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

Environmental and Social Management Plan

Disclaimer

This Environmental and Social Management Plan has been prepared for the submission of the proposal to the Green Climate Fund for the purposes of assisting in the assessment of the potential environmental and social impacts of the proposal. This Environmental and Social Management Plan has been prepared prior to undertaking an Environmental and Social Impact Assessment. Normally, an Environmental and Social Management Plan would be prepared following baseline studies and then the subsequent impact assessment contained within the Environmental and Social Impact Assessment and would form the basis for the construction and operational environmental and social management plans.

As no Environmental and Social Impact Assessment have been undertaken for the projects, this Environmental and Social Management Plan has been prepared solely on the author's experience with projects of this nature and in consideration of international good practice for these types of projects. Accordingly, the Environmental and Social Management Plan will be subject to change following the preparation of the Environmental and Social Impact Assessment/s.

Assumptions

The following assumptions have been made in the preparation of this Environmental and Social Management Plan:

1. all components of the proposal will have an Environmental and Social Impact Assessment/s prepared prior to the construction and operation of the specific project components;
2. none of the projects will require the displacement of people;
3. none of the projects will be conducted in sensitive locations including coral reef systems;
4. the desalination plants will be located in areas where the dilution of brine will be quick and therefore will not impact on the receiving environment. Appropriate modelling will be conducted to gain an excellent understanding of the potential impacts of the brine;
5. the water being used to recharge groundwater aquifers will be of sufficient quality to not result in deleterious impacts to the quality of groundwater. Appropriate sampling and modelling will be conducted prior to any recharge;
6. appropriate erosion and sediment control will be undertaken during all stages of the projects; and
7. there will be no release of pollution and/or chemicals as a result of the projects.

Environmental and Social Management Plan for

Projects

1. This document is an Environmental and Social Management Plan (ESMP) for the "*Supporting vulnerable communities in Maldives to manage climate change-induced water shortages*" project submitted to the Green Climate Fund for funding. The project will deliver safe and secure potable water to over 105, 000 people in the Maldives in the face of climate change. The supply of potable water will be achieved by delivering the following results:

    a) scaling up integrated water supply system to provide safe potable water to vulnerable households;

    b) decentralized and cost-effective dry season water supply system introduced benefiting the seven Northern Atolls; and

    c) groundwater quality improved to secure potable water reserves for long term resilience.

Governing Legislation

2. The legislative and policy basis for the provision of water supply and sanitation services in the Republic of Maldives is controlled via three main documents, these being the *Constitution of the Republic of Maldives 2008*, the Manifesto of the Progressive Party of the Maldives (2013-2017) and the *Public Health Act 2012.* Environmental management and the requirement for an environmental impact assessment are controlled by the *Environment Protection and Preservation Act 1993* and the *Regulation on the Preparation of Environmental Impact Assessment Report 2012*. Additionally, water projects must comply with the *Guideline for IWRM Projects*.

Environment Protection and Preservation Act

3. The *Environment Protection and Preservation Act 1993* created the regulatory framework for the Maldives. Prior to the development of the projects, environmental and social impact assessments (ESIA) must be prepared by qualified consultants.

Regulation on the Preparation of Environmental Impact Assessment Report 2012

4. The *Regulation on the Preparation of Environmental Impact Assessment Report 2012* provides the regulatory management of ESIA in the Maldives. It provides for the undertaking of ESIAs where they fall within the relevant provisions of Schedule D for major projects. All projects must comply with the legislation and regulations.

Overview - Institutional Requirements for the Environmental and Social Management Plan

5. As the rainwater, desalination and groundwater recharge projects will be funded by the Green Climate Fund through the UNDP, all works (including but not limited to civil and construction contractors) must adhere to the outcomes of the ESIA and this or a modified ESMP including complying with the appropriate avoidance and mitigation measures. The ESIA and this or a modified ESMP will be assessed for each project by the Ministry of Environment and Energy (MEE) and UNDP prior to any works being undertaken. The ESMP identifies potential risks to the environment and social matters from the projects and outlines strategies for managing those risks and minimising undesirable environmental and social impacts.

6. The MEE will be responsible for the supervision of the ESMP. The UNDP with gain the endorsement of the MEE and will ensure the ESMP is adequate and followed. The supervising engineer will ensure timely remedial actions are taken by the contractor where necessary.

Objectives of the Environmental and Social Management Plan

7. An ESMP is a management tool used to assist in minimising the impact to the environment and reach a set of environmental objectives. To ensure the environmental objectives of the projects are met, this ESMP will be used by the contractor to structure and control the environmental management safeguards that are required to avoid or mitigate adverse effects on the environment.

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

    a) provide potable water to the people of the Maldives to reduce the impacts on natural systems that are currently stressed;

b) encourage good management practices through planning, commitment and continuous improvement of environmental practices;

c) minimise or prevent the pollution of land, air and water, particularly with respect to groundwater recharge and brine pollution;

d) protect native flora and fauna from the impacts of desalination plants;

e) comply with all applicable laws, regulations and standards for the protection of the environment; and

f) adopt the best practicable means available to prevent or minimise environmental impact.

g) describe all monitoring procedures required to identify impacts on the environment; and

h) provide an overview of the obligations of MEE and UNDP staff and contractors in regard to environmental obligations.

9. The ESMP will be updated from time to time by the contractor in consultation with the UNDP staff and MEE to incorporate changes in the detailed design phase of the projects.

General Management Structure and Responsibilities

10. The UNDP and MEE are accountable for the provision of specialist advice on environmental issues to the contractor and for environmental monitoring and reporting. The MEE will assess the environmental performance of the contractor in charge of construction throughout the project and ensure compliance with the ESMP.

11. The MEE will be responsible for monitoring the implementation of the ESMP by relevant supervisory staff during construction. During operations the contractor will be accountable for implementation of the ESMP. Contractors working on the projects have accountability for preventing or minimising environmental and social impacts.

Administration

12. The MEE will be responsible for the revision or updates of this document during the course of work. It is the responsibility of the person to whom the document is issued to ensure it is updated.

13. The site supervisor will be responsible for daily environmental inspections of the construction site. The MEE will cross check these inspections by undertaking monthly audits.

14. The contractor will maintain and keep all administrative and environmental records which would include a log of complaints together with records of any measures taken to mitigate the cause of the complaints.

15. The contractor will be responsible for the day to day compliance of the ESMP.

16. MEE will be the implementing agency and will be responsible for the implementation and compliance with the ESMP via the contractor. The ESMP will be part of any tender documentation.

17. The Supervising Engineer/Project Manager will supervise the contractor, while the MEE will be responsible for environment and social issues.

Public Consultation and Environmental and Social Disclosure

18. The projects are designed to improve access to potable water for over 105,000 people in the northern atolls of the Maldives. No specific sites have been selected for the desalination plants; however, during site selection, the project will ensure there are no resettlement issues. The ESIAs will also include public consultation as part of their stakeholder engagement plan and this information will be included in any modified ESMP.

19. The projects were discussed with MEE staff. While no on ground consultation has been undertaken at this time, it is expected that consultation with affected communities will be undertaken when the detail design of the projects are available by MEE. It is anticipated that based on the communities' needs, the projects will be fully accepted.

20. The UNDP and MEE will develop and release Community Flyers on a regular basis to provide interested stakeholders with an update on the construction status of the projects. A publicised telephone number will be maintained throughout the construction of all projects to serve as a point of contact for enquiries,

concerns and complaints. All enquiries, concerns and complaints will be recorded on a register and the appropriate manager will be informed. All material must be published in both Divehi and English.

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

    a) time, date and nature of enquiry, complaint or concern;

    b) type of communication (eg telephone, letter, personal contact);

    c) name, contact address and contact number;

    d) response and investigation undertaken as a result of the enquiry, complaint or concern; and

    e) actions taken and name of the person taking action.

22. Some enquiries, complaints and concerns may require an extended period to address. The complainant(s) will be kept informed of progress towards rectifying the concern. All enquiries, complaints and concerns will be investigated and a response given to the complainant in a timely manner.

23. A nominated contractor staff will be responsible for undertaking a review of all enquiries, complaints and concerns and ensuring progress toward resolution of each matter.

Site Supervisor

24. The site supervisor is responsible for ensuring compliance with the ESMP. The site supervisor will provide advice on effective environmental management of the project to the UNDP Staff, MEE and engineers and all construction site personnel. The site supervisor is to also ensure the environmental awareness of project personnel is maintained through appropriate training. A compliance report on mitigation measures will be submitted by the UNDP to MEE for the civil contractor. An independent review of the compliance may be undertaken during construction and post construction where deemed necessary.

Environmental Procedures and Site and Activity-Specific Work Plans/Instructions

25. Environmental procedures provide a written method describing how the management objectives for a particular environmental element are to be obtained. They contain the necessary detail to be site or activity-specific and are required to be followed for all construction works. Site and activity-specific work plans and instructions are to be issued through the following methods:

Environmental and Incident Reporting

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

Daily and Weekly Environmental Inspection Checklists

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

Corrective Actions

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

Complaints Register

29. A complaints register will be established to record any concerns raised by the community during construction. Any complaint will be advised to the UNDP and MEE within 24 hours of receiving the

complaint. The complaint will be investigated and following the investigation, if it relates to a significant incident, the matter will be referred to the UNDP for commentary and/or advice.

30. All complaints must be published in a report produced every six months in both Dhivehi and English.

Review and Auditing

31. The ESMP and its procedures are to be reviewed at least two month by UNDP staff and MEE. The objective of the review is to update the document to reflect knowledge gained during the course of construction operations and to reflect new knowledge and changed community standards (values). Any changes are to be developed and implemented in consultation with UNDP Staff and MEE. When an update is made, all site personnel are to be made aware of the revision immediately through a tool box meeting.

Training of Contractors

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

33. All construction personnel will attend an induction which covers health, safety, environment and cultural requirements.

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

Key Environmental and Social Indicators

35. This section identifies the Key Environmental and Social Indicators identified for the project and outlines respective management objectives, potential impacts, control activities and the environmental performance criteria against which these indicators will be judged (i.e. auditable). This section further addresses the need for monitoring and reporting of environmental performance with the aim of communicating the success and failures of control procedures, distinguish issues which require rectification and identify measures which will provide continuous improvement in the processes by which the projects are managed.

Water Quality

36. The projects involve the construction and operation of four desalinations plants, the installation of rainwater harvesting systems and the recharge of groundwater that is currently over-utilised and subject to pollution impacts.

37. The desalination plants will result in the release of highly saline brine into the marine environment. While it is assumed that none of the desalination plants will be constructed in protected and/or pristine environments, there is a necessity to maintain appropriate water quality standards within these environments when undertaking the construction and particularly operation of the desalination plants.

38. The groundwater recharge component has the potential to impact degrade the existing environment if the quality of the water being used for recharge is not of an acceptable standard. As such, it will be necessary to ensure any grey or black water has at least secondary treatment prior to recharge.

Performance Criteria

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

    a. no significant decrease in water quality of the coastal marine environment as a result of construction and operational activities;

    b. no significant decrease in the quality and quantity of surface and/or groundwater as a result of construction and operational activities in proximity to the projects;

    c. water being used for recharge will meet international good practice standards prior to recharge;

    d. water quality shall conform to any approval conditions stipulated by UNDP, MEE and/or other government departments, or in the absence of such conditions follow a ‘no worsening’ methodology;

e. no offsite impact will occur other than through the release of brine into the marine environment; and

f. effective implementation of site-specific Erosion, Drainage and Sediment Control Plan (EDSCP).

40. By following the management measures set out in the ESMP, construction and operation of the desalination plants, rainwater harvesting systems and groundwater recharge will not have a significant impact on water quality across the broader area.

Monitoring

41. A standardised water quality monitoring program has been developed for the projects. The program is subject to review and update at least every two months from the date of issue. The site supervisor will be required to conduct a daily visual inspection for nitrates, phosphates, faecal coliforms and turbidity within or adjacent to their work area as a part of the daily site inspection checklist.

Reporting

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

Table 1: Water Quality Management Measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
W1: Elevated suspended solids, nitrates, phosphates, faecal coliforms, silt content and turbidity in groundwater systems.	W1.1: Develop and implement a site specific Erosion, Drainage and Sediment Control Plan (EDSCP) to address drainage control, sediment and erosion controls and stockpiling of materials including soil during construction of all components of the projects. EDSCP measures to be inspected regularly to ensure all devices are functioning effectively.	Pre Earthworks	Site Supervisor	Initial set up and then as required with reporting to MEE and UNDP
	W1.2: Designated areas for storage of fuels, oils, chemicals or other hazardous liquids should have compacted impermeable bases and be surrounded by a bund to contain any spillage.	Entire construction and operation phase	All Personnel	Weekly with reporting to MEE and UNDP
	W1.3: Conduct regular surface and groundwater quality monitoring in location where the groundwater is likely to be impacted including assessing the changes to groundwater quality in terms of salinity, nitrates, phosphate, faecal coliforms and other potential pollutants. Parameters to be monitored include *E.coli*, pH, total suspended solids, Residual Chlorine, Nitrate Nitrite, Ammonia, potassium, surfactants, conductivity, Soap, oils and grease and waxes, Phenolic compounds as Phenol, heavy metals and acute toxicity	Entire construction and operation phase	Site Supervisor	Twice weekly with reporting to MEE and UNDP
	W1.4: Schedule works in stages to ensure that disturbed areas are revegetated and stabilised progressively and as soon as practicable after completion of works.	Pre Earthworks - Works not be undertaken during wet season	Site Supervisor and MEE	Maintain records
	W1.5: Construction materials will not be stockpiled in proximity to the recharge locations and or the coastal environment that may allow for release into the marine environment. Construction equipment will be removed from in proximity to the coastal environment at the end of each working day or if heavy rainfall is predicted.	Entire construction and operation phase	Site Supervisor	Maintain daily records

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
W2: Eutrophication of surrounding water bodies and impacts from elevated nutrient levels.	W2.1 Minimise the release of clays and very fine silts into the coastal environment through the installation of sediment basins, rock checks and sediment fences in appropriate places as outlined in the EDSCPs.	Entire construction phase	All Personnel	Weekly with reporting to MEE and UNDP
	W2.2 Disturbance of vegetation and drainage lines to be limited to that required for construction works when installing water tanks and construction of the desalination plants.	Entire construction phase	All Personnel	Weekly with reporting to MEE and UNDP
	W2.3 Manage the application of fertilisers (if required during rehabilitation of any site) to ensure that over application does not occur.	Post Construction	Site Supervisor	Maintain records
W3: Increase of gross pollutants, hydrocarbons, metals and other chemical pollutants including brine into the groundwater or marine environment.	W3.1: Reuse suitable water runoff from site to supplement construction water supply.	All phases	All Personnel	Weekly with reporting to MEE and UNDP
	W3.2: Designated areas for storage of fuels, oils, chemicals or other hazardous liquids should: 1. Have compacted impermeable bases; and 2. Surrounded by a bund to contain any spillage.	All phases	All Personnel	Weekly with reporting to MEE and UNDP
	W3.3: Check all vehicles, equipment and material storage areas daily for possible fuel, oil and chemical leaks.	All phases	All Personnel	Daily and maintain records
	W3.4: Rubbish and waste materials to be placed in suitable facilities to ensure that they do not enter the coastal environment. Ensure all absorbent material is placed in contaminant bags prior to removal.	All phases	All Personnel	Weekly reporting to MEE and UNDP
	W3.5: Minimise the use of herbicides and use only biodegradable herbicides that have minimal impact on water quality and fauna.	All phases	All personnel	Maintain records
	W3.6: Ensure brine is quickly diluted in the marine environment so as not to cause any adverse impacts	Entire operation phase	All Personnel	Weekly reporting to MEE and UNDP

Erosion, Drainage and Sediment Control

43. The Maldive Islands comprise over 1200 islands on 22 atolls that encompass an area of ~107,500km^2 of which less than 0.3 percent is land area. The islands occupy the central 700 km-long portion of the 3000 km-long Lacadive-Chagos submarine ridge where they form a double chain of north-south oriented parallel atolls separated by an inner sea. The atolls rest on a submarine plateau that is 275-700 m deep, 700 km long and up to 130 km wide.

44. The islands themselves are low-lying Holocene features that began forming between 3,000 and 5,500 years ago. The islands represent the most recent deposition along a submarine plateau that is underlain by approximately 2100 meters of mostly shallow-water carbonates resting on slowly-subsiding Eocene volcanic foundation.

45. The islands are composed primarily of reef-derived carbonate sediment that has been deposited by waves and currents. The islands are either seaward edge islands on the peripheral atoll rim formed of sand and gravel with steep coarse beaches along their seaward margins and sand beaches along their lagoon (protected) shores; or lagoon-edge islands composed mostly of sand with minor amounts of gravel; and sand-cay type islands which form both on peripheral rims and within lagoonal reef-top settings. Land elevation is generally less than 2 m above mean sea level. Because of their unconsolidated nature, the islands are considered ephemeral features over geologic timescales and their low elevation makes them particularly vulnerable to changes in sea level.

Performance Criteria

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

    a. no build-up of sediment in the coastal marine environment and or groundwater as a result of construction and operation activities;

    b. no degradation of water quality on or off site of all projects;

    c. all water exiting the project site and/or into groundwater systems is to have passed through best practice erosion, drainage and sediment controls; and

    d. effective implementation of site-specific EDSCP.

47. By following the management measures set out in the ESMP, construction and operation activities of the projects will not have a significant impact as a result of sedimentation across the broader area.

Monitoring

48. A standardised sediment control monitoring program has been developed for the projects. The program is subject to review and update at least every two months from the date of issue. The site supervisor will be required to:

    a. conduct site inspections on a weekly basis or after rainfall events exceeding 20mm in a 24 hour period;

    b. develop a site-specific checklist to document non-conformances to this ESMP or any applicable EDSCPs; and

    c. communicate the results of inspections and/or water quality testing to the Site Supervisor and ensure that any issues associated with control failures are rapidly rectified and processes are put in place to ensure that similar failures are not repeated.

49. It is the responsibility of the site supervisor to:

    a. conduct daily inspections of EDS control measures as part of the Daily Check Procedure; and

    b. consult MEE and UNDP staff when a non-conformance is suspected and amend accordingly.

Reporting

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

Table 2: Erosion, Drainage, Sediment Control Measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
E1: Loss of soil material and sedimentation to the marine environment and/or groundwater systems from site due to earthwork activities	E1.1: Develop and implement an EDSCP for any surface works, embankments and excavation work, water crossings and stormwater pathways.	Entire construction phase	All Personnel	Maintain records
	E1.2: Ensure that erosion and sediment control devices are installed, inspected and maintained as required.	Entire construction phase	All Personnel	Maintain records
	E1.3: Schedule/stage works to minimise cleared areas and exposed soils at all times.	Pre and during construction	Site Supervisor	Maintain records
	E1.4: Incorporate the design and location of temporary and permanent EDSC measures for all exposed areas and drainage lines. These shall be implemented prior to pre-construction activities and shall remain onsite during work	Pre and during construction	Site Supervisor	Maintain records
	E1.5: Schedule/stage proposed works to ensure that major vegetation disturbance and earthworks are carried out during periods of lower rainfall and wind speeds.	Pre and during construction	Site Supervisor	Maintain records
	E1.6: Strip and stockpile topsoil for use during revegetation.	Pre and during construction	Site Supervisor	Maintain records
	E1.7: Schedule/stage works to minimise the duration of stockpiling topsoil material	During construction	All Personnel	Maintain records
	E1.8: Locate stockpile areas away from drainage pathways, waterways and sensitive locations.	Pre and during construction	Site Supervisor	Maintain records
	E1.9: Design stormwater management measures to reduce flow velocities and avoid concentrating runoff.	Pre and during construction	Site Supervisor	Maintain records

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
	E1.10: Include check dams in drainage lines where necessary to reduce flow velocities and provide some filtration of sediment.	Pre and during construction	Site Supervisor	Maintain records
	E1.11: Mulching shall be used as a form of erosion and sediment control and where used on any slopes (dependent on site selection), include extra sediment fencing during high rainfall.	During construction	All Personnel	Maintain records
	E1.12: Bunding shall be used either within watercourses or around sensitive/dangerous goods as necessary.	During construction	All Personnel	Maintain records
	E1.14: Grassed buffer strips shall be incorporated where necessary during construction to reduce water velocity.	During construction	Site Supervisor	Maintain records
	E1.15: Silt curtain to be installed to protect from increased sediment loads.	During construction	Contractors	Maintain records
	E1.16: Excess sediment in all erosion and sediment control structures (eg. sediment basins, check dams) shall be removed when necessary to allow for adequate holding capacity.	During construction	Contractors	Maintain records
E2: Soil contamination	E2.1: If contamination is uncovered or suspected (outside of the project foorprints), undertake a Stage 1 preliminary site contamination investigation. The contractor should cease work if previously unidentified contamination is encountered and activate management procedures and obtain advice/permits/approval (as required).	Entire construction phase	All Personnel	Daily and maintain records
	E2.2: Adherence to best practice for the removal and disposal of contaminated soil/ material from site (if required), including contaminated soil within the project footprints.	Entire construction phase	All Personnel	Daily and maintain records
	E2.3: Drainage control measures to ensure runoff does not contact contaminated areas (including contaminated material within the project foot prints) and is directed/diverted to stable areas for release.	Entire construction phase	All Personnel	Daily and maintain records

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
	E2.4: Avoid importing fill that may result in site contamination and lacks accompanying certification/documentation. Where fill is not available through on site cut, it must be tested in accordance with geotechnical specifications.	Entire construction phase	All Personnel	Daily and maintain records

Noise and Vibration

51. All construction and operation activities have the potential to cause noise nuisance. Vibration disturbance to nearby residents and sensitive habitats is likely to be caused through the use of vibrating equipment. Blasting is not required to be undertaken as part of this project. Further, the intakes and diffusers can create underwater noise via pumps.

52. It is assumed that there are no sensitive receptors in proximity to the projects.

53. Contractors involved in construction activities should be familiar with methods of controlling noisy machines and alternative construction procedures as contained within specific Maldives' legislation or in its absence, international good practice may be used if the legislation has not been enacted.

54. The detail, typical equipment sound power levels, provides advice on project supervision and gives guidance noise reduction. Potential noise sources during construction may include:

    a. excavation equipment for all aspects of the projects including for the installation of rainwater harvesting systems and desalination plants;

    b. delivery vehicles;

    c. pumps; and

    d. power tools and compressors.

Performance Criteria

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

    a. noise from construction and operational activities must not cause an environmental nuisance at any noise sensitive place;

    b. undertake measures at all times to assist in minimising the noise associated with construction activities;

    c. no damage to off-site property caused by vibration from construction and operation activities; and

    d. corrective action to respond to complaints is to occur within 48 hours.

Monitoring

56. A standardised noise monitoring program has been developed for the projects. The program is subject to review and update at least every two months from the date of issue. Importantly, the site supervisor will:

    a. ensure equipment and machinery is regularly maintained and appropriately operated;

    b. carry out potentially noisy construction activities during daylight hours only; i.e. 7am -5pm.

Reporting

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

Table 3: Noise and Vibration Management Measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
N1: Increased noise levels	N1.1: Select plant and equipment and specific design work practices to ensure that noise emissions are minimised during construction and operation including all pumping equipment.	All phases	Contractor	Maintain records
	N1.2: Specific noise reduction devices such as silencers, mufflers and/or acoustic rock breaking heads shall be installed as appropriate to site plant and equipment.	Pre and during construction	Contractor	Maintain records
	N1.3 Minimise the need for and limit the emissions as far as practicable if noise generating construction works are to be carried out outside of the hours: 7am-5pm (Mon - Fri).	Construction phase	All Personnel	Daily and maintain records
	N1.4: Consultation with nearby residents in advance of construction activities particularly if noise generating construction activities are to be carried out outside of the hours: 7am-5pm (Mon - Fri) and 7am-3pm (Sat).	Construction phase	All Personnel	Daily and maintain records
	N1.5 The use of substitution control strategies shall be implemented, whereby excessive noise generating equipment items onsite are replaced with other alternatives.	Construction phase	All Personnel	Daily and maintain records
	N1.6 Provide temporary construction noise barriers in the form of solid hoardings where there may be an impact on specific residents.	Construction phase	Site Supervisor	Daily and maintain records
	N1.7 All incidents complaints and non-compliances related to noise shall be reported in accordance with the site incident reporting procedures and summarised in the register.	Construction phase	Site Supervisor	Maintain records
	N1.8 The contractor should conduct employee and operator training to improve awareness of the need to minimise excessive noise in work practices through implementation of measures.	Pre and during construction	Contractor	Maintain records
N2. Vibration due to construction	N2.1: Identify properties, structures and habitat locations that will be sensitive to vibration impacts resulting from construction and operation of the projects.	Pre and during construction	Contractor	Maintain records
	N2.2: Design to give due regard to temporary and permanent mitigation measures for noise and vibration from construction and operational vibration impacts.	Pre-construction	Contractor	Maintain records

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
	N2.3: All incidents, complaints and con-compliances related to vibration shall be reported in accordance with the site incident reporting procedures and summarised in the register.	Construction phase	Site Supervisor	Maintain records
	N2.4: During construction, standard measure shall be taken to locate and protect underground services from construction and operational vibration impacts	Construction phase	Site Supervisor	Maintain records

Air Quality

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

59. Vibration disturbance to nearby residents is likely to be caused through the use of vibrating rollers, graders and construction traffic. Blasting is not required to be undertaken as part of this project.

60. It is assumed that there are no sensitive receptors in proximity to the projects.

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

Performance Criteria

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

    a. release of dust/particle matter must not cause an environmental nuisance;

    b. undertake measures at all times to assist in minimising the air quality impacts associated with construction and operation activities; and

    c. corrective action to respond to complaints is to occur within 48 hours.

Monitoring

63. A standardised air monitoring program has been developed for the projects. The program is subject to review and update at least every two months from the date of issue. Importantly, the site supervisor will:

    a. ensure all stockpiles are covered so as to not allow dust to generate; and

    b. the requirement for dust suppression will be visually observed by all personnel daily and by MEE and UNDP staff when undertaking routine site inspections (minimum frequency of once per week).

Reporting

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

Table 4: Air Quality Management Measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
A1: Increase in dust levels at sensitive locations	A1.1: Implement effective dust management measures in all areas during design, construction and operation.	Pre and during construction	All Personnel	Daily and maintain records
	A1.2: Install dust gauges at locations identified for construction lay down and stockpiling within the project footprints.	During construction	Site Supervisor	Daily and Weekly Reports
	A1.3: Manage dust/particulate matter generating activities to ensure that emissions do not cause an environmental nuisance at any sensitive locations	During construction	Site Supervisor	Daily and maintain records
	A1.4: Construction activities should minimising risks associated with climatic events.	During construction	Site Supervisor	Daily and maintain records
	A1.5: Implement scheduling/staging of proposed works to ensure major vegetation disturbance and earthworks are minimised.	Entire construction	Contractor	Daily and maintain records
	A1.6: Ensure that materials to be stockpiled onsite are not ordered and/or purchased until they are required for works.	Entire construction	Contractor	Daily and maintain records
	A1.7: Locate material stockpile areas as far as practicable from sensitive receptors.	During construction	Site Supervisor	Daily and maintain records
	A1.8: Source sufficient water of a suitable quality for dust suppression activities complying with any water restrictions.	During construction	Site Supervisor	Daily and maintain records
	A1.9: Schedule revegetation activities to ensure optimum survival of vegetation species.	During construction	Site Supervisor	Maintain records
	A1.10: Ensure an air quality management plan is developed and implemented.	Pre and during construction	Contractor	Maintain records
	A1.11: Rubbish skips and receptacles should be covered and located as far as practicable from sensitive locations.	During construction	Site Supervisor	Maintain records
	A1.12: Restrict speeds on haul roads and access tracks.	During construction	Site Supervisor	Daily and maintain records
	A1.13: Cover loads of haul trucks and equipment and plant when not in use and in transit.	During construction	Site Supervisor	Daily and maintain records

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
A2. Increase in vehicle emissions (including odours and fumes)	A2.1 Ensure construction vehicles are switched off when not in use.	During construction	Site Supervisor	Daily and maintain records
	A2.2 Ensure only vehicles required to undertake works are operated onsite.	During construction	Site Supervisor	Daily and maintain records
	A2.3 Ensure all construction vehicles, plant and machinery are maintained and operated in accordance with design standards and specifications.	During construction	Site Supervisor	Daily and maintain records
	A2.4 Develop and implement an induction program for all site personnel, which includes as a minimum an outline of the minimum requirements for environmental management relating to the site.	Pre and during construction	Contractor	Daily and maintain records
	A2.5 Locate construction car park and vehicle/plant/equipment storage areas as far as practicable from sensitive locations.	During construction	Site Supervisor	Daily and maintain records
	A2.6 Direct exhaust emissions of mobile plant away from the ground.	During construction	Site Supervisor	Daily and maintain records
	A2.7 Rubbish skips and receptacles should be covered and located as far as practicable from sensitive locations.	During construction	Site Supervisor	Daily and maintain records

Flora and Fauna

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

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

Performance Criteria

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

    a. no clearance of vegetation outside of the designated clearing boundaries;

    b. no death to native fauna as a result of clearing activities;

    c. no deleterious impacts on marine habitats

    d. no introduction of *new* weed species as a result of construction activities;

    e. no increase in *existing* weed proliferation within or outside of the corridor as a result of construction activities; and

    f. successful establishment of rehabilitation works incorporating species native to the local area.

Monitoring

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

    a. any non-conformances to this ESMP;

    b. the areas that have been rehabilitated during the preceding week; and

    c. details of the corrective action undertaken.

Reporting

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

Table 5: Flora and Fauna Management Measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
FF1. Habitat loss and disturbance of fauna	FF1.1 Limit vegetation clearing and minimise habitat disturbance through adequate protection and management of retained vegetation.	During construction	Site Supervisor	Daily and maintain records
	FF1.2: Minimise noise levels and lighting intrusion throughout construction and operation in the vicinity of any sensitive locations.	During construction	Site Supervisor	Daily and maintain records
	FF1.3: Ensure that all site personnel are made aware of sensitive fauna/habitat areas and the requirements for the protection of these areas.	During construction	Contractor	Daily and maintain records
	FF1.4 Minimise disturbance to onsite fauna and recover and rescue any injured or orphaned fauna during construction and operation.	During construction	Contractor	Daily and maintain records, report to MEE
FF2. Introduced flora and weed species	FF2.1: Implement an EDSCP to reduce the spread of weeds through erosion and sediment entering any waterways and therefore spreading.	Pre and during construction	Contractor	Maintain records
	FF2.2: Revegetate disturbed areas using native and locally endemic species that have high habitat value.	During construction	Site Supervisor	As required and maintain records
	FF2.3: Minimise disturbance to mature remnant vegetation, particularly canopy trees.	During construction	Site Supervisor	Daily and maintain records
	FF2.4: The removal of regrowth native trees should be minimised particularly where the width of a forest is narrow.	During construction	Site Supervisor	Daily and maintain records
	FF2.5: Small trees and shrubs shall be removed in preference to large trees.	During construction	Site Supervisor	Daily and maintain records
	FF2.6: Vegetation to be removed shall be clearly marked using paint or flagging tape.	During construction	Site Supervisor	Daily and maintain records

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
FF2. Introduced flora and weed species	FF2.7: Environmental weeds and noxious weeds within the project footprints shall be controlled.	During and post construction	Site Supervisor	Weekly and maintain records

Waste Management

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

    a. waste avoidance(avoid using unnecessary material on the projects) ;

    b. waste re-use (re-use material and reduce disposing);

    c. waste recycling(recycle material such as cans, bottles, etc.; and

    d. waste disposal (all petruscible to be dumped at approved landfills).

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

    a. filters etc used in the desalination process;

    b. filters used in the treatment of grey and black water for recharging groundwater aquifers;

    c. the excavation wastes unsuitable for reuse during earthworks;

    d. wastes from construction equipment maintenance. Various heavy vehicles and construction equipment will be utilised for the duration of the construction phase. Liquid hazardous wastes from cleaning, repairing and maintenance of this equipment may be generated. Likewise leakage or spillage of fuels/oils within the site needs to be managed and disposed of appropriately;

    e. non-hazardous liquid wastes will be generated through the use of workers' facilities such as toilets; and

    f. general wastes including scrap materials and biodegradable wastes

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

Performance Criteria

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

    a. waste generation is minimised through the implementation of the waste hierarchy (avoidance, reduce, reuse, recycle);

    b. no litter will be observed within the project corridor or surrounds as a result of activities by site personnel;

    c. no complaints received regarding waste generation and management;

    d. any waste from on-site portable sanitary facilities will be sent off site for disposal by a waste licensed contractor; and

    e. waste oils obtained from the oil separator will be collected and disposed or recycled off-site, local oil companies or shipped for recycling.

Monitoring

74. A waste management monitoring program has been developed for the projects. The program is subject to review and update at least every two months from the date of issue.

Reporting

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

Table 6: Waste Management Measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
WT1: Production of wastes and excessive use of resources	WT1.1: Preference shall be given to materials that can be used to construct the project that would reduce the direct and indirect waste generated.	Pre and during construction	Contractor	Maintain records
	WT1.2: Consideration shall be given to the use of recycled aggregates and fly-ash cement mixes for construction of the desalination plants.	Pre and during construction	Contractor	Maintain records
	WT1.3: Daily waste practices shall be carried out unless these are delegated to the activities of external waste management bodies.	During construction	Site Supervisor	Daily and maintain records
	WT1.4: The use of construction materials shall be optimised and where possible a recycling policy adopted.	During construction	Site Supervisor	Weekly and maintain records
	WT1.5: Separate waste streams shall be maintained at all times i.e. general domestic waste, construction waste and contaminated waste. Specific areas on site shall be designated for the temporary management of the various waste streams. Adequate signage and colour coded bins will be used for each waste streams.	During construction	Site Supervisor	Weekly and maintain records
	WT1.6: Any contaminated waste shall be disposed of at an approved landfill.	During construction	Site Supervisor	Weekly and maintain records
	WT1.7: Recyclable waste (including oil and some construction waste) shall be collected separately and disposed of correctly.	During construction	Site Supervisor	Weekly and maintain records
	WT1.8: Waste sites shall be sufficiently covered daily to ensure that wildlife does not have access.	During construction	Site Supervisor	Daily
	WT1.9: Disposal of waste including all filters shall be carried out in accordance with the Government of the Maldives' requirements.	During construction	Site Supervisor	Weekly and maintain records
	WT1.10: Fuel and lubricant leakages from vehicles and plant shall be immediately rectified.	During construction	Site Supervisor	Daily and maintain records
	WT1.11: Where possible, concrete batching plants shall be centrally located to minimise the occurrence of concrete batching at individual construction locations.	Pre and during construction	Contractor	Maintain records
	WT1.12: Major maintenance and repairs shall be carried out off-site whenever practicable.	During construction	Site Supervisor	Weekly and maintain records

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
	WT1.13: Remnants of concrete shall not be left at any location along the corridor.	During Construction	Site Supervisor	Weekly and maintain records
	WT1.14: Disposal of trees shall be undertaken in accordance with one or more of the following methods: a. Left in place; b. Chipped and mulched; and c. Large trunk sections may be sold/passed on to a commercial mill.	During Construction	Site Supervisor	Weekly and maintain records
	WT1.15: Hydrocarbon wastes shall be stored in colour coded and labelled drums placed around fuelling depots.	During Construction	Site Supervisor	Daily and maintain records
	WT1.16: Where possible, fuel and chemical storage and handling shall be undertaken at central fuel and chemical storage facilities, such as petrol stations.	During Construction	Site Supervisor	Daily and maintain records
	WT1.17: On-site storage of fuel and chemicals shall be kept to a minimum.	During Construction	Contractor	Daily, maintain records and report any incidents
	WT1.18: Any waste oils and lubricants are to be collected and transported to recyclers or designated disposal sites as soon as possible.	During Construction	Site Supervisor	Daily and maintain records
	WT1.19: Any dangerous goods stored on site shall be stored in accordance with Maldives' regulations.	During Construction	Contractor	Daily and maintain records

Chemical and Fuel Management

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

    a. diesel and unleaded petrol for the refuelling of plant equipment and generators;

    b. grease etc used during construction;

    c. chemicals used during the reverse osmosis process include but are not limited to chlorine, sodium hypochlorite, sodium bisulphate, heavy metals, anti-scalants; coagulants like ferric- or aluminum chloride; antifoaming agents like polyglycols; biocides; and cleaning chemicals; and

    d. chemicals used in the treatment of grey and black water for recharge into the groundwater aquifers.

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

78. Potential activities which could result in spills are:

    a. use of machinery and vehicles – potential for fuels, oils and lubricant spills;

    b. transport, storage and handling of fuels, machinery oils, grease;

    c. transport, storage and handling of cement/asphalt(bitumen) and other construction materials;

    d. potential release of chemicals used in the desalination process into the surrounding marine environment;

    e. potential release of chemicals used in the waste water treatment process into the groundwater aquifers; and

    f. Impacts associated with hazardous materials will primarily be associated with the storage and handling during the construction and operation phase.

Performance Criteria

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

    a. ensure a Material Safety Data Sheet (MSDS) Register should be developed for all chemicals and fuels retained on site;

    b. handling and storage of hazardous material is in accordance with the relevant legislation and best management practices;

    c. all spills are reported to MEE within ***one hour*** of occurrence; and

    d. no spills enter the local estuarine and/or coastal environment; and

    e. prevent the uncontrolled release of oil, grease and diesel to the environment;

    f. no spills of hazardous materials;

    g. no chemical spills into the groundwater aquifers; and

    h. no contamination of land due to spills of hazardous materials.

Monitoring

80. A chemical and fuel management program has been developed for the projects. The program is subject to review and update at least every two months from the date of issue. Importantly, the site supervisor should:

    a. conducted daily chemical and fuel assessments as part of their daily check procedure;

    b. manage the selection, purchase, storage, handling and disposal of chemicals to ensure minimal environmental impact;

    c. regularly inspect equipment that uses fuel, lubricants and/or hydraulic fluid;

d. regular inspect all equipment used in the desalination process for leaks etc;

e. develop procedures and install equipment to contain, minimise and recover spills; and

f. provide staff with procedures and training in spill prevention and clean up.

Reporting

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

Table 7: Chemical and Fuels Management Measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
C1 Poor management of chemicals and fuels	C1.1: Prepare spill management plan addressing measures	Pre-construction	Contractor	Maintain records and weekly reporting
	C1.2: Store and handle all chemicals, fuels, oils and potentially hazardous materials as specified in relevant standards and guidelines. All hazardous materials to be approved for use onsite. All hazardous materials and construction fuel will be stored in appropriate storage facilities (e.g. fuel and chemicals will be stored in a bunded area).	During Construction	Site Supervisor	Daily and maintain records
	C1.3: Hydrocarbon wastes shall be stored in colour coded and labelled drums placed around fuelling depots and disposed of.	During Construction	Site Supervisor	Daily and maintain records
	C1.4: Where possible, fuel and chemical storage and handling shall be undertaken at central fuel and chemical storage facilities, such as petrol stations/site depot.	During Construction	Site Supervisor	Daily and maintain records
	C1.5: Onsite storage of fuel and chemicals shall be kept to a minimum.	During Construction	Site Supervisor	Daily and maintain records
	C1.6: Emergency clean up kits for oil and chemical spills will be available onsite and in all large vehicles.	During Construction	Site Supervisor	Daily and maintain records
	C1.7: Refuelling activities to preferentially occur off site however if required onsite ensure refuelling activities occur in designated areas of the site where appropriate temporary protection measures have been designed/located and are no less than 20 metres from surface waters and drainage lines.	During Construction	Site Supervisor	Daily and maintain records

Emergency Response Plan

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

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

84. The contractor will need to incorporate construction emergency responses into the project complying with the requirements under the Occupational, Health and Safety Policy of the contractor or the work related Government of the Maldives legislation.

Performance Criteria

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

    a. no incident of fire outbreak during construction;

    b. reduce the risk of fire by undertaking hot works within cleared locations;

    c. provide an immediate and effective response to incidents that represent a risk to public health, safety or the environment; and

    d. minimise environmental harm due to unforeseen incidents.

Monitoring

86. An emergency response monitoring program has been developed for the projects. The program is subject to review and update at least every two months from the date of issue. Importantly, visual inspections will be conducted by site supervisor daily with reporting to MEE and UNDP staff on a weekly basis (minimum) noting any non-conformances to this ESMP.

Reporting

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

Table 8: Emergency Management Measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
E1. Fire and Emergency management and prevention strategies implemented	E1.1: Flammable and combustible liquids bunding/storage areas to be designed in accordance with appropriate international standards	Pre and during construction	Contractor	Daily and maintain records
	E1.2: Fire extinguishers are to be available within all site vehicle	During construction	Contractor	Daily and maintain records
	E1.3: No open fires are permitted within the project area	During construction	Site Supervisor	Daily and maintain records
	E1.4: No cigarette butts are to be disposed of onto the ground throughout the project area, all smokers must carry a portable disposal bin to reduce the risk of a spot fire starting and general litter	During construction	All Personnel	Daily and maintain records
	E1.5: Any stockpiles of mulch are not to exceed two metres in height and width and must be turned regularly.	During construction	All Personnel	Daily and maintain records
	E1.6: Train all staff in emergency preparedness and response (cover health and safety at the work site)	During construction	Site Supervisor	Daily and maintain records
	E1.7: Check and replenish First Aid Kits	During construction	Site Supervisor	Daily and maintain records
	E1.8: Use of Personal Protection Equipment	During construction	All Personnel	Daily and maintain records