

## 1. ENVIRONMENTAL IMPACT ASSESSMENT/ ENVIRONMENTAL MANAGEMENT PLAN

The establishment of the Island Waste Management Centres requires a formulation of an Environmental Impact Assessment or an Environmental Management Plan, depending on the respective environmental and socio-economic parameters. Environmental Assessments are as per the legal requisite in the Maldives for development projects that may have any undesirable impacts on the environment. Schedule D of the Amendment 2 to the Environmental Impact Assessment Regulations (2012) provides a screening list of all development types for which a full EIA is mandatory. Even though, the proposed development is not listed, a screening process through Environmental Protection Agency (EPA) shall be followed for the subject and with regard to EPA's decision, either an Environmental Impact Assessment or an Environmental Management Plan should be formulated and approved prior to the commencement of the project activities.

## 2. TECHNICAL SPECIFICATIONS FOR DESIGN

### 2.1. Tier Based Distribution of Islands

For strategic planning purposes of island level provisions for resource recovery and management, all the islands of the Maldives are divided into tiers based on the following factors:

- Resident population projection up to the year 2030
- Agricultural activities
- Guest house and tourism activities
- Land area of the island

The facilities for each island are to be provided under the tier wise distribution. For each tier, the size of the Island Resource Recovery Centre (IRRC) has been standardized as shown in **Table 1** below. The details of the islands and their tiers and their approved land area for the purpose of design and construction are provided in **Table 2**.

**Table 1: Tiers for Islands and Planned Facilities**

Tier	Tier 1	Tier 2 (Anaerobic)			Tier 3 (Aerobic)	
Sub-Tier	1C	2A	2B	2C	3A	3B
Resident Population 2030 Projection	4000 to 20000	2500 to 4000	1500 to 2500	900 to 1500	450 to 900	<450
Organic waste management Methodology	Anaerobic Digestion				Aerobic Composting	
Land Area Required (sqft)	tbd*	13,200	13,200	9,700	6,800	6,700
Est. Size of Compost Pad					35	20
Est. Area for Anaerobic Digestion	tbd*	90	90	90		

\*tbd = to be decided in a separate study

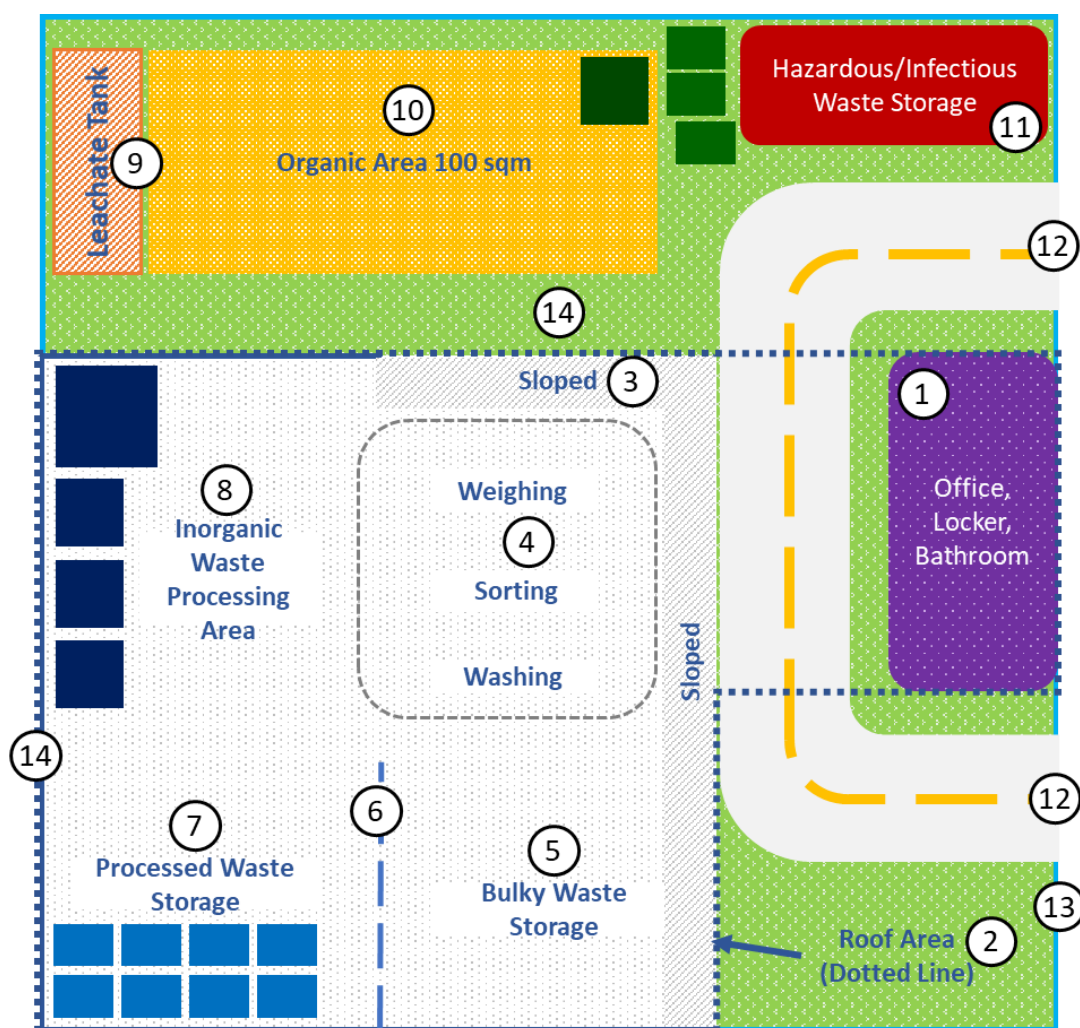
**Table 2: List of Islands and their Tiers with Estimated Built Up Areas**

No.	Atoll	Island	Registered Population	Tier	Size of Approved Land (sqft)
1	HA.	Dhihdhoo	4,246	1C	<b>TO BE APPROVED</b>
2	HA.	Maarandhoo	1,037	2C	8,073
3	HA.	Molhadhoo	388	3A	10,764
4	HA.	Muraidhoo	897	3A	7,535
5	HA.	Thakandhoo	941	2C	7,535
6	HA.	Uligamu	531	3A	<b>6,727 TO BE APPROVED AGAIN</b>
7	HDh.	Finey	580	3A	6,727
8	HDh.	Hirimaradhoo	566	3A	6,727
9	HDh.	Kumundhoo	1,487	2C	8,073
10	HDh.	Kuribi	744	3A	10,226
11	HDh.	Makunudhoo	1,790	2B	8,880
12	HDh.	Neykurendhoo	1,375	2C	8,073
13	HDh.	Nolhivaramu	2,681	2A	10,764
14	HDh.	Vaikaradhoo	1,821	2C	8,891
15	Sh.	Bilehffahi	706	3A	6,727
16	Sh.	Feevah	1,124	3A	8,073
17	Sh.	Feydhoo	1,258	2C	8,073
18	Sh.	Kaditheemu	1,570	2C	8,880
19	Sh.	Lhaimagu	822	3A	7,535
20	Sh.	Noomaraa	500	3B	5,382

## 2.2. Design Concept for Island Recovery Centres

The concept for the establishment of Island Resource Recovery Centres (IRRC) at all inhabited islands has been prepared based on the past experience and lessons learned by the Government of the Republic of Maldives in conducting waste management projects at islands as well as regional level.

A sample concept for Tier 2C islands with a land area of 9,700 sqft (30m by 30m plot size) is provided in **Figure 4** below.



**Figure 4: Example for a layout of the standard design concept for IRRCs created for Tier 2C for a land area of 9,700 sqft**

The main points to highlight within the current infrastructure concept of the IRRCs are listed in **Table 3** with numbers in reference to **Figure 4**.

No.	Feature	Details to consider in design
1	Office/Admin Building	<ul style="list-style-type: none"> <li>–Include an administrative building with office space, locker facilities and at least one bathroom facility with shower.</li> <li>–The wastewater should be routed to a septic tank of adequate capacity or connected to the island sewer system if available.</li> <li>–The building must be located near the entry way to allow for use as a guard house in addition to office space</li> <li>–The corners of the building are to be rounded</li> </ul>
2	Warehouse Area and Roofing	<ul style="list-style-type: none"> <li>–Single story warehouse with roof height 4-6 m</li> <li>–Structure must be compatible for rooftop solar panel installation</li> <li>–Allow leachate and wastewater from operation and maintenance processes to be conveyed to a septic tank of adequate size</li> </ul>
3	Entry way to warehouse	<ul style="list-style-type: none"> <li>–Slope the entry to paved area to allow for entry and parking of collection vehicle within the warehouse area as well as moving of wheelie bins through the centre</li> </ul>
4	Weighing/Sorting/Washing Area	<ul style="list-style-type: none"> <li>–Keep the weighing area at focus/centre of the entire facility when designing to allow for better flow within the facility</li> </ul>
5	Bulky Waste Storage Area	<ul style="list-style-type: none"> <li>–Bulky waste storage area should not be placed too far inside the sheltered warehouse area to allow easier access for loading/unloading and resale of items</li> </ul>
6	Partition Walls	<ul style="list-style-type: none"> <li>–Focus on modularity and have an open concept</li> <li>–Have minimum walls in processing area</li> <li>–If walls are necessary inside facility use movable partitions</li> </ul>
7	Processed Waste Storage Area	<ul style="list-style-type: none"> <li>–Enable storage of waste in movable closed containers</li> </ul>
8	Inorganic Waste Processing Area	<ul style="list-style-type: none"> <li>–Have electrical outlets installed in factory style that can be moved</li> </ul>
9	Leachate Tank	<ul style="list-style-type: none"> <li>–Allow leachate and wastewater from operation and maintenance processes within the inorganic area as well as organic waste processing area to be conveyed to a septic tank of adequate size</li> <li>–The slope of the slab should be designed to allow this</li> </ul>
10	Organic Waste Processing Area	<ul style="list-style-type: none"> <li>–Concrete slab should be provided with adequate slope for flow of water to the leachate tank</li> <li>–Allow leachate and wastewater from operation and maintenance processes to be conveyed to a septic tank of adequate size</li> </ul>
11	Hazardous and Infectious Waste Storage	<ul style="list-style-type: none"> <li>–Allow hazardous and infectious waste to be stored in a separate area that is sheltered, away from processing and office space with direct access for collection vehicles</li> </ul>
12	Gate and road access	<ul style="list-style-type: none"> <li>–A lockable metal gate should be provided at each exit/entry</li> <li>–Each exit/entry should be 4m wide</li> <li>–Roads should be paved and 4m wide and provided with adequate turn around radius at the turns</li> </ul>
13	Fence	<ul style="list-style-type: none"> <li>–Walls with fence should be provided around the facility</li> </ul>

14	Grounds	<ul style="list-style-type: none"> <li>–Paved area should be reduced to only the necessary areas with the remaining left as bare ground for landscaping</li> <li>–Design should be created to minimise clearance of existing coconut palms and trees within the land plot as far as possible</li> </ul>
15	Ventilation	<ul style="list-style-type: none"> <li>–There should be adequate ventilation provided within the warehouse area as well as the office building</li> <li>–Fans should be provided within the warehouse area to ensure flow of air</li> </ul>

### 1.2.1. Electricity Requirements

All IRRCs are to be equipped with solar panels to increase the share of renewable energy utilized within the operational power required for the centre. Additionally, if the IRRC is located far from the existing electricity grid of the island, a generator of adequate capacity should be provided to the IRRC with regard to the best feasible option in terms of environmental and socio-economic aspects. If the electricity grid of the island is close enough to the IRRC and the connection to the grid is feasible, this option will be preferred over provision of a generator.

In addition to the electricity outlets within the office, electricity outlets must be provided for the weighing/sorting/washing area, the inorganic waste processing area as well as outdoor outlets for the organic waste sorting area.

### 2.2.2. Water Requirements

All IRRCs are to be equipped with water that is fit for the following purposes:

- Potable for human consumption
- Bathroom and washing facilities
- Washing and maintenance of vehicles and equipment
- Washing and maintenance of the facility floor
- All operational processes that require water

Irrespective of availability of water supply on the island, rain water harvesting facilities must be provided at all IRRCs with adequate storage capacity installed.

In addition to the taps in bathroom facilities, water taps must be included at each processing area:

- Organics processing area
- Weight/Sorting/Washing area
- Processing area

### 2.2.3. Special Design Provisions for IRRCs

On the occasion of shortage of land for the establishment of an IRRC at an island of the Maldives, the principles of the design concept are to be implemented as far as possible within the available land. Special design provisions for the temporary storage and extraction of all waste generated on the island will be needed for islands that do not have space for the management of organic waste. Such situations need to be discussed in detail before and throughout the entire design process.

### **3. TECHNICAL SPECIFICATIONS FOR CONSTRUCTION**

#### **3.1. Working Site**

1. The site should be kept clean during the construction work period and should be thoroughly cleaned once the works are completed.
2. Works should be carried out on site in a safe manner to all the workers on site and the people living in the vicinity of site.
3. Disturbance to the neighborhood should be kept to a minimum.
4. Electricity and water supply to the site, during construction period, should be provided by the contractor.
5. Modifications to the environment outside of the developmental footprint should be avoided, and the work should be carried out with minimum environmental damage. Furthermore, all aspects of environmental and social safeguard best practices should be respected during the construction, including mobilizations and demobilization as well

#### **3.2. Site Clearance**

1. The working site needs to be cleared of vegetation and waste if required according to the instruction of the council.
2. The working site needs to be cleared of any construction waste or debris within the demobilization process before handover of the land.

#### **3.3. Concrete**

1. Cement conforming to BS12 standards should be used for all concrete, masonry and plastering works. The cement intended for use should be fresh and should not have any traces of hardened cement in the bag.
2. All concrete works should be done using one brand of cement
3. Sand and aggregate used for concrete works should be well graded.
4. Concrete should be mixed in the ratio 1:2:3 which are 1 part cement, 2 parts sand and 3 parts aggregate.
5. All foundations should be cast on a lean concrete layer. The lean concrete should be placed on well compacted ground.
6. Concrete should be mixed using a concrete mixer. Concrete should not be mixed by hand. When pouring concrete into the formwork, the mix should be compacted using a mechanical vibrator.
7. Aggregate used for concrete works should not be larger than 20mm.
8. Sand and aggregate used for concrete works should be clear from dust, mud and other debris.
9. All reinforcement bars used for the concrete works should be free from rust and grease that could weaken the bonding between the reinforcement bar and the concrete. Care should be taken to use continuous bars rather than short segments joined by laps.

### **3.4. Masonry Works**

1. All masonry work should be done using Cement confirming to BS12 standards.
2. Masonry blocks should be made from imported sand or local white sand sourced from a permitted sand borrow area. The sand should be free from organic matter and other debris.
3. Masonry blocks should be made from mortar mixed at 1:5 ratio with 1 part cement to 5 part sand.
4. Average size of sand particles should not exceed 5mm.

### **3.5. Plastering Works**

1. All plastering work should be done using Cement confirming to BS12 standards.
2. Plaster mix should be made from imported or local sand white sand sourced from a permitted borrow area. The sand should be free from organic matter and other debris.
3. Plaster mix should be made by mixing Cement and Sand at a ratio of 1:3 with 1 part Cement to 3 part Sand.
4. Average size of sand particles should not exceed 5mm.

### **3.6. Structural Steel work**

1. All steel pipes obtained for the work should be new pipes and free from rust.
2. Thickness of pipes should not be less than 2.5mm.
3. All weld joints should be treated to limit/minimize rusting and corrosion.
4. All metal components within the structure should be painted with marine grade paint.

### **3.7. Electrical works**

1. All materials used for electrical wiring should comply with Utility Regulatory Authority's standards.

### **3.8. Roofing works**

1. All materials used for roofing work should be newly purchased for the project.
2. All screws or bolts used for roof fixing should be G.I or Zinc finish screws.