



Ministry of Environment
Republic of Maldives

Greater Malé Waste-to-Energy Project

The Government of Maldives is planning to tender a design, build and operate (DBO) contract for a waste-to-energy (WTE) facility for the Greater Malé region to help in managing solid waste. The project is supported with technical and financial assistance from the Asian Development Bank and other international financial institutions.

The attached brochure provides summary information on the project and invites your feedback/views on this opportunity.

Please note that this is just an open market sounding exercise and it is not associated with the procurement/bidding process for the WTE facility. Any feedback from potential/interested parties is welcome, and if deemed appropriate, may be considered it while preparing the bid document

Please address enquiries and comments concerning this opportunity to the project management unit using the email address zone3wte@environment.gov.mv.

We look forward to receiving your feedback, comments and questions.



Market Sounding
Information Brochure for Potential Bidders
Greater Malé Waste-to-Energy Project
Design-Build-Operate Contract



Malé, January 2019

INTRODUCTION

Given the remote location of the Maldives, the limited amount of waste and the constraint set by the geographical context, the Government of the Maldives and key stakeholders are undertaking a market sounding to evaluate interest in the design, build and operation of a Waste to Energy (WtE) plant, and associated infrastructure in the Greater Malé Area. This document has been prepared to provide prospective bidders with background information about the forthcoming opportunity.

The Government of the Maldives, represented by its Ministry of Environment (MoE), is the responsible authority to address any questions relating to the subjects of the envisaged project. Contact details may be concluded from chapter 7. Further details of the project and enquiries sent to MoE and hereto related replies will be anonymised and disclosed on MoE's webpage (<http://www.environment.gov.mv/v2/en/project/8039>).

The response of the market will be reviewed and analysed and, subject to the best fit to the needs of MoE and the local conditions, the contract package will be tailored.

IMPORTANT NOTICE

All information provided in this document is preliminary and may be subject to change during the ongoing conceptual engineering design phase. Despite the endeavours to reflect the current status of the engineering, MoE does not warrant the correctness of the data and information provided and reserves the right to adopt necessary changes after disclosure of the document without notice to the recipient.

The document does not constitute a legal obligation to proceed as outlined.

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1 Background Information

The Government of Maldives (GoM) is committed to improve the environmental conditions and strengthen the Solid Waste Management system in the Maldives. GoM has taken an initiative to implement “Greater Malé Environmental Improvement and Waste Management Project (hereinafter “the Project”) and is seeking financial support from the Asian Development Bank (hereinafter ADB) and other financial institutions.

In 2016 and in 2017 respectively, the Maldives Ministry of Environment (MoE) commissioned an engineering firm to conduct a concept design of the future waste transfer and to carry out a feasibility study for a Regional Waste Management Facility (RWMF) on the island of Thilafushi. Commissioning of the main components of the RWMF is scheduled for 2023.

1.1 Main Stakeholders

The Ministry of Finance (MoF) will be the executing agency (EA) while the Ministry of Environment (MoE) will act as the implementing agency (IA) for the project. Assets of the envisaged project will be owned by MoE. A fully governmental owned entity, Waste Management Corporation Ltd (WAMCO), runs the waste collection and transfer system under the supervision of MoE. Other major stakeholders are the State Electricity Company Ltd (STELCO) who operates the grid on Thilafushi and in Malé, and the Environmental Protection Agency (EPA). Owing to the location of the RWMF on Thilafushi island, Greater Malé Industrial Zone Limited (GMIZ), owned by MoF, will be another important stakeholder who is responsible for the envisaged development of Thilafushi island as industrial hub of the Greater Malé area.

Apart from ADB, the government is exploring additional external funding institutions to co-finance the contract package.

1.2 Catchment Area and Current Disposal

The Project is envisaged to be implemented in the area (Zone 3 region) that covers Greater Malé (Malé, Villingili & Hulhumalé) including the inhabited islands in atolls of Kaafu, Alifu Alifu, Alifu Dhaalu and Vaavu. The project area has a population of approximately 220,000 currently which is spread over 35 islands and 73 tourist resorts. The population is expected to grow to 300,000 within the next five years due to the significant development of Hulhumale. Together with commercial and industrial entities, institutions and about 1 million tourists, in 2022 the residents will generate approximately 115,000 tonnes of Municipal Solid Waste (MSW) per year which is complemented by another 70,000 to 100,000 tonnes of construction and demolition waste (CDW). Around 10 to 15% of the CDW material is assumed to be flammable.

To date the majority of the waste generated within Zone 3 is dumped haphazardly on the island Thilafushi which is located close to the capital Malé. Waste from Malé, Hulhumale and Vilimale is delivered with landing crafts while resorts are using so called dhonis which fulfil a dual purpose as supply and waste transfer vehicle. Waste from islands will be delivered after completion of the RWMF only. The island Thilafushi itself has been created using both MSW and CDW as reclamation material for more than 25 years now. Starting in 1992, land has been reclaimed from the lagoons to build up the artificial island. The lagoons’ depth is about 1 to 3 m only. The land itself has been reclaimed using waste generated in Malé and surroundings to fill the lagoons which were steadily extended by banking up sand to a berm. Across the island, the height above sea level is about 1 to 2 m. As of 2008 the Municipal Council of Malé which was the then responsible institution for waste collection and disposal started to deliberately burn waste to extend the dump’s lifetime which the current operator, WAMCO, continues practicing. Ongoing smouldering and open fires are a constant nuisance

to nearby resorts and an environmental peril to a unique ecological gem, and put people exposed to the fumes to a severe health risk.

According to a topographic survey, the site contains approx. 800,000 m³ of waste (above sea level) which partly is mineralised through uncontrolled burning. Apart from partly burnt waste, CDW and metals form a significant and visible portion of the dumped material. Since waste has been dumped haphazardly, its delivery was not recorded or monitored. Other waste disposal sites within Zone 3 comprise of similar but smaller dumpsites.

1.3 Envisaged Waste Management Infrastructure

GoM and ADB have agreed to implement the Project in a two phase approach:

- Phase 1: identify feasible quick-fix solutions to control nuisances and environmental perils of Thilafushi island dumpsite, rehabilitate the reception area (blue area below in Figure 1) and manage incoming waste, provide equipment for island waste management centres, and install an appropriate transfer and collection system in Malé and the islands/resorts; and
- Phase 2: rehabilitate the existing dumpsite (red confined site) and complement the upgraded infrastructure by setting up a Waste to Energy (WtE) plant including all auxiliary facilities (white plot).

The envisaged Regional Waste Management Facility (RWMF) will consist of:

- Harbour and reception area incl. admin building and weigh bridge for the reception of containerised waste (Phase 1);
 - Construction and demolition waste (CDW) processing plant (Phase 1);
 - End-of-life vehicle (ELV) dismantling unit (Phase 2);
- WtE plant including landfill for air pollution control (APC) residue and non-recyclable bottom ash (Phase 2). As per current waste projections, the WtE will have to be extended after 15 years operations;
 - Bottom ash processing plant (Phase 2);
 - Leachate storage and treatment facilities (Phase 2);
 - Seawater inlet/outlet structure (Phase 2).

Until commissioning of the WtE plant, the daily generated waste will be separated into two fractions (CDW and MSW). MSW and flammables from CDW will be baled and stored in a bale stock. It is envisaged that the bale stock will comprise of approx. 300,000 tonnes of waste when the WtE will be commissioned. Bales will constantly be supplied to the WtE plant to accommodate variations in the incoming waste volume.

Studies on the market for recycled CDW and bottom ash will be conducted to provide useful information about the market potential to absorb mineral products in the Maldives. In addition a market sounding will be carried out to appraise the marketing potential for recyclables such as PET and other plastics, paper/cardboard, metals etc.



Figure 1: Thilafushi Island and current dumpsite (red, upper picture), white-rimmed plot is the envisaged area for the RWMF (source: Google Earth).

Subject to the findings of the market study for recyclables the decision shall be taken to install a sorting facility to recover the most valuable fractions (such as PET, HDPE, cans etc.).

1.4 The Site

The island of Thilafushi is located close to the capital Malé (distance around 7 km) and in sight of several, partially high class tourist resorts (see Figure 1). Access to Thilafushi is possible via boat or vessel only. Plans to construct a bridge between Malé (via Vilimale) and Thilafushi are in their infancy at the moment. Besides small and medium sized boat builders, a clinker mill, two Liquid Petroleum Gas (LPG) filling plants, a cement packaging facility, and some carpenters are running their businesses in Thilafushi.

Two plots of land will be used for the WtE and ancillary facilities (confined in white, figure 1, total area 15 ha) which are separated by a road which is under GMIZ's control. These plots have been reclaimed recently only. Sand from the inner lagoon (north to the dump site) will be dredged and used for that reclamation. While the plot towards the eastern toe will be rehabilitated to allow for a containerised waste handling (confined in blue, approx. 3 ha), the dumpsite will be rehabilitated (red plot). An access from the harbour to the WtE will facilitate the transport of waste containers to the bunker of the WtE. All waste and all incoming and outgoing materials can be recorded using the weigh bridge at the WtE facility. The harbour

area will be provided with necessary infrastructure to facilitate a containerised waste transfer and to operate the facilities (CDW processing, workshop, small admin building etc.).

The dumpsite stretches over an area of approx. 7 ha currently and its volume, of course, is increasing every day due to the ongoing waste delivery. Waste is dumped in an uncontrolled and unsystematic manner which shall be rectified as soon as new equipment arrives. Next to the dump (towards the east) a scrap dealer runs his business while towards the south an NGO operates a baler to compact PET bottles and HDPE containers. The site is not fully equipped with utilities yet which will be provided during Phase 1 while it will be the DBO Contractor's responsibility to define the utility interfaces required for Phase 2.

2 Design, Build and Operate Contract

The DBO Contract will be based on the FIDIC Gold Book in its latest version.

2.1 Design-Build Component

One purpose of this indicative market sounding is to collect views of interested parties on the envisaged structure of the DBO contract which can encompass the entire set of facilities or parts thereof only.

According to the current project set-up, the assets

- Harbour and reception area incl. admin building and weigh bridge,
 - CDW processing plant,
- Sorting/compaction facilities (provisionally), and
 - ELV dismantling unit

will be operated by the government (WAMCO), while the

- WtE facility and the balance of the plant,
 - Bottom ash processing unit and the
- APC residue and residual bottom ash landfill and the hereto related leachate treatment plant

will constitute the scope of the envisaged DBO contract.

It is expected that the WtE facility itself will be designed as a conventional state-of-the-art grate type incinerator consisting of:

- Tipping hall and bunker including bunker cranes;
- Bale opening and unwrapping device to allow supply of baled waste;
- Furnace incl. feeding hopper and pusher, grate and wet de-asher;
 - Boiler incl. superheaters and economiser;
 - Boiler make up water demineralisation unit;
- Flue gas cleaning incl. all necessary dosing and storage units;
- Extraction condensing type turbine and sea water cooled condenser;
 - Generator;
- See water in-/outlet structure, incl. cooling water pipes.

Emission standards and continuous emission monitoring requirements will be based on the latest European regulations. All required statutory approvals and permitting will remain within the DBO Contractor's responsibility.

The tentative mass balance of the RMWF during the first operational year can be concluded from the figure below. Running the facility with MSW steadily delivered and waste which was baled and stored for a number of years, the plant’s capacity will need to exceed 152,000 Mg/y. Owing to the demographic trend, the annual waste throughput is expected to increase to 234,000 Mg in 2037. According to the current conceptual design, the initial capacity of the facility shall be 167,000 Mg/y (two trains 250 Mg/d or 10.5 Mg/h each) which then can be extended by a third train. Baled waste can be used as buffer to accommodate any waste volume fluctuations.

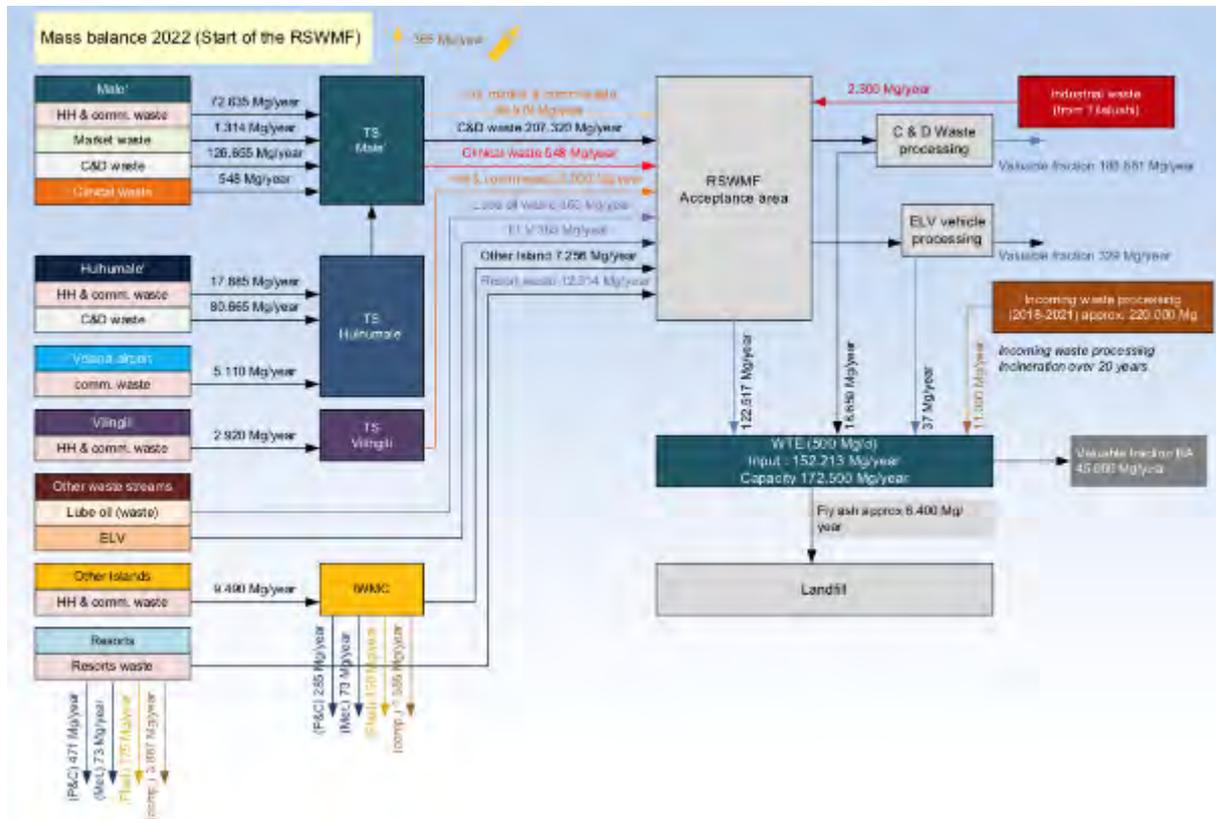


Figure 2: Tentative mass balance of the RMWF in 2022 (source: Feasibility Study of MoE consultants)

The latest waste audit showed the following composition: food & kitchen waste 40%, green & garden waste 10%, other organic waste 10%, paper and cardboard 12%, plastic 10%, hazardous waste 1%, metal 4%, glass 3%, and other 10%. The net calorific value (NCV) of the waste is 7.5 MJ/kg. Baled waste certainly will desiccate to a yet unknown extent and will increase the heat input. It shall be within the Contractor’s responsibility to operate the facility within the stoker capacity diagram which will be provided with the tender documents.

A preliminary lay-out developed during the concept phase is depicted in Figure 3. The image on the title page shows a 3D conceptual lay-out taken from the north eastern toe of the site.

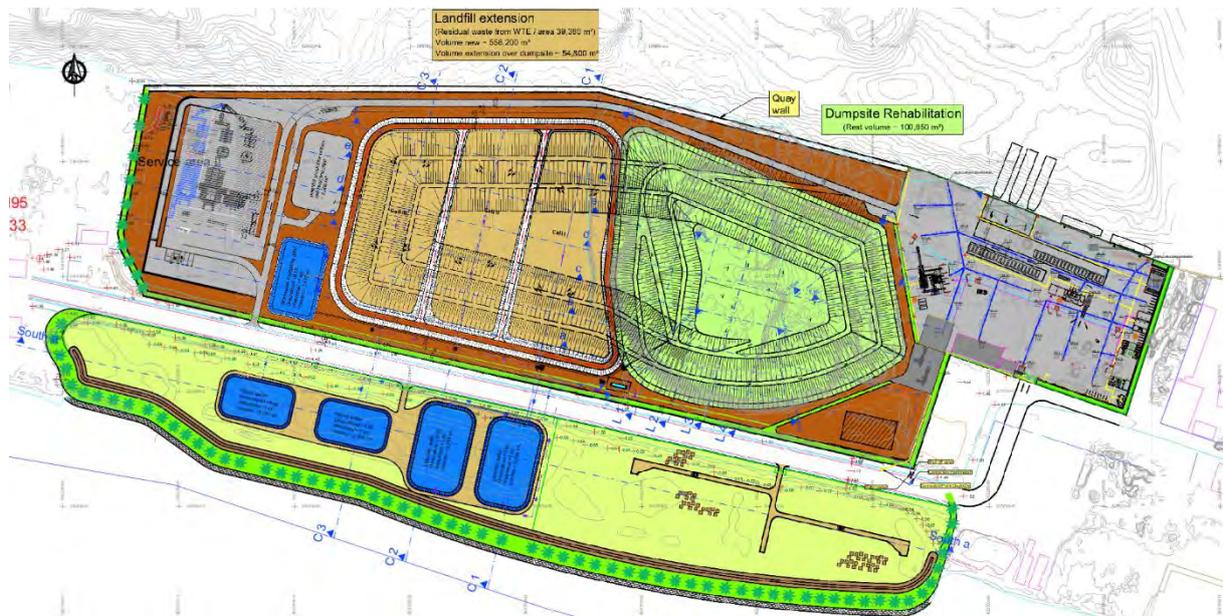


Figure 3: Preliminary lay-out as per current planning status (source: Feasibility Study of MoE consultants)

Feeding power into the STELCO electricity grid is subject to discussions with STELCO and with GMIZ about the development of Thilafushi and its future power demand (see section 2.2).

Noting that the final design will depend on the DBO Contractor, the basic data of the WtE facility and the envisaged interfaces and the scope are summarised in the following table.

Table 1: Preliminary design parameters of the WtE and ancillary facilities

Parameter		Range/Data/Type	Remarks
WtE - Facility			to be operated by DBO Contractor
Capacity	Mg/y	167,000	
	Mg/hr	21	
No of trains		2	
NCV	kJ/kg	6,500 – 9,500	
Design NCV	kJ/kg	7,500	
Expected IBA amount	%	25	of input
Baled waste input	%	min. 10	of nominal mechanical capacity
Overload	%	10	of nominal thermal and mechanical capacity
Furnace		grate system 850°C, 2s	roller, forward or reciprocating
Boiler		natural circulation	horizontal or vertical boiler passes, cladding of corrosion prone boiler components
Turbine		extraction condensing	robustness is crucial, no. of turbines subject to DBO Contractor, extraction rate is yet to be defined
Re-cooling unit		sea water cooling	environmental sensitivity of coral reefs to be considered
APC system		Dry system	final design subject to DBO Contractor meeting European emission standards is compulsory, minimising volume of residue
IBA processing		maturation, FE/NON-FE, crushing, screening	tradable volume subject to market
Residue landfill			preferably to be operated by DBO Contractor

Parameter		Range/Data/Type	Remarks
Total volume	m ³	560,000	incl. base liner system and leachate collection system, for APC residues and non-marketable IBA (and other rejects)
No of cells		≥ 3	final design subject to DBO Contractor
Envisaged life time	years	> 15 years	subject to IBA recycling and marketing
Leachate treatment			to be operated by DBO Contractor
Treatment system		reverse osmosis	
Capacity	m ³ /d	120	expected throughput up to 55 m ³ /d
Brine disposal	m ³ /d	max. 14	via APC system of WtE

2.2 Constraints of the Site

Thilafushi island does not offer a power network currently which is capable to absorb the surplus power of the WtE facility which is estimated to be in the range of 6 to 8 MW because the installed capacity of STELCO is 1.2 MW only. GMIZ development plans indicate though that the installed capacity will increase and that a link to the power grid of Malé may be established sooner or later.

Because a WtE facility can trip without notice, the power network on Thilafushi likely will collapse (if no grid connection to Malé is established) because STELCO cannot provide back-up power instantaneously which would be required to stabilise the grid. These aspects need to be considered in the design of the water-steam-system, the turbine and the condenser and the self-excitation which yet has to allow a grid backed operation. For the time being, the WtE shall be assumed to be operated in a sort of island mode satisfying its own consumption and the power demand of other consumers within the RWMF.

The potential to produce drinking water (for example via RO or multi-effect distillation) will be subject to the development of Thilafushi as industrial hub and to further discussions with the drinking water producers in the Maldives. Producing ice-flakes for fishermen could also be an attractive package to include in the system. An active role in this process is expected from the DBO Contractor. The turbine and the condenser shall be designed to allow for both options of future energy usage (i.e. maximising power output and combined heat and power operations) and to operate the WtE in an island mode.

A limiting factor is the land availability in the Maldives in general and on the island of Thilafushi in particular. A plot of 40,000 m² has been allocated for the residue landfill. Suggestions on how to improve the arrangement of facilities to gain land will form part of the bid evaluation. To what extent the rehabilitated dump site may be used for the disposal of residues of the IBA processing will be an outcome of the current design of the rehabilitation which is carried out concurrently.

In addition, some landfill volume is required to dispose of residues from the CDW and IBA processing plants which are unsuitable for the market and which cannot be incinerated.

Since the land to accommodate the WtE plant is a newly reclaimed plot which again is situated on a coral reef, interested parties will be requested to share their view on potential risks to be considered during the construction of the WtE. A geotechnical survey of the site will be provided with the tender documents.

2.3 Operation Service Period and Interfaces

Owing to the asset owners and the envisaged operators, the following interfaces between the DBO Contractor and WAMCO are to be considered:

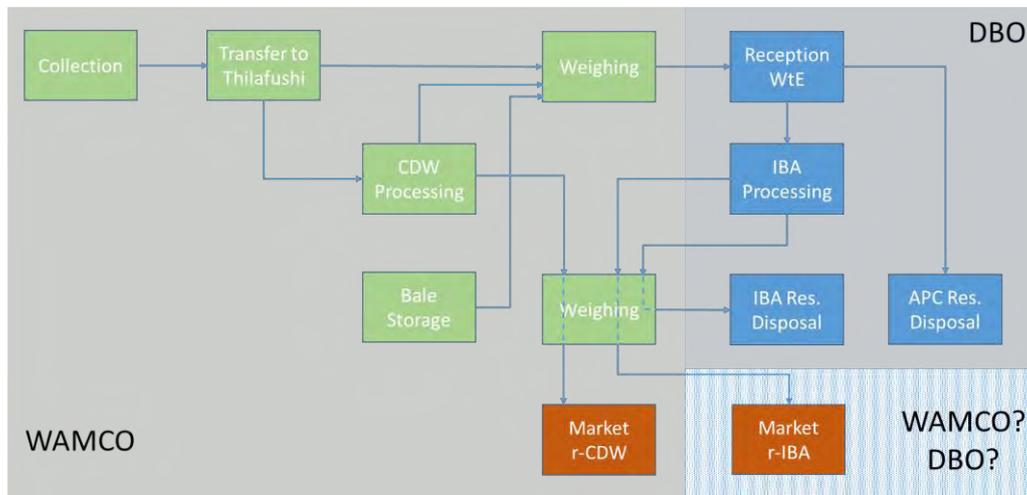


Figure 4: Interfaces between WAMCO and DBO Contractor

How the market for recycled IBA and CDW eventually will be penetrated will be subject to the market study which will be carried in parallel to the tender of the DBO contract. Interested parties are invited to share their views whether WAMCO or the DBO Contractor shall market recycled bottom ash.

The Operation Service Period will commence after successful commissioning of the facilities and is envisaged to last for 15 or 20 years. Relevant provisions of the FIDIC Gold Book do apply.

3 Payment Terms and Mechanism

ADB will be a primary financier of the DBO contract during the DB phase and standard ADB lump sum staged payment terms will apply.

Payments to the DBO will be arranged according to payment milestones against by a bank guarantee, standby letter of credit (LoC) or similar instruments while the milestone conditions will be stipulated in an, potentially irrevocable, LoC to protect a DBO Contractor's interests.

The payment terms during the Operation Service Period have not yet been finalised. The following arrangements are being considered:

- The DBO Contractor will receive a monthly fixed fee to cover the Contractor's fixed O&M costs such as personnel costs, maintenance, overheads and profit;
- The DBO Contractor will receive a monthly variable fee based on the WTE throughput to cover the Contractor's throughput-related costs such as chemicals, lubricants, and other consumables;
- Asset replacement (for assets with greater than a 5 year asset life) will be reimbursed according to a priced schedule included in the Contractor's bid;
- During trial run operations/performance demonstration the DBO Contractor may be entitled to receive monthly instalments on daily/weekly pro rata basis based on the actual throughput;
- O&M fee will be adjusted for inflationary effects and exchange rate movements according to typical price adjustment clauses;

- Revenue sharing between the Employer and the DBO contractor from selling heat/steam or electrical energy to either STELCO or other customers, for sales of recovered metals from IBA processing, and, subject to the outcome of the market study, for the sales of recycled IBA;
- Price adjustment clauses for special/unforeseen conditions (i.e. of incineration of mono-charges with high content of HCl and SO₂ entailing higher costs for consumables and supplies).

It is the Employer's aim to develop payment arrangements that provide for an equitable allocation of risk and reward the Contractor for good performance. The Employer is interested to hear the views of potential bidders in relation to arrangements for payment and payment security during the operation service period, such as escrow accounts or suitably structured LoCs.

4 Qualification Criteria

Because of the uniqueness of the location and the particular conditions and constraints of the site only sufficiently qualified contractors will be taken into consideration. Criteria will encompass successful completion of DBO or BOT projects of similar size, budget and nature in countries other than the bidder's or JV partner's home country (for example two in the last ten years), relevant experiences in key activities of similar projects, such as lead partner of a DBO/BOT JV, in the design and construction, and operation and maintenance of WtE facilities, experiences in designing an industrial or a similar plant to cope with marine environmental conditions. The Employer and its funding partners are currently considering whether to undertake advance prequalification. Upon agreement with ADB and others, the final qualification requirements will be issued with the relevant documents. ADB country (and other) restrictions as well as ADB procurement policy and regulations will apply. Another important factor which will be valued is the experience to execute civil works in low-lying ground like the Maldives to demonstrate the capability of a civil contractor to cope with the specific requirements of such an undertaking.

The criteria will be applied to either single entities or to the members of a JV or bidding consortium. Subcontracting essential parts of the scope will be allowed while core components of the DBO contract must be delivered by the bidding party, or a member of the JV or bidding consortium.

5 Timeframe

As mentioned, the conceptual design of the facilities as per feasibility study level has been accomplished while the qualification and the Employer's requirements are under development currently. The bid preparation period will be 5 months. The design and commissioning period includes all necessary permitting applications and the relevant approvals. Permitting is expected to last 6 months.

The following overall timeframe for the Design-Build component is expected. Interested parties are invited to share their views on the envisaged scheduling. The bid will be advertised in Maldives newspapers and ADB website. A prebid meeting will be held.

	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4																
Prequalification	■																			
Shortlisting		■																		
Request for proposals			■	■																
Evaluation and contract award				■	■	■	■	■												
WtE/balance of plant design+construction									■	■	■	■	■	■	■	■	■	■	■	■
Commissioning WtE																				■

6 Risk Allocation

Risk allocation will be based on the standard FIDIC Conditions of Contract for Design Build and Operate Contracts (Gold Book). The Contractor will be expected to carry performance risk in relation to the design, construction commissioning and operation of the works.

Though the Employer intends to provide bidders with a geotechnical and environmental site survey, he would be interested to understand views and concerns of interested parties about the potential implications of the site given by the neighboring dumpsite and the fact that the facilities are to be built on a newly reclaimed land on a coral reef. Any suggestion for how such risks can be mitigated would be appreciated.

In the event bidders will identify a major issue or risk arising during the tender document appraisal and bid preparation they will be requested to advise the Employer accordingly.

Risks during the Operation Service Period will be allocated according to nature of the risk. For example, higher maintenance costs than expected is a risk typically to be borne by the DBO Contractor while an insufficient waste delivery is a risk the Employer has to carry.

7 Contact

Any enquiry to the project details and its current status shall be addressed to:

Project Management Unit (PMU)
Zone 3 Waste to Energy - Greater Male' Environmental Improvement and Waste
Management Project
Ministry of Environment
Handhuvaree Hin'gun, Maafannu
Malé 20392
Republic of Maldives

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It has to be noted that no other source of information will be provided prior to issuing the tender notice and the tender documents.