**REVISED ENVIRONMENTAL MANAGEMENT PLAN**

**KULHUDHUFFUSHI HARBOUR EXPASION PROJECT**

An environmental management plan is an implementation plan that consists of mitigation measures, monitoring program and institutional setup to be adapted during construction and operation of harbor expansion works to minimize adverse environmental and social impacts. This plan also includes actions that can be taken to implement mitigation measures. Budgetary estimates for environmental mitigation measures, monitoring program during construction and operation phases are also given.

1. **Mitigation Measures; Construction Phase**

The environmental impacts associated with the construction phase result from dredging, reclamation, construction of breakwaters, and construction of quay walls and transportation of construction material and construction workforce camp. The impacts will be mainly on the marine and socio-economic environments. The mitigation measures for each of the activities, which are exerting impacts on the environment, are presented in the following sections.

**Dredging, reclamation and construction of breakwater:** Dredging of the harbor basin will would generate sandy material of varying size, causing disturbance to the bottom sediments, impacts on the seawater quality, air and noise pollution, etc. The dredged material will be used in reclamation. The construction of breakwaters will require import of granite rock. The measures proposed to be adopted for mitigation of the impacts are:

* Interaction with local communities and community leaders will be held so that they are made aware of the construction.
* The construction zones would be demarcated along with display / signboards restricting movement of locals, limited to the construction period, in and around the construction limits.
* Fire-fighting equipment will be installed at the construction sites for addressing potential fire related risks and accidents.
* Mitigation measures like provision of silt screens and creation of bund wall from initial dredge material will be adopted. The dredging and reclamation works will be limited mostly to day time and where possible to low tide. Work at low tide will ensure fine sediments are not readily washed off to residual impact areas.
* Reclamation and dredging operational area be limited to bare minimum so that the impacted zone is minimal.
* Diesel driven engines of workboats, barges and dredgers will be well-maintained and will meet emission norms of diesel vehicles.
* Seawater quality monitoring program will be initiated with special emphasis on turbidity and will follow the schedule given in the monitoring program.
* Extreme precaution will be taken to avoid spillage or leakage of diesel, oils and lubes from construction related vehicles. To reduce the impacts from spills or leaks occur during operation and maintenance of these vehicles will be done only at designated and surfaces in the construction yard. Spills / leaks, if any, will be recovered and disposed according to local standards.
* Pollution control equipment such as boomers and dispersants will be made available at the construction sites for addressing potential pollution risks and accidents.
* The worker camps will be located close to the harbor within the reclaimed land.
* The camps will be adequately equipped with all the necessary facilities / amenities such as water supply, power supply, wastewater collection, solid waste collection and sanitation.
* The domestic wastes generated from the camps will be disposed at local waste disposal site.

**Construction of Ferry Terminal Building and Fish Market:** During construction of the proposed ferry terminal and fish market, large amounts of construction waste are believed to be generated, which may have some environmental impacts on the environment. In order to address construction waste related issues and impacts, the following measures will be undertaken;

* A dedicated site for construction waste collection will be identified.
* All construction waste such as cement bags, wood, iron, concrete, packing, paints, etc will be initially collected at the waste collection area.
* Measures will be taken to transport construction waste from the waste collection area to the waste management site of the island for proper disposal on a regular basis.
* All reusable items will be reused in the construction works.
* Measures will be taken to minimize construction waste at all times.

1. **Mitigation measure: Operation Phase**

**Harbour operations**

Harbor expansion works aims to provide a dedicated harbor area for cargo and passengers. The cargo to and from harbor would be general trade cargo from Male and local produce to and from nearby islands. Therefore the general cargo to be handles is clean and no significant impact is expected. Some level of solid waste from general cargo will be produced. Liquid waste sourced from ships is likely to cause some impact. This includes deterioration of water quality resulting from waste water from ships, sewage waste, ship based bilge water oil and waste oil spills. The following measures are proposed to mitigate impacts from discharge that are of ship based;

* Operational facilities such as passenger terminal amenities will be connected to local sewerage disposal system.
* Oily wastes which are generated from the mechanical areas of the port will be collected and disposed appropriately according to local standards
* Ships / vessels calling at harbor would be discouraged from dumping the wastewater during the berthing period since there is no local regulation prohibiting such actions.

**Ferry Terminal and Fish Market operations**

Most likely impacts from operation of ferry terminal and the fish market will be generation of solid waste and wastewater and if these wastes are inappropriately disposed, some environmental impacts are believed to occur. The following measures will be implemented during operation of the ferry terminal and fish market to safeguard the environment.

* Waste collection bins will be placed in designated areas of the ferry terminal such as hall, café and the fish market and bins will have lids for keeping it closed at all times.
* A regular mechanism for collecting waste from the ferry terminal and the fish market will be implemented.
* In order to appropriately dispose wastewater from ferry terminal and fish market, wastewater will be connected to the island sewerage system.
* Appropriate grease traps will be installed in the wastewater collection network from the café at the ferry terminal.
* Fish waste and wastewater from the fish market will not be disposed at the site.
* Proper hygiene will be maintained at all time at the ferry terminal and the fish market. In this regard, the premises will be cleaned on a regular basis.

The following table provides environmental mitigation measures for all relevant components identified that may have an impact on either natural or socio economic environment. It was provided an indication of the duration and magnitude of impacts and specific institutional responsibility for both construction and operation phase of the project.

**Table1: Possible environmental impacts and mitigation measures for harbor expansion construction and operation phases**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Potential impacts** | **Mitigation measures** | **Location** | **Impact intensity** | **Implementing agency** | **Supervising agency** | **Estimated cost (USD)** |
| 1. **Detailed design and pre-construction stage** | | | | | | |
| 1.1 Non  compliances  due to lack of  clearances and  permits | Secure the environmental clearance before the start of any civil works  Secure all other permits and no objections that may be necessary for construction works | N/A | High | PMU | MHI | Covered by  MHI |
| 1.2 Inadequate  EMP | Review the EMP and revise it based on the detailed design as necessary for approval by the PMU. | N/A | Moderate | PMC | PMU | Covered under  PMC costs |
| 1.3 Poor  environment  safeguards  planning and  implementation  documents | Prepare the following plans for review and approval by the PMC and before the start of the respective works:  - Construction camp layout and management plan  - Dredge management plan  - Spoil disposal plan  - Emergency management plan | N/A | Moderate | Contractor | PMC | Covered under  Contractors  costs |
| 1. **Construction stage** | | | | | | |
| 2.1 Littering on  terrestrial and  marine  environment | Littering, accidental disposal and spillage of any construction wastes should be avoided by pre-planning ways of their transportation and unloading at site. Careful planning of the work activities can also reduce the amount of waste generated.  During works over water structures, all construction related waste will be collected and sent to the waste management site. Burnable  waste will be sent to local disposal site. | Land and Lagoon  Land and Lagoon | Minor to  moderate, short  term impact  Minor | Contractor  Contractor | PMU, PMC  PMU, PMC | N/A (no  additional cost)  Included in the  initial cost of  project |
| 2.2 Damage to  reef by  unloading  works | Awareness raising of project managers on environmentally friendly practices to minimize  negative impacts on all aspects of construction | Temporary  access area  and land | Minor, short  term impact | Contractor | PMC, PMU | N/A |
| Remaining material and machinery demobilized after completion of dredging works  Reclamation and dredging operational area be limited to bare minimum so that the impacted zone is minimal, | On land | Minor | Contractor | PMC, PMU | N/A (may cost more, for the  material  unloading  process) |
| 2.3  Sedimentation  and siltation on  the reef and  lagoon | Operation of heavy machinery only in the low tide(dredging and piling works)  Clearly mark needed areas for dredging and reclamation  Install silt screens and of bund wall around the  dredging area to confine sediments within the  construction site  Limit dredging and reclamation works mostly today time and where possible to low tide. Working at low tide will ensure fine sediments are not readily washed off to residual impact areas. | Lagoon | Major to  moderate, short  term impact | Contractor | PMC, PMU | Cost of heavy  machinery  increase of 20%  Silt curtain cost  unit rate is  $55.00, total  length required  is 680 m plus installation charges of $7,500  therefore cost is  $44,900.00  Development of bund walls by the reclamation sites will cost $75/m |
| 2.4 Physical  damage to  marine flora  and fauna | Avoid operation of heavy machinery out of construction area or boundary  Prohibit workers from harvesting/fishing or intestinally harming any marine flora or fauna and penalize them if anyone carries out any of these prohibited activities. | Lagoon /  reef | Minor to  moderate | Contractor | PMC. PMU | N/A |
| 2.5 Seawater  contamination, | Oil /chemical handling and management procedures will be made known to all relevant  staff, appropriate supervision,  Take precaution to avoid spillage or leakage of diesel, oils and lubes from construction vehicles.  Conduct maintenance of these vehicles only at  designated areas and surfaces in the construction yard and not inside the water  Spills / leaks, if any, will be recovered and disposed according to local standards.  Locate worker camps within the reclaimed land and away from the beach area  Equip camps with necessary facilities / amenities such as water supply, power supply, wastewater collection, solid waste collection and sanitation.  Domestic wastes generated from the camps will be disposed at local waste disposal site. | Reef flat  area/ lagoon | Moderate impact | Contractor | PMC, PMU | N/A (included  in the initial  project cost) |
| 2.6 Air pollution | Heavy machinery used dredging and reclamation works operated minimized.  Regularly maintain diesel driven engines of work boats, barges and dredgers and ensure they meet required emission levels for diesel vehicles. | Air | Minor/short  termed | Contractor | PMC, PMU | N/A (may  increase labor  cost) |
| 2.7 Noise  pollution | Avoid use of heavy machinery during night hours | At  construction  site | Minor/short term | Contractor | PMC, PMU | N/A (same as  above) |
| 2.8 Poor  occupational  Health and  Safety | Provision of adequate safety gear to workers such as gloves, face masks, earplugs, boots, life jackets etc.  Maintain a fully equipped first aid kit on the construction site and establish proper links with the local medical facility to treat more injuries and sickness.  Maintain hygienic environment in construction camp site by providing proper waste management facilities, clean drinking water and proper toilet facilities.  Provide proper fencing and signage to ensure public do not enter unsafe areas in and around the construction site.  Installation of fire-fighting and pollution control equipment at the construction sites. | Construction  site | Moderate | Contractor | PMC, PMU | Covered under contractors costs.  Fire fighting equipment $15,000 and pollution control equipment $10,000 |
| 1. **Operational stage** | | | | | | |
| 3.1 Solid waste  generated at  harbor, ferry terminal and fish market | All waste generated from harbor related activities with appropriate guideline.  Place bins in key areas of the terminal, café and fish market.  Install grease traps in the café wastewater collection system.  Solid waste sorted at service outlets and sorted at the waste processing area.  Reuse and recycle waste where possible. | On land and in harbour | Minor if proper  waste  management  plans are in  place | Harbor management unit | EPA,  Kulhudhuffushi  Council | N/A (included in  the initial project  cost) |
| 3.2 Release of  liquid waste  from boats into  the harbor, ferry terminal and fish market | Encourage boat passengers to use the toilet facilities in the Harbor terminal.  Explore technical solutions with the boat to have liquid waste storage systems to be disposed on land.  Ensure waste oil from boats is not dumped within the harbor. | Harbor | Moderate | Harbor management unit,  Kulhudhuffushi Council  CDTA consultant | EPA |  |
| 3.3 Damage to  the reef by boat  land  recreational  activity | Harbor entrance channel clearly marked.  Marked access and recess from recreational harbor with appropriate buoys. | Lagoon, reef | Monitoring term | Harbor management  Kulhudhuffushi Council | Kulhudhuffushi  Council | USD 100-150  (cost of making  markers and  buoys)  N/A  (included in the  staff training  program) |
| 3.4 Air pollution  from boat  operation | Engine running of the vessels when in harbor is minimized. | Air | Minor if properly  managed, long  term | Harbor management | Kulhudhuffushi  Council | N/A |

1. **Institutional arrangements**

Effective implementation and supervision of the environmental mitigation measures and monitoring activities identified in this document can only be achieved through a suitable institutional mechanism involving stakeholders of the project. A broad institutional mechanism for environment safeguards associated with the project, roles and responsibilities of various agencies and parties for implementing environment safeguards are provided below.

**Project Management Unit (PMU):** The Project Director (PD) under the PMU is responsible for the overall compliance of the project with the SPS and the applicable environmental laws and rules under the Government of Maldives. The Environmental officers under the Environment Unit of MHI will be responsible for processing the environmental clearance and addressing environmental concerns under the project as needed. The PD will be responsible for:

* Reviewing and approving all environment safeguards related documents such as the IEE report, safeguard monitoring reports prepared by the PMC and forwarding to ADB for disclosure on the ADB website.
* Conducting monthly site visits.
* Timely endorsement and signing of key documents and forwarding to the respective agency required for processing of environmental clearance and other environment safeguards related permits and licenses.
* Award the civil works contract only after the environmental clearance has been received from EPA.
* Ensure all contractors obtain permits, licenses etc. for activities such as dredging and others before the implementation of the respective construction activity.
* Taking proactive and timely measures to address any environment safeguards related challenges and significant grievances (during construction stage).

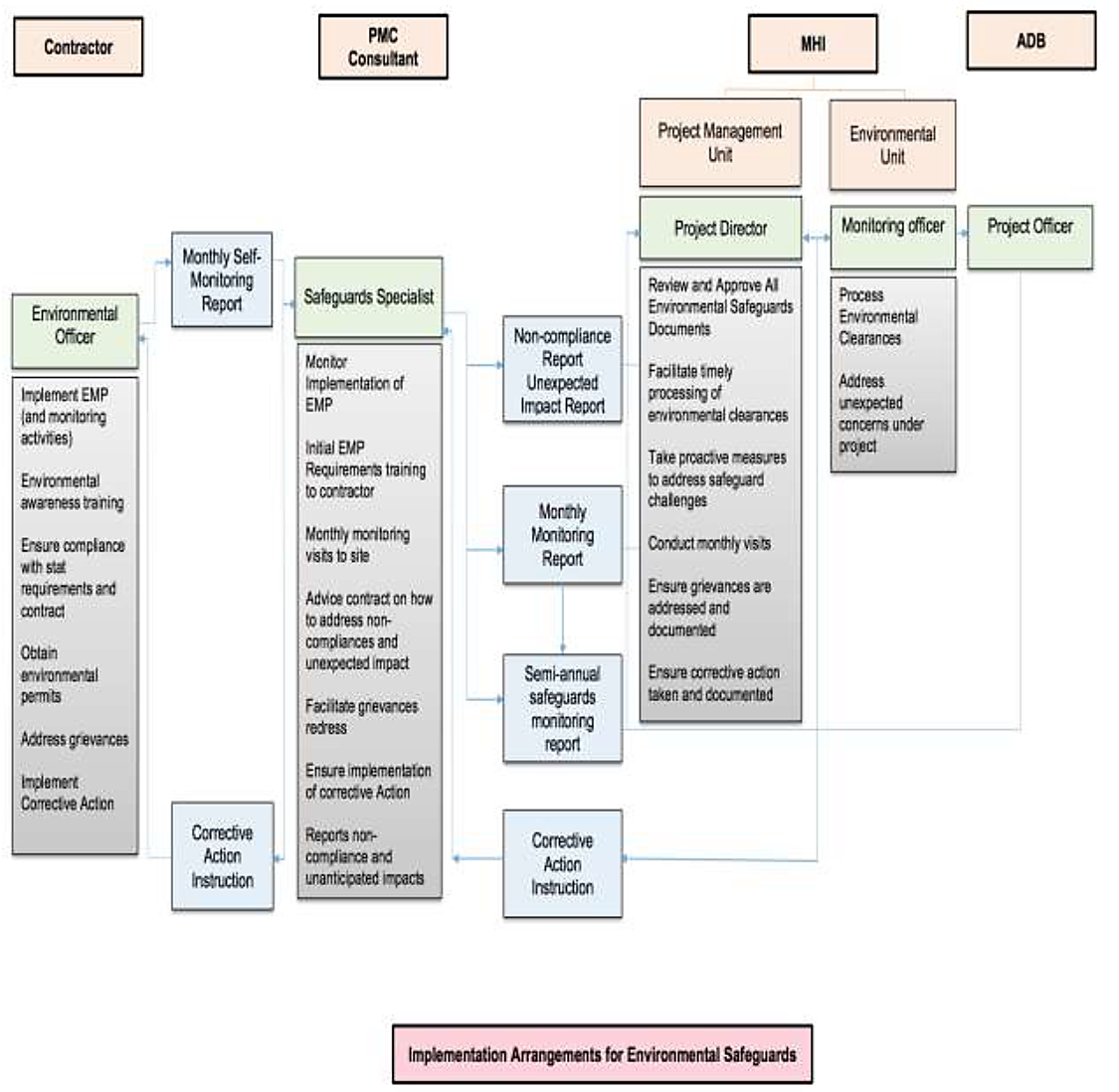
**Project Management Consultant (PMC):** The Environment Specialist under the PMU will monitor implementation of the EMP and monitoring plan by the contractor. Specific responsibilities of the Environmental Specialist are:

* Review the detailed design of the harbor and ensure it includes the least impacts on the local environment and follows recommendations made in the IEE report.
* Conduct an initial training on implementation of the EMP requirements for the contractor including providing guidance on format of monitoring checklists/reports to be maintained by the contractor.
* Provide on the job training for contract workers as needed during project construction.
* Conduct monthly site visits to the construction site.
* Review the test results for testing the seawater quality and air quality.
* Review the EMP implementation records of the contractor and crosscheck with the project site conditions.
* Ensure contractors secure necessary permits and clearances on a timely basis.
* Prepare monthly monitoring reports based on the site visit and submit it to the PD for review and approval.
* Based on the monthly reports prepare a consolidated Semi-Annual Safeguards.
* Monitoring reports with inputs from the Social Development Specialist of the PMC on social safeguards. The Semi-Annual Safeguards Monitoring Report will be submitted to the PD for review and approval and further submission to ADB for disclosure on the ADB website.
* Advise the contractor on how to address non-compliances.
* Report the occurrence of any unanticipated impacts to the PD and recommend mitigation measures and need for the IEE report to be updated.
* Accordingly advise the contractor on how to address the unanticipated impact.
* Facilitate the functioning of grievance redress mechanism and ensure that all complaints are resolved on a timely basis.

**Contractor:** The Contractor is the principal agent to implement the EMP during the pre-construction and construction stage. Specifically, the contractor will:

* Appoint a qualified environment focal person to implement the EMP and monitoring plan.
* Obtain necessary environmental license(s), permits etc. from relevant agencies as prior to commencement of civil works contracts.
* Implement all mitigation measures in the EMP and activities in the Monitoring Plan.
* Submit monthly self-monitoring reports to the PMU.
* Ensure that all workers, site agents, including site supervisors and management participate in training sessions delivered by PMU.
* Ensure compliance with environmental statutory requirements and contractual obligations.
* Participate in resolving issues as a member of the GRC.
* Respond promptly to grievances raised by the local community or any stakeholder and implement environmental corrective actions or additional environmental mitigation measures as necessary.
* Based on the results of EMP monitoring, cooperate with the PIU to implement environmental corrective actions and corrective action plans, as necessary.

Implementation arrangements for environmental impact mitigation and monitoring to ensure both local and ADB specific environmental safeguards are met are given in following Figure.



1. **Grievance Redress Mechanism**

GRC will be established at two-levels, one at the project site level and another at PMU level, to receive, evaluate and facilitate the resolution of concerns, complaints and grievances of all affected persons. The GRC is aimed to provide a trusted way to voice and resolve concerns linked to the project, and to be an effective way to address displaced person’s concerns without allowing it to escalate resulting in delays in project implementation. The GRC will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. The response time prescribed for the GRCs would be four weeks. The GRC is not intended to bypass the government’s inbuilt redress process, nor the provisions of the statute, but rather it is intended to address displaced persons concerns and complaints promptly, making it readily accessible to all segments of the displaced persons and is scaled to the risks and impacts of the project.

First Level of GRC: The project site level GRCs will function on site where the harbor expansion is being implemented. The GRC will be chaired by the Resident Engineer and the members will comprise of the following as members, including 2 women members.

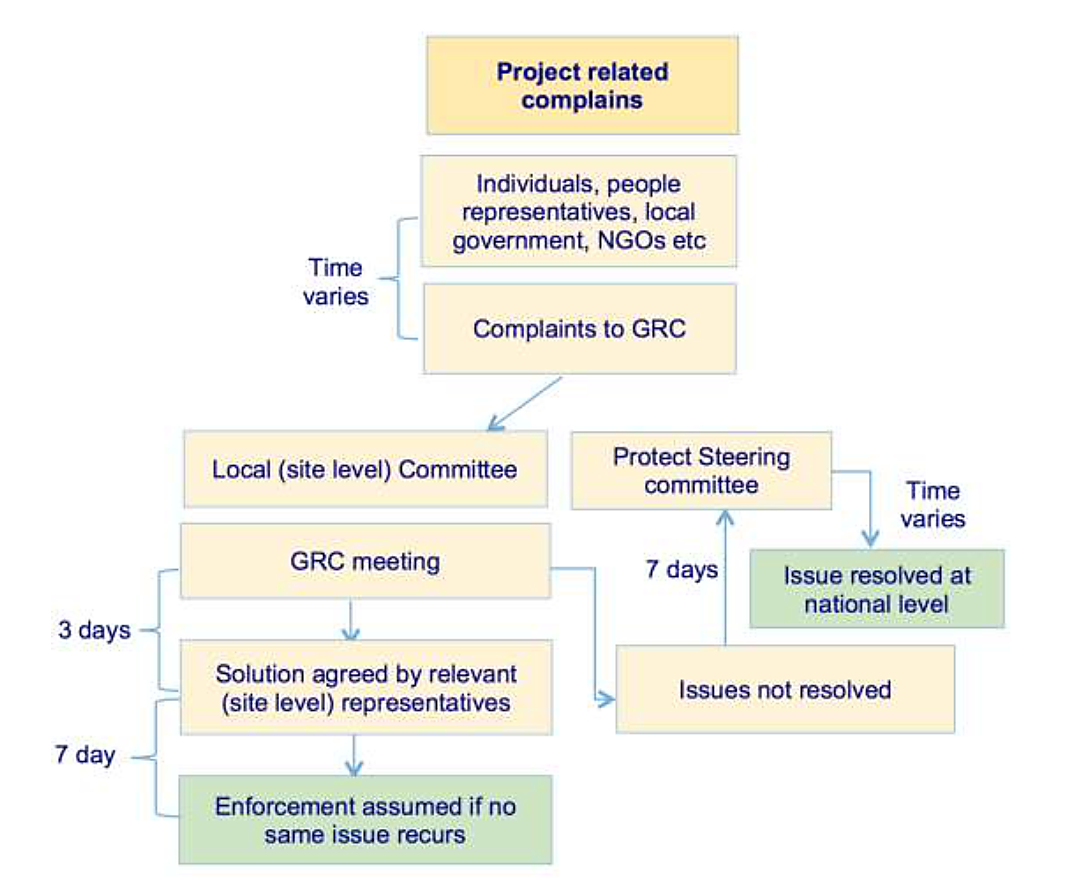
* Island Council representative
* NGO representative / Person of standing from the community
* NGO representative / Person of standing from the community
* Contractor representative

Second Level GRC: Project Steering Committee

* Senior Official, MoFT
* Senior Official, MHI
* Senior Official, MED

The primary level of actions to address project related grievances are through grievance redress committee at site (First level of GRC). Complaints from local individuals, community representative can be filed to the committee through the project management site office. A formal complaint logbook can be placed at the site office. Minor complaints can be resolved immediately where possible by the site supervisor or engineer. If a complaint cannot be resolved then the matter has to be discussed at first level grievance committee no later than 3days of the logged complaint. If a solution for the complaint can be agreed it shall be implemented and rectified to a satisfactory level within 7 days from a decision made from the committee meeting. If no further compliant from a specific is does not recur it shall be assumed that the specific issue is resolved. All complaints and resolutions for those complaints shall be appropriately logged for relevant reporting and documentations.

It any compliant cannot be resolved at site and no suitable remedial measures are reached then such issues can be brought to attention of second level grievance committee (Project Steering Committee). Such issues shall be informed to the committee within 7 days of meeting of the committee (first level) where a decision a decision cannot be made. The timeframe for addressing issues in such instances are difficult to estimate and thus may vary. Where timely decision can be made by steering committee it shall be communicated to the site level committee and to establish good communication between relevant stakeholders of the complaint. The mechanism for resolving complaints showing various responsible representatives and time frames are shown in following Figure.



1. **Environmental monitoring**

Monitoring is the systematic collection of information over a long period of time. It involves the measuring and recording of environmental variables associated with the development impacts. Monitoring is needed to;

* Compare predicted and actual impacts
* Assess the effectiveness of mitigation measures
* Obtain information about responses of receptors to impacts
* Enforce and ensure legal standards and requirements set with project approval
* approvals
* Prevent and take remedial measures for negative environmental issues resulting
* from inaccurate predictions
* Minimize errors in future assessments and impact predictions
* Make future assessments more efficient
* Provide information environmentally responsible project management
* Improve IEE and monitoring process

Impact and mitigation monitoring is carried out to compare predicted and actual impacts occurring from project activities to determine the efficiency of the mitigation measures. This type of monitoring is targeted at assessing project related impacts on the natural, social and economic impact natural resources and dependent communities that are likely to affect due to implementation of the project. Impact monitoring is supported by an expectation that at some level anthropogenic impacts become unacceptable and action will be taken to either prevent further impacts or re-mediate affected systems and community. Monitoring environmental mitigation identified for significant environmental impacts aims to compare predicted and actual(residual) impacts so that effectiveness of mitigation measures can be determined.

Monitoring works during the construction and operational phase will be carried out according to the following Tables. Cost for the monitoring (data collection) activities will be covered by Project Management Consultant (commitment to carryout and finance environmental mitigation and monitoring work shall be provided by Project proponent (MHI). Letter of commitment is given in the Proponent’s declaration EIA Report, page xiii).

The monitoring report structure provided in the EIA Regulations 2012 (2012/R-27) shall be used for the monitoring report preparation. Environmental monitoring reports including social safeguard inputs shall be submitted every six months to EPA and ADB for the duration of construction phase with data collected as scheduled on environmental attributes as proposed in monitoring program (See Table 2). Environmental monitoring report during operation stage of the project shall be submitted to EPA and ADB on an annual basis with data collected as scheduled on environmental attributes as proposed in the monitoring program during operation (see following Table).

**Table 2: Monitoring program for the project**

|  |  |  |  |
| --- | --- | --- | --- |
| **Reef community** | **Methodology** | **Sampling frequency** | **Responsibility** |
| **Construction phase** | | | |
| Reef benthos (coral  and other benthic  cover) | Photo quadrate  method at 250 by 5  meter belt transect  areas at baseline  project impact area  and control site | Every 3 months | Contractor, Verification by PMC |
| Reef fish  community, diversity  and abundance | Visual Census of  reef fish diversity  and abundance at  baseline data  collection locations | Every 3 months | Contractor, Verification by PMC |
| Seawater (seawater  tested for  contaminants or  increased in  nutrients due to  dredging,  reclamation and  harbor protection  related works), | Water sampled from baseline sampling locations.  Water samples tested by a Nationally accredited laboratory Following parameters are to be tested;  **Physical**  **properties:**  Salinity, pH,  Electrical  conductivity,  Dissolved oxygen,  Turbidity  **Chemical**  **properties:**  Biological Oxygen  Demand,  Nitrite, Nitrate,  Phosphate,  Sulfates  Hydrocarbon  **Biological**  **properties:** Total  coliforms, fecal  coliforms  **Metals including**  **heavy metals:**  Iron, Copper,  Zinc, Magnesium | Every 1 month | Contractor, Verification by PMC |
| Sedimentation rates | Set up sediment  traps on baseline  data collected as  project impact area  and control site | Every 2 weeks for the entire duration of dredging and reclamation works, 3 months post dredging and reclamation. | Contractor, Verification by PMC |
| **Operation phase** | | | |
| Reef benthos (coral  and other benthic cover) | Photo quadrate  method at 250 by 5meter belt transect areas at baseline  project impact area  and control site | Every 6 months after construction phase is completed  (total 2 years) | PMU |
| Reef fish  community, diversity  and abundance | Visual Census of  reef fish diversity  and abundance at  baseline data  collection locations | Every 6 months after construction phase is completed (total 2 years) | PMU |
| Sediment quality | Sediment sampling  at harbor basins (2)  are core samples  and analyzed for  physic-chemical  properties and  heavy metals by a  Nationally accredited  laboratory to  include:  pH, organic matter,  nutrients, Iron,  Copper, Tin, Zinc,  Magnesium,  Mercury | Quarterly for 2 years | PMU |
| Seawater (seawater  tested for  contaminants or  increased in  nutrients due to  waste from vessels,  fuel and waste oils, | Water sampled  from baseline  sampling locations.  Water samples  tested by a  Nationally  accredited  laboratory  Following  parameters are to  be tested;  **Physical**  **properties:**  Salinity, pH,  Electrical  conductivity,  Dissolved oxygen,  Turbidity  **Chemical**  **properties:**  Biological Oxygen  Demand,  Nitrite, Nitrate,  Phosphate,  Sulfates  Hydrocarbon  **Biological**  **properties:** Total  coliforms, fecal  coliforms  **Metals including**  **heavy metals:**  Iron, Copper,  Zinc, Magnesium | Quarterly for 2 years | PMU |

**Monitoring report format**

Monitoring reporting and format will follow the schedule and report structure shown in Environmental Impact Assessment Guidelines by EPA.

The following Monitoring Report Format will be followed;

**Summary monitoring report**

* Title, date, Consultant
* Summary of parameters measures, methods, equipment, location and frequency
* Highlight and discuss any unusual and/or significant results that may be of concern based on the IEE/EIA report

**Final monitoring report**

* Title, date, Consultant
* An executive summary
* Basic information on the project
* Drawing/plans as appropriate showing the project area, any environment sensitive receivers and the location of the monitoring and control stations
* Discussion on the implementation of the mitigation measures and pollution control measures
* Parameters monitored, methodology used, environment quality performance/standards limits
* Monitoring results including date, time, frequency and duration
* Presentation of monitored parameters (graphical plots and trends)
* Constrains and any factors which might have affected the monitoring results
* A summary of non-compliance of the environmental quality performance limits and discussion of their implications
* Description of the actions taken in the event of non-compliance
* A summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken
* A forecast of the works programme, impact prediction and monitoring schedule for the remainder of the project
* Comments, recommendations and conclusions for the monitoring period.