

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ



Ministry of National Planning and Infrastructure
Male', Republic of Maldives.

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މާލެ، ރިޕުބްލިކް އޮފް މާލްދިވެހިރާއްޖެ.

TERMS OF REFERENCE

Consultancy Services for conducting detailed investigations and Design development for Coastal Protection at S.Meedhoo and S.Hithadhoo, Maldives

A. INTRODUCTION

Ministry of National Planning and Infrastructure (MNPI) on behalf of the Government of Maldives is seeking the assistance of a qualified and competent consulting firm for conducting detailed investigations and Design development for Coastal Protection at S.Meedhoo and S. Hithadhoo, Maldives.

B. BACKGROUND

The Republic of Maldives is a low lying, atoll based, archipelagic nation in the central Indian Ocean. It comprises 1,190 islands grouped into 26 atolls that together occupy a land area of 298 km² and form a chain over 820 km in length, spread over an area of around 90,000 sq km. With a total population of 341,256, it is the smallest Asian country in terms of area and population. It is also amongst the most susceptible to climate change. The country has an average elevation of 1.5 meters above sea- level. The two most important sectors of the economy are tourism and fisheries which contribute nearly 80% of the country's Gross Domestic Product (GDP).

Vulnerability of Maldives

The Maldivian islands are regularly exposed to multiple natural hazards and the disaster risk scenario for the country is described as “moderate” due to a low probability of hazard occurrence and high vulnerability from exposure to geographical, topographical and socio-economic factors. Its unique geography makes this archipelagic small-islands nation particularly vulnerable to projected adverse consequences of climate change, including sea-level rise, as well as increases in sea surface temperature, ocean acidification and frequency/intensity of droughts and storms. Coastal erosion and associated impacts are one of the most pressing issues faced by the islands of Maldives. Due to the inherent land scarcity of

having small islands, most of the human settlements and critical infrastructure are concentrated along the coastal areas. While erosion and accretion of littoral sediments is a natural and dynamic process; extreme wave and storm conditions, changes in long term wave regimes and sea level rise impacts have been observed to exacerbate impacts of climate change. Despite stringent environmental laws in place, coastal modifications such as harbor development have been observed as a major driver of erosion.

Vulnerability of Meedhoo, Addu Atoll

The island of Meedhoo is located on the north eastern peripheral reef of Addu Atoll. According to 2014 census, the resident population of the island is 1,871.

Meedhoo has been facing severe coastal erosion on the northern and eastern side of the island for numerous years, resulting in impacts not limited to loss of land.

The case of erosion at Hithadhoo is very severe on the ocean side, with a number of houses being on the edge of the eroding beach.

To prevent further land loss and contribute to the resilience of the community in Meedhoo and Hithadhoo, Ministry of National Planning and Infrastructure (hereinafter referred to as the Ministry) is seeking consultancy for detailed environmental investigations and design development for coastal protection at Meedhoo and Hithadhoo, Addu Atoll based on in depth analysis of the existing situation in the islands.

C. OBJECTIVES OF THE ASSIGNMENT

The main objective of the assignment is to prepare a design for coastal protection of these islands that will cater to both protection and usability of the coast by the residents, based on the outcome of the detailed investigation.

The specific tasks associated with this assignment include the following:

- Undertake literature review of information available on the existing environment of Meedhoo and Hithadhoo;
- Undertake long term environmental, bathymetrical and hydrological (including but not limited to waves and currents) data collection relevant to the assignment. Data collection on the shoreline changes, wave and current data shall be taken in May, July and September and presented as an environmental survey report;

- Undertake a feasibility study to determine the most appropriate coastal protection method for the islands;
- Undertake public consultation to map the uses of the coast, including their concerns and their vision for the coast to maximize both usability and protection of the coast;
- Develop concept engineering designs that balances both environmental and socioeconomic requirements;
- Prepare final engineering design for the feasible coastal protection options for the islands, including design report, drawings, BOQ and specifications; and
- Prepare and submit Environmental Impact Assessment Report to obtain the necessary environmental clearances.

D. SCOPE OF WORKS

Under the guidance and coordination with the Ministry, the consultant will work to deliver the following sub-component activities in consultation with Meedhoo and Hithadhoo councils and the community. The specific tasks for the assignment include the following:

1. Undertake literature review of existing information available. When undertaking this task include existing studies undertaken for the islands with respect to coastal modification, coastal erosion and hazard vulnerability, including but not limited to any historical and current data on coastal erosion rates, shoreline dynamics, anthropogenic and environmental drivers of erosion, flooding associated with storm surges, any existing survey maps and data from Environmental Impact Assessment reports, and other relevant documents. Also include any information on historically significant areas around the shoreline.
2. Data collection to assess the state of the existing environment and long term coastal processes, fill information gaps and to get most up to date information. This shall include but not be limited to waves and currents data collection, shoreline survey, topographic survey, bathymetric and marine surveys and socio economic surveys. The above mentioned surveys shall be undertaken at preapproved intervals to map sediment movement and shoreline changes, and change in coastal process shall be examined by image analysis of this together with collected information for historical coastal modification, natural extreme event, etc. Sample parameters and data collection frequency is stated in the table below.

LITTORAL MOVEMENT			
No.	Item for Survey, Analysis	Objective	Data to be required
1	Satellite Image Analysis	To know long term change of shoreline & coral reef	satellite image or/and old aerial photo
2	Wave & Current Observation	To know driving force of littoral movement	wave height, period, direction, water level
3	Beach Profile Survey & Taking photo from fix point	To know seasonal change of beach	Beach profile for each section Shoreline change for each frequency Photo comparison for each fix point
4	Sand Sampling & Sieve analysis	To know required grain size for nourishment	photo for sand sample and result of sieve analysis
			Specification, Frequency 1969, 1996, 2003, 2019 and others (if collected) Prefer to collect data for 1 year (if possible) frequency of maintenance (change battery, data extraction) is every 4 months Mes. Mode : 20 min. in every 20 min., $\Delta t=0.2$ or 0.5s, install depth : more than 15 m Frequency: every 3 months Duration: 1 year Section interval : every 300 m in continuous sediment cell Section : same section as beach profile survey Taking point: LWL, MWL, HWL and berm top for 1 section
NATURAL ENVIRONMENT			
No.	Item for Survey, Analysis	Objective	Data to be required
1	Line transect (substrate conditions)	To know substrate conditions at the target site	distances at the substrate changes along the transect line (coral, sand, rock sea grass, etc.) Taking photos of substrates conditions
3	Water quality	To know seasonal change of sea water quality	Sea water quality (pH, DO, EC, Turbidity, temperature, Salt)
			Specification, Frequency Section: same section as beach profile survey Distance: up to reef edge Photos: every changes in substrates Section: same section as beach profile survey Taking point: LWL, MWL, HWL and berm top for 1 section

Table 1: Sample parameters for data collection and it's frequency

3. Undertake public consultation with sufficient representation from all groups of the local council and community, including but not limited business/economic sectors and NGOs. Identify the current uses of the beach, how erosion has impacted these uses and their future vision for the beach. Discuss options of coastal protection and ascertain the public perception of which methods would be most acceptable to the community and why.
4. Based on the initial environmental surveys and public consultation, prepare concept drawings for coastal protection at these islands, and outline the pros and cons of each option with reference to the environmental, socioeconomic and financial aspects. Incorporate as much as realistic, the public views and vision for their islands.
5. Present final environmental surveys report including data collected as stated in task 2. This report is expected to fill the gaps identified in the report on existing environment (task 1). The report shall inform development of the feasibility study for the coastal protection options.
6. A feasibility study to determine best possible coastal protection option for the islands. At least three options need to be presented excluding the no project option and each option needs to be compared taking into account financial, social and environmental context. A cost benefit analysis needs to be undertaken for each selected option. When undertaking the feasibility study, based on the base map created in task 2 above, maps need to be developed for various future climate scenarios and the robustness of the different proposed options in each of these climate scenarios needs to be investigated. In addition, the option needs to be tested for various extreme weather events, for example one in twenty-five year, one in 50 year, flood events. The consultant shall recommend the best possible option based on this feasibility study.
7. Prepare detailed engineering design and drawing for the most feasible option selected above through task 3. The detailed engineering design should include detailed accounting for the material required and estimate costing for material requirements and labor (BOQ). A rough schedule of implementation of the project needs be proposed with the detailed engineering design.

8. Prepare and submit Environmental Impact Assessment report as per Environmental Impact Assessment Regulations 2012, including but not limited to the information gathered in the studies above.

E. OUTPUTS/DELIVERABLES

Please note that the timings are approximate depending on the actual date of the commencement of the assignment. The deliverables stated below should include, but not be limited to, the corresponding items noted in the Scope of Works above.

- (i). Inception brief detailing out the specific tasks to be carried out, a time-based work plan, work methodology and other appropriate technicalities for conducting the assignment (to be submitted to the Ministry). The Inception brief shall be submitted no later than **02** weeks after the commencement of the assignment. The Inception brief shall also identify any constraints the consultant/firm foresees with delivering the services and propose actions to be implemented to overcome the constraints identified.
- (ii). Report on existing environment needs to be prepared based on the literature review and initial field surveys undertaken. This report shall identify data and information gaps that will need to be addressed to prepare a holistic and successful coastal protection project. This report needs to be submitted no later than **06** weeks after the commencement of the assignment.
- (iii). Public consultation report which identifies uses, concerns and constraints faced by the community due to coastal erosion and associated impacts, and include their vision for the coast. This report needs to be submitted no later than **09** weeks after the commencement of the assignment.
- (iv). Concept drawings for coastal protection at this islands outlining the pros and cons of each option with reference to the environmental and socioeconomic aspects. Incorporate as much as realistic, the public views and vision for their islands. This deliverable needs to be submitted no later than **15** weeks after the commencement of the assignment.
- (v). Final environmental survey report should address the identified information gaps as stated in Deliverable 2 of this assignment. This report needs to be submitted no later than **20** weeks after the commencement of the assignment.

- (vi). Feasibility study report, exploring three different options proposed by the consultants, needs to be prepared and submitted, no later than **24** weeks from the commencement of the assignment.
- (vii). Report, drawings and specifications of the detailed engineering design Upon approval of the most feasible option from above by the Ministry, the detailed engineering design and drawings, along with the BOQ need to be developed for this option. The report highlighting the detailed engineering design and drawings needs to be submitted no later than **28** weeks from the commencement of the assignment.
- (viii). Environmental Impact Assessment Report to get the necessary environmental clearance for this project. This shall include preparation and submission of any additional information required to gain an approval for this project. The Environmental Impact Assessment report needs to be submitted no later than **32** weeks from the commencement of the assignment.

F. REPORTING OBLIGATIONS

All reports and documents needs to be submitted to the Ministry by the specified due date for each deliverable. All reports and documents needs to be first submitted in draft format as an electronic copy. The Client will review the reports and documents and provide comments to the consultant as soon as practicable. The consultant will address the comments of Client and submit as Final Reports within a week of receipt of comments. Following approval of the drafts, all final reports and documents should be submitted in English in 2 (two) hard copies and an electronic copy on CD. Designs shall be submitted in both AutoCAD and PDF format.

G. CONSULANT STAFFING REQUIREMENTS

Shortlisted consultants will have the opportunity to propose staff to support their technical proposal in the response to the Request of Proposals. The following table identifies the minimum staffing requirements and their qualification.

Professional Staff	Area of Expertise
Project Manager/Team leader	<p>Bachelor’s degree in environmental science, civil/environmental engineering, geography, hydrology or earth science.</p> <p>Master’s degree in environmental science, civil/environmental engineering, geography, hydrology or earth science will be an advantage.</p>
	<p>General work experience of more than 6 years after graduation will be an added advantage</p>
	<p>Experience in undertaking surveys and assessments for coastal protection and/or modification and hazard and risk assessment.</p> <p>Previous relevant experience working in the Maldives (Knowledge of issues around environmental sustainability and climate change adaptation in Maldives)</p>
Civil Engineer/ Coastal Engineer	<p>Bachelor’s degree in Civil/Coastal Engineering</p> <p>Master’s degree in in Civil/Coastal Engineering will be an advantage.</p>
	<p>General work experience of more than 6 years after graduation will be an added advantage.</p>
	<p>Experience in undertaking surveys and assessments for coastal protection and/or modification and hazard and risk assessment.</p> <p>Previous relevant experience working in the Maldives.</p>

	<p>Experience in coastal protection/infrastructure design projects of similar nature.</p> <p>Previous relevant experience working in the Maldives (Knowledge of issues around environmental sustainability and climate change adaptation in Maldives)</p>
Community Liaison Officer	<p>Bachelor's degree in the social sciences, business administration, economics or environmental science.</p> <p>Master's degree in social sciences, business administration, economics or environmental science will be an advantage.</p> <p>General work experience of more than 6 years after graduation will be an added advantage.</p> <p>Experience in undertaking community consultations and liaising with the community in undertaking development projects.</p> <p>Previous relevant experience working in the Maldives (Knowledge of issues around environmental sustainability and climate change adaptation in Maldives)</p>
EIA Consultant	<p>Bachelor's degree in environmental science/management, civil/environmental engineering, geography, hydrology or earth science.</p> <p>Master's degree environmental science/management, civil/environmental engineering, geography, hydrology or earth science will be an advantage.</p> <p>General work experience of more than 6 years after graduation will be an added advantage.</p>

	<p>Experience in undertaking surveys and assessments for coastal protection and/or modification and hazard and risk assessment.</p> <p>Experience in undertaking EIAs for coastal protection and/or modification projects</p> <p>Previous relevant experience working in the Maldives (Knowledge of issues around environmental sustainability and climate change adaptation in Maldives).</p> <p>Be a permanent EIA consultant registered at Environmental Protection Agency.</p>
Surveyor	<p>Diploma in Surveying or related field.</p> <p>Bachelor's degree Surveying or related field will be an advantage.</p> <p>General work experience of more than 6 years after graduation will be an added advantage.</p> <p>Experience in conducting environmental surveys in projects of similar nature (coastal protection/coastal infrastructure projects).</p> <p>Previous relevant experience working in the Maldives (Knowledge of issues around environmental sustainability and climate change adaptation in Maldives).</p>
Quantity Surveyor	<p>Diploma in Quantity Surveying/ Diploma in Civil Engineering with experience in conducting quantity surveying.</p> <p>Bachelor's degree Quantity Surveying/ Civil Engineering will be an advantage.</p> <p>General work experience of more than 6 years after graduation will be an added advantage.</p> <p>Experience in conducting quantity surveying in projects of similar nature (coastal protection/coastal infrastructure projects)</p>

	Previous relevant experience working in the Maldives (Knowledge of issues around environmental sustainability and climate change adaptation in Maldives).
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In addition, all experts in the consultant team should possess the following:

- (i). Computer literacy and good word processing skills;
- (ii). Excellent written and oral English communication skills;

The Consultant team will also be expected to include at least one person who is fluent in reading and writing Divehi to facilitate the work of the team.

H. SCHEDULE FOR THE ASSIGNMENT

Estimated duration of the assignment is 32 weeks from the commencement of the consultancy.

I. QUALIFICATION CRITERIA FOR EIA STAGE

- To be eligible for this assignment, the Consultancy firm must have experience in consultancy works for at least 05 years.
- The consultancy firm must demonstrate past experience in performing the services in similar assignments. The Firm shall have carried out a minimum of Four (4) similar assignments. This must include the completion letters of these assignments.
- The firm must include a list of professionals and availability of resources in their profile.

J. FACILITIES TO BE PROVIDED BY THE CLIENT

The Ministry will coordinate closely with the consultant during the process. The Ministry will assign a project specific counterpart to liaise with the consultant. This counterpart may also join some field visits and review progress from time to time. The Ministry will ensure that access to data and reports that are identified in the various tasks will be provided to the consultant in a timely manner. The Ministry will facilitate meetings with various ministries and government agencies, including the local government officials to enable productive field visits, workshops and consultations.