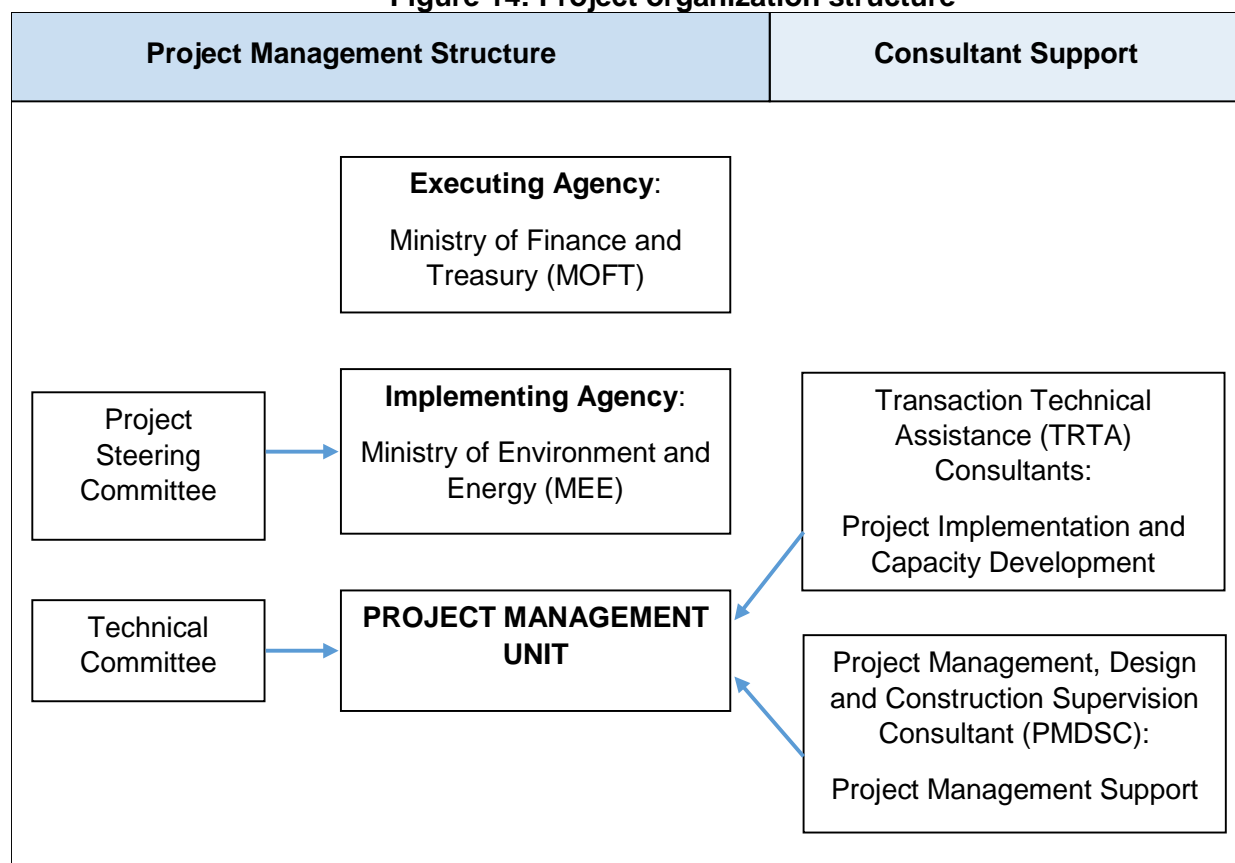
- (i) confirm existing IEEs/EMPs are updated based on detailed designs, and that new IEEs/EMPs are prepared in accordance with the EARF and subproject selection criteria related to safeguards;
- (ii) confirm whether IEEs/EMPs are included in bidding documents and civil works contracts;
- (iii) provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by island councils and contractors
- (iv) establish a system to monitor environmental safeguards of the project, including monitoring the indicators set out in the monitoring plan of the EMP;
- (v) facilitate and confirm overall compliance with all government rules and regulations regarding site and environmental clearances, as well as any other environmental requirements (e.g., location clearance certificates, environmental clearance certificates, etc.), as relevant; e. supervise and provide guidance to the island councils to properly carry out the environmental monitoring as per the EARF;
- (vi) review, monitor, and evaluate the effectiveness with which the EMPs are implemented, and recommend necessary corrective actions to be taken as necessary;
- (vii) consolidate monthly environmental monitoring reports from PIUs and submit semi-annual monitoring reports to ADB;
- (viii) ensure timely disclosure of final IEEs/EMPs in locations and form accessible to the public;
- (ix) address any grievances brought about through the grievance redress mechanism in a timely manner;
- (x) With assistance from the PMDSC, provide orientation to PCU and PIU staff in environmental management arrangements for the project;
- (xi) Provide inputs to progress reports and the project completion report;
- (xii) Visit worksites during construction and provide guidance relating to supervision and compliance monitoring; and
- (xiii) Visit completed works and assist with establishing environmental monitoring procedures for the operation phase of the improved infrastructure.

**138. Terms of Reference for PMDSC Safeguard Consultants.** The Social, Environmental and Occupational Health and Safety Expert in PMDSC will:

- (i) Ensure compliance with ADB safeguard requirements;
- (ii) Screen and categorize IWMCs for inclusion in the project;
- (iii) Ensure no Category A subproject per ADB SPS definition;
- (iv) Provide guidance on safeguards and issue instructions to the Contractors;
- (v) Assist in obtaining all necessary permissions and complying with statutory requirements;
- (vi) Prepare necessary IEE and EMP for each IWMC that will be considered in the project.
- (vii) Submit IEE and EMP to PMU for submission to ADB;
- (viii) Ensure IEE and EMP is included in the bid and contract document and ) and such items are included in BOQ;

- (ix) Review the Contractor's Environmental Management Plan (CEMP) for adequacy in terms of compliance with the requirements of the EMP and instruct amendments and additions as necessary;
- (x) Monitor and ensure compliance with ADB SPS and contractors' implementation of the EMPs;
- (xi) As part of the EMP, prepare a project focused Occupational Health and Safety Plan (OHS) to be adopted by the Client and the Contractor;
- (xii) Ensure that relevant provisions in contracts on OHS are abided by the contractors during the construction works;
- (xiii) Facilitate meaningful consultations and carry out disclosure of safeguard documents;
- (xiv) Prepare environmental and social mentoring reports;
- (xv) Prepare corrective action plan/s as required to ensure compliance with ADB SPS, 2009 and national laws and regulations;
- (xvi) Assist in GRM implementation;
- (xvii) Conduct Safeguards Orientation to contractors prior to mobilization; and
- (xviii) Develop and conduct regular safeguards trainings (see indicative institutional capacity development program) to ensure PMU, island councils and other stakeholders have common understanding of ADB SPS requirements during all phases of project implementation.

**Figure 14: Project organization structure**



**Table 11: Roles and Responsibilities of Project Implementation Organizations**

<b>Project Implementation Organizations</b>	<b>Management Roles and Responsibilities</b>
Executing agency Ministry of Finance and Treasury (MOFT)	Guide and monitor overall project execution. Financial oversight. Ensure flow of funds to the implementing agency and timely availability of counterpart funding; ensure adequate budget for successful implementation of the project. Monitors compliance with project legal Agreements Procurement oversight. Responsible for approving procurement. Review and coordinate evaluation of bids for works, goods, and consultant services. Maintaining project accounts and project financial records; Review and sign withdrawal applications before submitting to Asian Development Bank (ADB). Approve project management unit (PMU).
Project steering committee [Chair: Minister, Ministry of	Provide policy direction to facilitate project implementation. High-level troubleshooting.
Environment and Energy (MEE)]	Meets quarterly (or as needed) to review project performance and resolve issues.
Implementing agency 1 (MEE)	Overall day-to-day project management, monitoring, and evaluation.
PMU in MEE	Responsible for overall project management, implementation and monitoring; Reviews the reports submitted by (project management, design and construction supervision consultant) PMDSC with respect to detailed design, costs, safeguards, financial, economic, and social viability Prepare, with the support of PMDSC, bidding documents, request for proposals, and bid evaluation reports; Serves as point of contact with ADB, maintains project documents, and submits timely reports (quarterly progress reports and project completion report) to ADB by consolidating relevant inputs from PMDSCs and island council; Consolidates expenditures and prepare withdrawal applications for direct payment, reimbursements and use of imprest advance; Opens and manages imprest account for ADB Grant; Organize project orientation for participating island councils by elaborating scope of the project and sharing about their obligation and including maintaining separate accounts for their respective contributions; Establishment and maintaining of project website by disclosing progress reports, safeguard monitoring reports and design reports; and Collect supporting documents and submit withdrawal applications to ADB via MOFT. Monitors and ensures the compliance of covenants, particularly timely submission of audited project accounts and compliance with safeguard requirements;
Technical committee	Advise and facilitate to resolve technical issues.
WAMCO	Operator for collection, transport, and disposal of waste services in project area Manage regional waste management facilities
Island Councils	Operators of solid waste services on outer islands Responsible for management and O&M of Island Waste Management Centers



Project Implementation Organizations	Management Roles and Responsibilities
ADB	<p>Conducts project review missions, midterm review mission and project completion review mission to assess project implementation progress of all outputs, compliance of grant covenants including actions required in terms of safeguards (environmental impacts and social mitigation measures applicable); timeliness of budgetary allocations and counterpart funding; project expenditures; progress with procurement and disbursement;</p> <p>Post on ADB website the updated project information documents and safeguards documents as per disclosure provision of the ADB safeguards policy statement.</p> <p>Reviews executing agency and implementing agency's submissions for procurement of goods, equipment, works and services and provides comments and no objection on the submissions</p> <p>Checks Statement of Expenditure on sampling basis</p>

139. **The Contractor.** The contractor will have the following roles and responsibilities:

- (i) obtain all statutory clearances prior to commencement of civil works;
- (ii) complies with all applicable legislation, is conversant with the requirements of the EMP, and briefs staff about the requirements of same;
- (iii) prepare a Contractor's EMP based on the EMP of this IEE, and submit to PMDSC for approval;
- (iv) carry out all of the monitoring and mitigation measures set forth in the approved CEMP;
- (v) ensures any sub-contractors/ suppliers, who are utilized within the context of the contract, comply with the environmental requirements of the CEMP/EMP. The Contractor will be held responsible for non-compliance on their behalf;
- (vi) implement any corrective or preventative actions set out in safeguards monitoring reports that the executing agency or implementing agency will prepare from time to time to monitor implementation of this IEE, EMP, and CEMP;
- (vii) provides environmental awareness training to staff;
- (viii) bears the costs of any damages/ compensation resulting from non-adherence to the EMP or written site instructions;
- (ix) conducts all activities in a manner that minimizes disturbance to directly affected residents and the public in general, and foreseeable impacts on the environment;
- (x) ensures that its staff or engineers are informed in a timely manner of any foreseeable activities that will require input from the environment and safety officers (or equivalent);
- (xi) appoints one full time environment and safety officer (or equivalent) for implementation of EMP, community liaising, reporting and grievance redressal on day to day basis; and
- (xii) receives complaints/grievances from the public, immediately implements the remedial measures and reports to the PMU and PMDSC.

### C. Institutional Capacity Development Program

140. The PMU, to be established by the MEE, will be responsible for the implementation of safeguards and ensuring that they comply with ADB requirements as well as the EPPA. The body responsible for approving environmental impact assessments and issuing of permits is the Environmental Protection Agency (EPA), which is under the Ministry of Environment and

Energy.<sup>33</sup> Capacities were assessed by the PPTA consultants during interviews that took place in July and September 2017. The EPA has few trained technical staff and at the time of capacity assessment work undertaken by the PPTA consultants, all senior members of the EPA's waste department were away from the office for study, which is indicative of a low staffing resource level. The agency relies on external consultants for functions such as environmental monitoring for projects; however this is usually confined to the construction phase. The EPA does have one team of field staff a laboratory and a boat for fieldwork, but laboratory operations and travel is constrained by budget constraints. The situation is reflected in other departments of the MEE.

141. The PMDSC will provide assistance during the project for the implementation of safeguards in compliance with ADB SPS 2009 requirements and with the requirements of the EPPA. This provision responds to lessons learned for project design to include support to PMU staff in project implementation particularly in procurement, contract management, and safeguards. The PMDSC will provide assistance to the PMU for overseeing EMP implementation.

142. Besides the IEC component which includes some capacity building measures for ICs (e.g. increasing outreach of IEC, closing feedback loop), the Transaction Technical Assistance (TRTA) for Strengthening Capacity for Sustainable Solid Waste Management in the Greater Malé Region will provide both implementation and safeguard guidance and assistance towards the PMU. Since recycling is of a major concern, a market sounding will be carried out during the TRTA to increase the knowledge in this regard and to inform the institutional stakeholders (mainly MEE, WAMCO and ICs) about the potential for recycling of certain waste components.

143. Capacity development support will be provided via the TRTA to support the improvement of the C&D waste plant, ELV workshop, waste vessel harbor improvements and the administration building. This will include implementation guidance specifically to the new PMU to be formed for the project. The TRTA team includes a national safeguards and gender expert.

#### **D. Impacts and Mitigation**

144. Table 10 summarizes the potential impacts and mitigation measures in relation to location, construction and operation identified in the IEE.

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<sup>33</sup> Note that EPA, while it comes under MEE, has a governing board which is a statutory body.

**Table12: Environmental Management Plan**

<b>Impacts</b>	<b>Location</b>	<b>Mitigation Measures</b>	<b>Performance Standard</b>	<b>Source of Funds</b>	<b>Responsibility for Implementation</b>	<b>Responsibility for Supervision</b>
<b>Pre-Construction Stage</b>						
Dust hazard for C&D waste plant operation	Thilafushi RWMF	Incorporation into design of safe cabins for plant operators	Compliant with PMDSC / design company quality control standards	Project funds	Designers	PMDSC / MEE
Waste vessel harbor improvements	Thilafushi RWMF	Inclusion in design of treatment measures for water used to wash vehicles and containers  Design to be consistent with EHS Industry Sector Guidelines for Ports Harbors and Terminals	Compliant with PMDSC / design company quality control standards	Project funds	Designers	PMDSC / MEE
Administration building	Thilafushi RWMF	Inclusion of provisions for canteen, meeting room and toilet facilities, including provisions for treatment/discharge of wastewater in design of the administration building	Compliant with PMDSC / design company quality control standards	Design cost	Designers	MEE
C&D waste plant	Thilafushi RWMF	Inclusion of provision of safety features for the plant including noise suppression, dust suppression guard rails, emergency shut-off and lighting	Compliant with PMDSC / design company quality control standards	Design cost	Designers	MEE

<b>Impacts</b>	<b>Location</b>	<b>Mitigation Measures</b>	<b>Performance Standard</b>	<b>Source of Funds</b>	<b>Responsibility for Implementation</b>	<b>Responsibility for Supervision</b>
ELV Plant	Thilafushi RWMF	Design of the ELV for a process that includes (i) removal of vehicle parts likely to contain heavy metals such as the catalytic converter, (ii) de-pollution by removing fluids including lubricant oil, brake oil and fuel residues, and proper storage and removal of the fluids, (iii) separation of body panels from the chassis, and plastic/vinyl parts, (iv) processes such as crushing of body panels to allow transport to appropriate locations for recycling or landfilling. Measures to be consistent with EHS Industry Sector Guidelines for Waste Management Facilities.	Compliant with PMDSC / design company quality control standards	Project funds	Designers	PMDSC / MEE
Design of the overall site	Thilafushi RWMF	Site design, including drainage, access, safety features and security to comply with EHS guidelines for Waste Management Facilities	Compliant with PMDSC / design company quality control standards	Project funds	Designers	PMDSC / MEE
Hazardous waste provision	Thilafushi RWMF	Consider providing a separate secure building for hazardous waste storage, rather than an room within the Administration building as indicated in the Feasibility Study	Compliant with PMDSC / design company quality control standards			
Construction Impacts	Thilafushi RWMF	Preparation of Contractor's Environmental Management Plan providing specific detail in relation to chosen construction methods	Approval by PMDSC	Construction Cost	Contractor	PMDSC

<b>Impacts</b>	<b>Location</b>	<b>Mitigation Measures</b>	<b>Performance Standard</b>	<b>Source of Funds</b>	<b>Responsibility for Implementation</b>	<b>Responsibility for Supervision</b>
General impacts on local residents	Thilafushi RWMF	Provision of information to the public on Grievance Redress Mechanism	Completion of disclosure measures as prescribed in the GRM	Project Management Cost	PMU	-
Climate risk and vulnerability mitigation	Thilafushi RWMF	Incorporation of recommendations from CRVA into detailed design	Compliant with PMDSC company quality control standards	Design cost	PMDSC	MEE
Confirmation of pre-construction stage updates	Thilafushi RWMF	IEE / EMP to be updated to reflect final detailed design and construction methods. ADB clearance obtained before proceeding.	Documented ADB clearance	Design cost	PMDSC	ADB and MEE
<b>Construction stage impacts</b>						
Waste generation from construction activities	Thilafushi RWMF	All solid waste must be disposed of at a landfill or approved disposal site. Importation of any materials rated as hazardous under the Globally Harmonized System of Classification and Labeling of Chemicals to be subject to approval by PMDSC, which will be conditional on stating adequate arrangements for disposal.	Sites free of construction waste on commissioning.  Written PMDSC approval available for any hazardous chemical in use	Construction Cost	Contractor	PMDSC

<b>Impacts</b>	<b>Location</b>	<b>Mitigation Measures</b>	<b>Performance Standard</b>	<b>Source of Funds</b>	<b>Responsibility for Implementation</b>	<b>Responsibility for Supervision</b>
Accumulated waste at the construction site and contaminated land	All areas where construction is to take place	Accumulated waste to be separated into main fractions and disposed on existing dumpsite. For sites found to be contaminated, the contractor is to undertake a risk assessment, quantitatively assess risks to the environment and and arrange for appropriate treatment, removal or containment as appropriate	Risk assessments and plans for treatment, removal or containment approved by PMDSC and carried out	Construction Cost	Contractor	PMDSC
Release of silt	Thilafushi RWMF,	Excavated areas to be rapidly refilled on completion of works. Use of silt fences around temporary piles of excavated material. Avoid excavation in wet weather to the extent practicable.	No instances when silt release is uncontrolled	Construction Cost	Contractor	PMDSC
Water pollution	Thilafushi RWMF	Vehicles and plant are to be maintained in sound operable condition, free of leaks. The condition of vehicles and equipment will be periodically checked. Contractor to prepare and submit a plan for spill management, including provision of spill kits, training/briefing of workers on procedures on handling spills and allocation of responsibility within the contractor's team for ensuring that spill kits are available and that workers know how to use them.	Vehicles and construction plant to have at all times at a minimum: (i) intact and securely fitted exhaust pipes and mufflers (ii) operable brakes (iii) no fuel or lubricant leaks.  Spill kits on site at all times	Construction Cost	Contractor	PMDSC

Impacts	Location	Mitigation Measures	Performance Standard	Source of Funds	Responsibility for Implementation	Responsibility for Supervision
Community health and safety hazards	Thilafushi RWMF	<p>Restriction of access to the RWMF. For work at the periphery of the sites, provide notices to the public identifying hazards and erect safety barriers / covers for areas of open excavation.</p> <p>Contractors to adopt the WB EHS Guidelines on Community Health and Safety, particularly those that relate to construction works.</p>	Barriers and notices to be in place at all times, entrance to sites actively controlled	Construction Cost	Contractor	PMDSC
Occupational health and safety hazards	Thilafushi RWMF	<p>Contractors to appoint health and safety officers for each site and to ensure regular briefing of construction workforce on health and safety issues. Adequate personal protective equipment to be provided to the workforce.</p> <p>Contractors to adopt the WB EHS Guidelines on OHS, particularly those that relate to construction works.</p>	Member of the Contractor's staff nominated as health and safety officer to be present on site. Appropriate protective equipment to each construction operation to be worn at all times (including steel toe capped boots at all times, hard hats when working near machinery or roofing work, eye protection for welding)	Construction Cost	Contractor	PMDSC
<b>Impacts During Operation</b>						

<b>Impacts</b>	<b>Location</b>	<b>Mitigation Measures</b>	<b>Performance Standard</b>	<b>Source of Funds</b>	<b>Responsibility for Implementation</b>	<b>Responsibility for Supervision</b>
Risks of loss of containers and contents	Thilafushi RWMF; surrounding waters	O&M training to include instruction on maintenance of containers, loaders, cranes and vessels and sound operation including licensing of vehicle and plant operators and restrictions on operation during stormy weather	O&M training completed  Operators to have undergone training and have licenses to drive/operate vehicles and machinery.	Training budget	Implementation consultants / Contractor	MEE
Pests: Rodents and birds	Thilafushi RWMF	Maintenance of site cleanliness, minimizing storage time for putrescible waste, provision of enclosures for putrescible waste.	Sites to be clean and all putrescible waste enclosed at the close of operations each day	Operation Cost	WAMCO	MEE
Occupational health and safety	Thilafushi RWMF	Operators trained to recognize risks and hazards. Personal safety equipment issued and worn. Health and safety recognized as primary employer responsibility. Protection from dust to be provided for C&D waste plant, and from potentially toxic fumes in the ELV plant.  Contractors to adopt the WB EHS Guidelines on OHS for SWM projects.	Allocation of responsibility for safety standards to a full time member of staff. Appropriate protective equipment to each construction operation to be worn at all times (including steel toe capped boots and hard hats at all times)	Operation Cost	Implementation consultants / Contractor  WAMCO	MEE
Handling of liquid waste	Thilafushi RWMF	Regular maintenance of drains and septic tanks. Septic tank discharge to comply with general effluent liquid quality standards in the EHS general guidelines	Completion of regular tasks, confirmed according to an inspection regime to be established prior to commissioning	Operation Cost	WAMCO	MEE



<b>Impacts</b>	<b>Location</b>	<b>Mitigation Measures</b>	<b>Performance Standard</b>	<b>Source of Funds</b>	<b>Responsibility for Implementation</b>	<b>Responsibility for Supervision</b>
C&D waste plant operation: dust hazard	Thilafushi RWMF	Provision of breathing apparatus and rules of operation; allocation of responsibility to ensure these are used	Provision of equipment in good repair and requirement of staff to wear them	Operation Cost	WAMCO	MEE
Handling of hazardous materials	Thilafushi RWMF	Plan to be developed for assessing, storing, treating and disposing of different types of hazardous waste and implemented.	Development of plans for hazardous waste management and regular implementation of them	Operation Cost	WAMCO	MEE

## E. Environmental Monitoring

### 1. Monitoring Plan

145. The design of the environmental monitoring system is based on an analysis of the key environmental performance issues associated with each stage of the project, set out in Table 11 below.

**Table 11: Analysis of Environmental Monitoring Needs**

Phase	Key Environmental Performance Issues	Environmental Performance Indicator	Means of Monitoring
Design/ Preconstruction	Inclusion of mitigation measures in design/build and/or detailed design documentation and construction activities  Air and water quality  Noise	Compliance with EMP design measures  Water Quality: BOD, TSS, TPH Faecal coliform/enterococci; Metals (Pb, Cu, Cd, Hg, Cr)  Air Quality: SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>10</sub> , PM <sub>2.5</sub> , O <sub>3</sub>  Noise L <sub>Aeq</sub> 1hr (dBA)	Compliance monitoring  Measurements Prior to Construction
Construction	Adherence to provisions in the EMP to mitigate construction impacts	Compliance with EMP	Compliance monitoring
	Direct effects on island residents from impacts such as accidental damage, dust generation, noise generation and safety	Views and opinions of island residents  Contractor's records relating to minor and major pollution and health and safety incidents (with a target of zero incidents)	Community feedback  Grievance redress mechanism
	Air and water quality; noise	As above	Measurements at monthly intervals
Operation	Effectiveness of operation of the improved facilities	Reduced occurrence of floating waste in the sea in the Greater Malé area	Site observations Community feedback
	Air and water quality; noise	As above	Regular measurements according to agreed monitoring plan for operation

BOD = biological oxygen demand; TSS = total suspended solids; TPH = Total Petroleum Hydrocarbons, L<sub>Aeq</sub> = weighted continuous noise equivalent level dBA = decibels

146. Two areas of environmental monitoring are identified: compliance monitoring and community feedback, which are in addition to monitoring measures in the Design and Monitoring

Framework for the project. These provide a means of gauging whether the stations operate more efficiently and with less loss of waste into the sea.

147. Compliance monitoring is required during detailed design and construction of the improved facilities, to ensure that mitigation specified in the EMP is carried out to an adequate standard. Compliance monitoring is a function of the PMU and its cost of this monitoring is part of the running cost of the PMU.

148. Community feedback provides for the monitoring of environmental indicators gauged by public perception. Appropriate indicators are:

- (i) Reductions in the incidence of waterborne diseases; and
- (ii) Effectiveness of waste handling (appearance of floating waste in the sea between the Malé station and Thilafushi)

149. Costs of environmental assessment and monitoring during construction are project costs. Environmental monitoring during operation is carried out by the WAMCO, and costs will be met from O&M budgets prepared and managed by the WAMCO.

**Table 12: Environmental Monitoring Plan**

Impact to be Monitored	Means of Monitoring	Construction Phase			Operation Phase		
		Frequency	Responsible Agency	Indicative Annual Cost	Frequency	Responsible Agency	Indicative Annual Cost
General Construct-ion Impacts	Community Feed-back	To be established by PMDSC	PMU	Covered in project participation plan	To be established by PMDSC	WAMCO	Operational Cost
Compliance with EMP	Inspections	As set up by supervising engineers	PMU / PMDSC	Included in project management and consultancy cost	To be established by PMDSC	WAMCO	Operational Cost
Occurrence of floating waste	Community Feed-back	To be established by PMDSC	PIU	To be determined in design of community outreach component of Project 1	To be established by PMDSC	WAMCO	Operational Cost

## **2. Reporting**

150. EMP compliance monitoring will be undertaken by the PMU, with support of the PMDSC. Effects will be monitored by means of community feedback and laboratory testing. Consistent with reporting requirements set out in the Project Administration Manual (PAM). PMU will prepare reports to be sent to ADB on a semi-annual basis during and immediately after construction. Semi-annual reports during operation are to be prepared by WAMCO until ADB issues a project completion report. The suggested outline of semi-annual reports is attached as Appendix 3. To facilitate monitoring and enable responses to emerging issues, monthly reports will be prepared by the PMU.

## **X. CONCLUSION**

151. The overall finding of the IEE is that the Project will result in significant environmental benefits, as it is conceived and designed to enable efficient operation of the RWMF at Thilafushi, which is necessary for improved operation and increasing capacity to handle rapidly growing volumes of waste that are projected in coming decades. It will not have significant adverse environmental impacts and potential adverse impacts are manageable through the effective implementation of the EMP.

152. The classification of Category B is confirmed. No further environmental assessment is therefore required. However, this IEE will be finalized based on the final detailed design and this classification shall be reassessed or reconfirmed accordingly.

## Rapid Environmental Assessment Checklist

### Instructions:

- (i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.
- (ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
- (iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

### Country/Project Title:

Greater Malé Env. Improvement & Waste Managt. Project: RWMF harbour/logistics

### Sector Division:

South Asia Department / Urban Development and Water Division

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area...			
▪ Densely populated?		✓	Thilafushi is an artificial island created as a municipal landfill situated to the west of Malé, and is located between Kaafu Atoll's Giraavaru and Gulhifalhu of the Maldives. The subproject components are located in Thilafushi Island. Approximately 2,200 people comprising mainly workers from other islands or overseas are in the island. There are no residential structures.
▪ Heavy with development activities?		✓	This is a 30-year old 10-hectare dumpsite.
▪ Adjacent to or within any environmentally sensitive areas?		✓	
• Cultural heritage site		✓	
• Protected Area		✓	
• Wetland		✓	
• Mangrove		✓	
• Estuarine		✓	
• Buffer zone of protected area		✓	
• Special area for protecting biodiversity		✓	
• Bay		✓	The island is situated within a large atoll (Kaafu Atoll).
B. Potential Environmental Impacts Will the Project cause...			
▪ impacts associated with transport of wastes to the disposal site or treatment facility	✓		The transport of waste from transfer stations to Thilafushi Island will have potential impact as the route will be by the sea through marine vessels. However, the Project will include the introduction of a containerized system to improve the efficiency of waste handling from collection points to the disposal site.

Screening Questions	Yes	No	Remarks
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		✓	There are no historical and cultural monuments at the subproject sites.
▪ degradation of aesthetic and property value loss?		✓	The subproject will substantially improve the existing situation.
▪ nuisance to neighboring areas due to foul odor and influx of insects, rodents, etc.?		✓	There are no residential structures in Thilafushi Island. The Project will improve the existing situation.
▪ dislocation or involuntary resettlement of people?		✓	Not anticipated.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		✓	Not anticipated.
▪ risks and vulnerabilities related occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	✓		OHS risks are inherent to construction activities. However, these risks can be reduced through implementation of good construction practices and adoption of internationally recognized OHS measures such as the WB EHS guidelines on OHS on construction activities and SWM operations. These are included in the EMP.
▪ public health hazards from odor, smoke from fire, and diseases transmitted by flies, insects, birds and rats?		✓	No public access. Unauthorized personnel are not allowed in Thilafushi Island. However, the EMP ensures good housekeeping measures are included to mitigate the impacts at all subproject sites.
▪ deterioration of water quality as a result of contamination of receiving waters by leachate from land disposal system?		✓	Not applicable. However, the subprojects will be designed with concrete flooring and provided with leachate management (leachate treatment will be finalized during detailed design stage).
▪ contamination of ground and/or surface water by leachate from land disposal system?		✓	Not applicable. However, the subprojects will be designed with concrete flooring and provided with leachate management (leachate treatment will be finalized during detailed design stage).
▪ land use conflicts?		✓	Not anticipated.
▪ pollution of surface and ground water from leachate coming from sanitary landfill sites or methane gas produced from decomposition of solid wastes in the absence of air, which could enter the aquifer or escape through soil fissures at places far from the landfill site?		✓	Not applicable.
▪ inadequate buffer zone around landfill site to alleviate nuisances?		✓	Not applicable. Design of the existing Thilafushi Island included buffer zone.
▪ road blocking and/or increased traffic during construction of facilities?	✓		Anticipated during construction activities. However, impacts are temporary and short in duration. The EMP ensures measures are included to mitigate the impacts. Construction contractors will be required to coordinate with the local traffic police and they will prepare Traffic Management Plan. This will be included in the Contractor's EMP.
▪ noise and dust from construction activities?	✓		Limited receptors in vicinity, high ambient noise levels and winds. Impact of noise can be avoided by undertaking activities during day time when background noise is high. Noise-suppression gadgets will also be used. Dust emission can be avoided with the implementation of dust control measures such as sprinkling of water on sites and regular hauling of spoils.

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> <li>▪ temporary silt runoff due to construction?</li> </ul>	✓		Run-off during construction will be more. However, impacts are temporary and short in duration. The EMP ensures measures are included to mitigate the impacts. Construction contractors will be prohibited from stockpiling loose materials along drain channels and will be required to immediately dispose any waste materials. Silt fences and traps to be used.
<ul style="list-style-type: none"> <li>▪ hazards to public health due to inadequate management of landfill site caused by inadequate institutional and financial capabilities for the management of the landfill operation?</li> </ul>		✓	Not applicable. No access to public. Unauthorized persons are not allowed in Thilafushi Island. Output 3 of the Project will ensure WAMCO will have the capacity to manage and improve existing situation.
<ul style="list-style-type: none"> <li>▪ emission of potentially toxic volatile organics from land disposal site?</li> </ul>		✓	Not applicable.
<ul style="list-style-type: none"> <li>▪ surface and ground water pollution from leachate and methane gas migration?</li> </ul>	✓		Not applicable. However, the subprojects will be designed with concrete flooring and provided with leachate management (leachate treatment will be finalized during detailed design stage). Methane gas is not expected to be generated from C&D waste processing plant and ELV dismantling workshop.
<ul style="list-style-type: none"> <li>▪ loss of deep-rooted vegetation (e.g. trees) from landfill gas?</li> </ul>		✓	Not applicable. No trees on site.
<ul style="list-style-type: none"> <li>▪ explosion of toxic response from accumulated landfill gas in buildings?</li> </ul>		✓	Not applicable. Design of the subprojects will consider vents and gas monitoring (gas from existing dumpsite).
<ul style="list-style-type: none"> <li>▪ contamination of air quality from incineration?</li> </ul>		✓	Not applicable. The subproject will not cover incineration.
<ul style="list-style-type: none"> <li>▪ public health hazards from odor, smoke from fire, and diseases transmitted by flies, rodents, insects and birds, etc.?</li> </ul>		✓	No access to public. There are no residential structures in Thilafushi Island. The Project will improve the existing situation.
<ul style="list-style-type: none"> <li>▪ health and safety hazards to workers from toxic gases and hazardous materials in the site?</li> </ul>	✓		The EMP ensures occupational health and safety measures are included following relevant WB EHS guidelines. Chemicals other than vehicle fuels will not be used during construction and operation activities. Fuels will be stored and handled properly as per EMP.
<ul style="list-style-type: none"> <li>▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?</li> </ul>		✓	No significant increase in population of workers from overseas or off-island. Labor requirements will be sourced locally. Priority in employment will be given to local residents. Construction contractors will be required to provide workers camp with water supply and sanitation.
<ul style="list-style-type: none"> <li>▪ social conflicts if workers from other regions or countries are hired?</li> </ul>		✓	No significant increase in population of workers from overseas or off-island. Labor requirements will be sourced locally. Priority in employment will be given to local residents. Construction contractors will be required to provide workers camp with water supply and sanitation.
<ul style="list-style-type: none"> <li>▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?</li> </ul>		✓	No community in Thilafushi Island. Chemicals other than vehicle fuels will not be used during construction and operation activities. Fuels will be stored and handled properly following WB EHS guidelines as included in the EMP.



Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> <li>▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components (e.g., landfill or incinerator) of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?</li> </ul>		✓	No community in Thilafushi Island. Chemicals other than vehicle fuels will not be used during construction and operation activities. Fuels will be stored and handled properly following WB EHS guidelines as included in the EMP.

### A Checklist for Preliminary Climate Risk Screening

**Country/Project Title:** Greater Malé Environmental Improvement and Waste Management Project

**Sector :** Waste Management

**Subsector:** Water and urban infrastructure and services

**Division/Department:** South Asia Department / Urban Development and Water Division

Screening Questions		Score	Remarks <sup>34</sup>
<b>Location and Design of project</b>	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	1	All sites are located close to the coastline
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	Sea level rise and peak tide levels need to be considered in design
<b>Materials and Maintenance</b>	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	1	Design life of structures to take account of heat stress due to predicted temperature increases
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	
<b>Performance of project outputs</b>	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

**Result of Initial Screening (Low, Medium, High):** Medium Risk

**Other Comments:** \_\_\_\_\_

**Prepared by:** \_\_\_\_\_

<sup>34</sup> If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

### Grievance Redress Mechanism Complaint Form

(To be available in local language, if any)

The Greater Malé Environmental Improvement and Waste Management Project welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing \*(CONFIDENTIAL)\* above your name. Thank you.

<b>Date</b>		<b>Place of registration</b>			
<b>Contact Information/Personal Details</b>					
<b>Name</b>		<b>Gender</b>	<b>Male</b> <b>Female</b>	<b>Age</b>	
<b>Home Address</b>					
<b>Village / Town</b>					
<b>District</b>					
<b>Phone no.</b>					
<b>E-mail</b>					
<b>Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below:</b>					
If included as attachment/note/letter, please tick here:					
<b>How do you want us to reach you for feedback or update on your comment/grievance?</b>					

#### FOR OFFICIAL USE ONLY

<b>Registered by: (Name of official registering grievance)</b>	
<b>If – then mode:</b> <input type="checkbox"/> Note/Letter <input type="checkbox"/> E-mail <input type="checkbox"/> Verbal/Telephonic	
<b>Reviewed by: (Names/Positions of Official(s) reviewing grievance)</b>	
<b>Action Taken:</b>	
<b>Whether Action Taken Disclosed:</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No
<b>Means of Disclosure:</b>	

#### GRIVENCES RECORD AND ACTION TAKEN

Sr. No.	Date	Name and Contact No. of Complainer	Type of Complain	Place	Status of Redress	Remarks

## Appendix 1: Template for Semi-Annual Environmental Monitoring Report

### Introduction

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

Name	Designation/Office	Email Address	Contact Number	Roles
1. PMU				
2. PIUs				
3. Consultants				

- Overall project and sub-project progress and status
- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components/List of Works	Contract Status (specify if under bidding or contract awarded)	Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&M) <sup>a</sup>	If On-going Construction	
				%Physical Progress	Expected Completion Date

<sup>a</sup> If on-going construction, include %physical progress and expected date of completion.

**Compliance status with National/State/Local statutory environmental requirements<sup>a</sup>**

Package No.	Subproject Name	Statutory Environmental Requirements <sup>b</sup>	Status of Compliance <sup>c</sup>	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish <sup>d</sup>

<sup>a</sup> All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the “remarks” column.

<sup>b</sup> Specify (environmental clearance, permit/consent to establish, forest clearance, etc.)

<sup>c</sup> Specify if obtained, submitted and awaiting approval, application not yet submitted

<sup>d</sup> Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.

**Compliance status with environmental loan covenants**

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

**Compliance status with the environmental management plan (refer to EMP tables in APPROVED IEE/s)**

- Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

**Package-wise IEE Documentation Status**

Package Number	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No)	Remarks
	Not yet due (detailed design not yet completed)	Submitted to ADB (Provide Date of Submission)	Disclosed on project website (Provide Link)	Final IEE provided to Contractor/s (Yes/No)		

- For each package, provide name/s and contact details of contractor/s’ nodal person/s for environmental safeguards.

**Package-wise Contractor/s’ Nodal Persons for Environmental Safeguards**

Package Name	Contractor	Nodal Person	Email Address	Contact Number

- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below

**Summary of Environmental Monitoring Activities (for the Reporting Period)<sup>a</sup>**

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
<b>Design Phase</b>						
<b>Pre-Construction Phase</b>						
<b>Construction Phase</b>						
<b>Operational Phase</b>						

<sup>a</sup> Attach Laboratory Results and Sampling Map/Locations.

**Overall Compliance with CEMP/ EMP**

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

**Approach and methodology for environmental monitoring of the project**

- Briefly describe the approach and methodology used for environmental monitoring of each sub-project.

### Monitoring of environmental Impacts on Project Surroundings (ambient air, water quality and noise levels)

- Discuss the general condition of surroundings at the project site, with consideration of the following, whichever are applicable:
  - Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
  - Identify if muddy water is escaping site boundaries or if muddy tracks are seen on adjacent roads.
  - Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these are intact following heavy rain;
  - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area in the Appendix.
  - Confirm spill kits on site and site procedure for handling emergencies.
  - Identify any chemical stored on site and provide information on storage condition. Attach photograph.
  - Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
  - Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
  - Provide information on barricades, signages, and on-site boards. Provide photographs in the Appendix.
  - Indicate if there are any activities being under taken out of working hours and how that is being managed.
- Briefly discuss the basis for environmental parameters monitoring.
- Indicate type of environmental parameters to be monitored and identify the location.
- Indicate the method of monitoring and equipment used.
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements.

*As a minimum the results should be presented as per the tables below.*

#### Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 µg/m <sup>3</sup>	SO <sub>2</sub> µg/m <sup>3</sup>	NO <sub>2</sub> µg/m <sup>3</sup>

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m <sup>3</sup>	SO <sub>2</sub> µg/m <sup>3</sup>	NO <sub>2</sub> µg/m <sup>3</sup>

**Water Quality Results**

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)						
			pH	Conductivity $\mu\text{S/cm}$	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L	Heavy Metals (Cu, Cr, Hg, Pb) mg/L

Site No.	Date of Sampling	Site Location	Parameters (Monitoring Results)						
			pH	Conductivity $\mu\text{S/cm}$	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L	Heavy Metals (Cu, Cr, Hg, Pb) mg/L

**Noise Quality Results**

Site No.	Date of Testing	Site Location	$L_{Aeq}$ (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	$L_{Aeq}$ (dBA) (Monitoring Results)	
			Day Time	Night Time

**Grievance Redress Mechanism**

- Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).

**Complaints Received during the Reporting Period**

- Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

**SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS**

- Summary of follow up time-bound actions to be taken within a set timeframe.



**APPENDIXES**

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors
- Others

## SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name \_\_\_\_\_  
 Contract Number \_\_\_\_\_

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_  
 TITLE: \_\_\_\_\_ DMA: \_\_\_\_\_  
 LOCATION: \_\_\_\_\_ GROUP: \_\_\_\_\_

WEATHER CONDITION: \_\_\_\_\_

INITIAL SITE CONDITION: \_\_\_\_\_

CONCLUDING SITE CONDITION:  
 Satisfactory \_\_\_\_\_ Unsatisfactory \_\_\_\_\_ Incident \_\_\_\_\_ Resolved \_\_\_\_\_ Unresolved \_\_\_\_\_

INCIDENT:  
 Nature of incident: \_\_\_\_\_

Intervention Steps: \_\_\_\_\_

Incident Issues

Resolution

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

### Inspection

Emissions	Waste Minimization
Air Quality	Reuse and Recycling
Noise pollution	Dust and Litter Control
Hazardous Substances	Trees and Vegetation

Site Restored to Original Condition      Yes            No     

Signature \_\_\_\_\_

**Sign off**

\_\_\_\_\_