# Baseline Report

## Waste Management in Laamu Atoll

ENDhERI

gef

UN environment programme

Prepared by *Enhancing National Development through Environmentally Resilient Islands* (ENDhERI) Project for the Ministry of Environment, Climate Change and Technology



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## ACRONYMS

| | |
|---|---|
| MECCT | Ministry of Environment, Climate Change and Technology |
| ENDhERI | Enhancing National Development through Environmentally Resilient Islands |
| UNEP | United Nation Environment Program |
| GEF | Global Environment Facility |
| MCEP | Maldives Clean Environment Project |
| UNDP | United Nation Development Program |
| WHO | World Health Organization |
| EPA | Environmental Protection Agency |
| EPPA | Environment Protection and Preservation Act |
| WM | Waste Management |
| LECReD | Low Emission and Climate Resilient Development |
| IWRMC | Island Waste and Resource Management Centres |
| NC | Natural Capital |
| N/A | Not Available |
| SWM | Solid Waste Management |
| URA | Utility Regulatory Authority |

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# EXECUTIVE SUMMARY:

Waste management has been one of the key environmental challenges in Maldives. The quantity of waste generated continues to rise with potential increase of non-biodegradable waste, growing tourism industry, increase population and changes in lifestyle and consumption patterns of the community. The land scarcity for waste collection and management and unavailability of appropriate technology for management of waste in outer islands, has resulted in stockpiles of mixed waste in every island, without proper management.

The 4-year, US$9.2 million United Nations (UN) Joint Programme, “Low Emission and Climate Resilient Development” (LECReD) funded by the Government of Denmark, implemented by UNDP has provided number of islands in Laamu Atoll with waste management centers and equipment. However, due to challenges in operation of equipment, financial constraints, lack of technical capacity and human resources within the council, over 90% of waste management centers are non-operational after the project lifetime.

The Ministry of Environment, Climate Change and Technology (MECCT)has the mandate for implementation of government’s policy on waste management and establishment of waste management systems in the islands with the operational function being a responsibility of local councils. The Maldives Clean Environment Project (MCEP) implemented by Ministry of Environment, Climate Change and Technology, aims to commence establishment waste management center for zone 4 and 5 in the year 2022.

The findings of the report is based on reviewing existing literature, data collected through local councils with challenges in waste management identified through accounts from councils, field observations and consultation with waste department of MECCT. The report indicated that most islands in Laamu Atoll has a waste management center specifically identified and demarcated, equipped with vehicles and waste management equipment. However, most of the waste management center has structural issues, area and location issues and also, issues of providing electricity to operate the equipment as well as sustaining the operation of waste management centers. Additionally, building capacity of councils to operate and maintain the equipment is a current need for the councils.

# 1 INTRODUCTION:

This assessment is conducted by Enhancing National Development through Environmentally Resilient Islands (ENDhERI) project, implemented by Ministry of Environment Climate Change and Technology (MECCT), financed by Global Environment Facility (GEF) and assisted by United Nations Environment Program (UNEP). The main objective of the project is to enhance reef protection, resilience and ecosystem recovery by reducing development impacts in a selected project site of the Maldives, enabled for replication nationally through public awareness and integrating the values of marine biodiversity and other natural capital in national accounting.

This project aims to assist the government of the Maldives in its implementation of new environmental policies and transition towards national adoption of Green Growth atoll development that will sustain marine Natural Capital (NC) and strengthen the resilience and recovery of reef ecosystems. This will be informed by learning from atoll-wide integrated coastal zone management within a Managed Marine Area / Biosphere Reserve framework, and the application of innovative sustainability practices and standards in agriculture, fisheries, tourism and construction sectors as the basis for transforming the human ecological footprint in Laamu Atoll, and taking this up to national level through sector transformation, spatial planning and improved governance based on NC accounting. The intermediate objective of this transformation is to minimize the flows of pollutants from land-based activities into the adjacent marine environment, and reduce marine-based drivers of reef degradation including baitfish and reef fisheries. Overall, the project seeks to enhance reef ecosystem integrity and resilience through sustainable management, reducing development impacts and integrating NC accounting into national planning.

The main aim of the report is to identify and assess the current waste management status of Laamu Atoll. The report is developed as a baseline for the implementation of waste management components within the ENDhERI project. The baseline will assist in the following;

- Identification of current status of local waste management practices
- Identification of priority areas and waste management needs for the Atoll
- Provide support through ENDhERI project for local waste management

# 2 METHODOLOGY:

The baseline of waste management in Laamu Atoll is prepared by reviewing existing literature, analyzing primary WM data collected from councils, information collected in consultations meetings with Waste department of MECCT and field observation during site visit. The literature review highlights on the history of waste management, while primary data reflects on the current status of waste management in inhabited islands. The consultation with waste department reflects on future plans for waste management in Laamu Atoll and site visit was conducted to observe the WM works at community level.

The study includes 4 main areas of focus.

1. Historical information on Waste Management were gathered using reviewing existing literature and consultation with stakeholders.
2. Institutional Framework, Policies and Plans for waste management: Based on existing laws, regulation on WM and series of consultations conducted with Waste Department of MECCT.
3. Status of waste management in Laamu Atoll: Data was collected to identify general waste management outline and practices in Laamu atoll through questionnaires sent to councils. After identification of general waste management status in Laamu atoll, a focused waste segregation and disposal data were collected from islands where waste management is practiced. Data collection sheets are attached in Annex 3 and Annex 4 of this report.
4. Based on data collected and field observation, an account on challenges of waste management in each inhabited island of Laamu Atoll is discussed in the report.

# 3 HISTORY OF WASTE MANAGEMENT IN LAAMU ATOLL:

The most visible pressing environmental challenge faced by the communities in Laamu Atoll is solid waste management. The limited space in the island combined with population growth, changes in lifestyle and lack of proper waste management systems has exacerbated the situation in the atoll. Moreover, lack of trained personnel, waste management equipment and a proper waste transport mechanism has added to the issue.

Prior to the LECReD Programme, six waste management centres existed in Laamu atoll. These infrastructures were mainly donations through various international aid agencies following the 2004 Indian Ocean Tsunami. According to LECReD reports, during the initial scoping of LECReD, such structures were observed in Fonadhoo, Isdhoo, Mundoo, Kalaidhoo and Dhanbidhoo. However, only the waste management centre in the island of Fonadhoo was the partially functional one when LECReD was implemented. All other structures were either full, unutilized, or deteriorating.

The Output 4, Activity 4.5.1 of LECReD Programme, involved establishing proper waste management systems in place for waste segregation, composting, recycling, transport and storage in Laamu atoll, as an effort to improve the ecosystem resilience of the atoll( LECReD 2018). The Solid Waste Management Investment Plan developed under LECReD focused on an island level waste management system with the following elements:

i. Segregation of waste at source
ii. Waste collection service
iii. Island Waste and Resource Management Centre (IWRMC)
iv. Management of healthcare waste (Through WHO support)

A total of 9 Island's Waste and Resource Management Centres (IWRMC) were established under UNDP LECReD project, by project's end in 2018. Waste Management equipment were also provided to these islands under LECReD. This does not include L. Gan and L. Dhanbidhoo, hence IWRMCs in these 2 islands are planned to be established under Maldives Clean Environment Project (MCEP). However, most islands provided with IWRMC and equipment are at different stages of operations, most does not have the proper functioning of waste management due to several technical and operational challenges, sustainable financial mechanism and constraints in current setup.

Additionally, the ministry has provided small grant from PSIP fund to Maabaidhoo, Kunahandhoo, Gan and Fonadhoo island councils, in the last quarter of 2021, for purchasing WM vehicle.

# 4 LEGAL, INSTITUTIONAL FRAMEWORK, PLANS AND POLICIES IN WASTE MANAGEMENT:

The Ministry of Environment, Climate Change and Technology has the mandate for protection and preservation of environment. The Waste Department of the Ministry, which was established in 2014, oversees the function of making national level policy recommendation, implementation of waste management policies, the establishment of waste management systems, infrastructure and plans in the country. The Environmental Protection Agency (EPA) established under Minister of Environment, is responsible for implementation and enforcement of all laws and regulations relevant for environment protection. The Utility Regulatory Authority formed under clause 4 of Law number 2020/26 “Utility Regulatory Authority Law”, is mandated to set guidelines to manage utility services and regulate the services provided by the service provider, which includes waste management services.

The basic environment law, Law No.4/93 Environment Protection and Preservation Act (EPPA) was enacted in April 1993 as an umbrella law to protect and preserve the environment of the country. The main elements of the EPPA includes, the provision for disposal of waste, oil and poisonous substances. Any type of waste, oil, poisonous gases or any substance that may have harmful effect on the environment shall not be disposed within the territory of the Maldives.

In case where the disposal of the substance stated in paragraph (a) of this clause becomes absolutely necessary, they shall be disposed only within the areas designated for the purpose by the government. If such waste is to be incinerated, appropriate precautions shall be taken to avoid any harm to the health of the population.

Hazardous/Toxic or Nuclear Wastes that is harmful to human health and the environment shall not be disposed anywhere within the territory of the country. Permission shall be obtained from the relevant government authority at least 3 months in advance for any trans-boundary movement of such wastes through the territory of the Maldives.

The Waste Management Regulation of the Maldives was enacted based on Article 22 of the Constitution of the Republic of Maldives and under powers vested in the Ministry of Environment, Climate Change and Technology under the Article 3 of the Environmental Preservation Act 4/93 in relation to Article 7 and 8 of the same Act. The regulation is implemented by the Environmental Protection Agency. This regulation focus on following five areas:

i. **Waste management standards**: Defines standards for waste collection, transfer, treatment, storage, waste site management, landfills and managing hazardous waste;
ii. **Waste management Permits**: Defines approval procedures for waste sites;
iii. **Waster transfer:** Standards and permits required for waste transport on land and sea, including transboundary movements;
iv. **Reporting requirements**: Defines reporting and monitoring requirements and procedures;
v. **Enforcement**: Defines procedures to implement WRM and penalties for non-compliance.

The enactment of Utility Regulatory Authority Law (2020/26), mandated URA to implement of aforementioned 5 key functions, according to environmental standards and guidelines set by EPA. The 5th Amendment to WM Regulation (2021-R/109) requires all islands for waste segregation at source, effective from 1st January 2022. The amendment states the minimum levels and requirements for source segregation.

Disposal of waste in a reasonably safe manner at the island level so as it does not create any inconvenience to the community is one of the services rendered by the local councils, under the Decentralization Act. Under this Act the Island Councils have the power to charge a fee or rent in order to obtain funds for the services they provide including for safe disposal of wastes. Such fees to be charged shall be determined in consultation with the people of the area and in accordance with the Laws of Maldives. Under Chapter 14 of the Act the Island Councils have the power to formulate regulations on matters which fall within their jurisdiction with advice of the Local Government Authority. In addition, with the advice of the Local Government Authority, the city councils, atoll councils, and the island councils have the power to make regulations on waste management and disposal in their islands.

# 5 STATUS OF WASTE MANAGEMENT IN LAAMU ATOLL:

## 5.1. IWRMC:

Laamu atoll consists of 11 inhabited islands with an estimated population of 12,000 people. The data collected from island councils indicated that except L. Dhanbidhoo, all the other inhabited island has areas allocated and demarcated for waste management. The data collected from Waste Department (MECCT) shows that, apart from waste collection centers at L. Gan and IWRMC build by red cross after Indian Ocean Tsunami, rest of the IWRMC were established under LECReD Project (Table 1). The IWRMC established by LECReD Project are equipped with vehicle, compactor, glass crushers, bins and wood chipper machines. The equipment and vehicle details for individual islands are discussed in the Chapter 7 of this report.

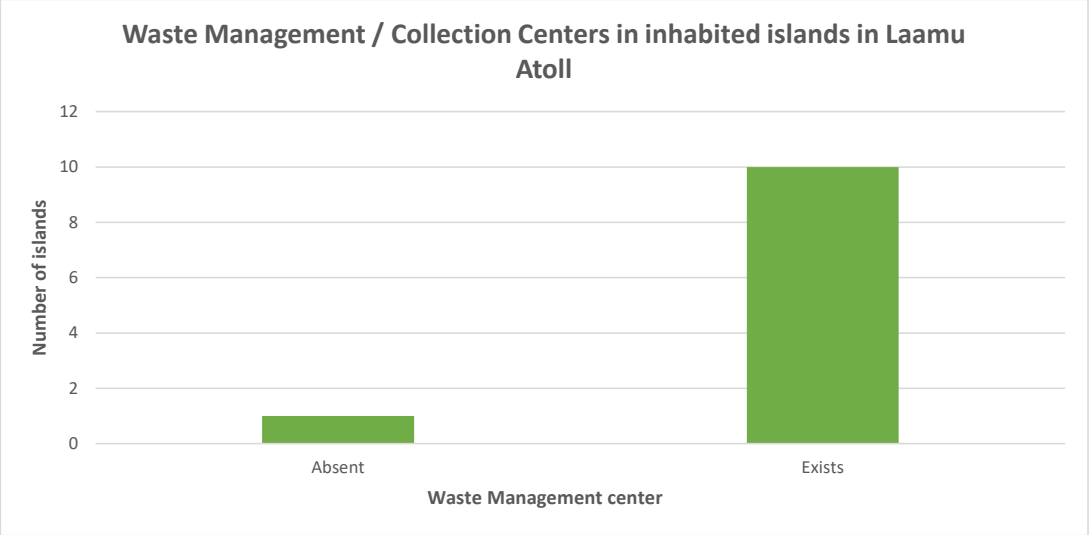



*Figure 1: Number of IWRMC in Laamu Atoll.*

The Table 1 shows a current status, scope, funding and year of completion of IWRMC in Laamu Atoll.

| ISLAND | STATUS | YEAR OF COMPLETION | SCOPE | FUNDING | Planned and On- going | Project |
|---|---|---|---|---|---|---|
| Isdhoo | Completed | 2018 | Construction of new IWRMC | LECRED | | |
| Kalaidhoo | Completed | 2018 | Construction of new IWRMC | LECRED | | |
| Dhan'bidhoo | Completed | 2007 | Construction of new IWRMC | TDWMP (Red Cross) | Construction of new IWRMC (2022) | MCEP |
| Maabaidhoo | Completed | 2018 | Construction of new IWRMC | LECRED | | |
| Mundoo | Completed | 2018 | Construction of new IWRMC | LECRED | | |
| Gan | - | | | | Construction of new IWRMC (2022) | MCEP |
| Maavah | Completed | 2018 | Construction of new IWRMC | LECRED | | |
| Fonadhoo | Completed | 2018 | Construction of new IWRMC | LECRED | Upgrading IWRMC (2022 | MCEP |
| Maamendhoo | Completed | 2018 | Construction of new IWRMC | LECRED | Mechanical Com-posting Pilot | MCEP |
| Hithadhoo | Completed | 2018 | Construction of new IWRMC | LECRED | | |
| Kunahandhoo | Completed | 2018 | Construction of new IWRMC | LECRED | | |

As indicated in the table 1, waste management centres for 9 islands of Laamu Atoll were established with LECreD funding in 2018. Dhan'bidhoo island did have a waste management centre established with red cross funding in 2007, however the infrastructure is not currently operational. Establishment of IWRMC for Gan and Dhan'bidhoo are planned under Maldives Clean Environment Project in 2022, together with upgrading works of Fonadhoo IWRMC. In addition, two pilot projects are to be carried out in Maamendhoo and Fonadhoo. Mechanical Composting is to be piloted in Maamendhoo, while Anaerobic Digestion project are to be implemented in Fonadhoo.

## 5.2. Estimated amount of waste produced:

The estimated average amount of waste produced in Laamu Atoll is 4.36 tons per day according to primary data from the island councils. The lowest tonnage being reported by L. Dhanbidhoo (0.5 tons) and highest being reported by L. Isdhoo (8.0 tons). The amount of waste was determined by the number of loads of waste collected by the vehicle or transported to IWRMC per day, however it does not consider the amount of waste disposed by individuals. Isdhoo has reported the highest tonnage of waste produced (8 tons), followed by Gan (7.0 tons), Fonadhoo (7.0 tons), Maavah (6.0 tons), Hithadhoo (6.0 tons) and Kunahandhoo (6.0 tons). The lowest amount of waste is produced in Dhandbidhoo (0.5 tons) and Mundoo (1.0 ton) which has the lowest populations in the atoll.

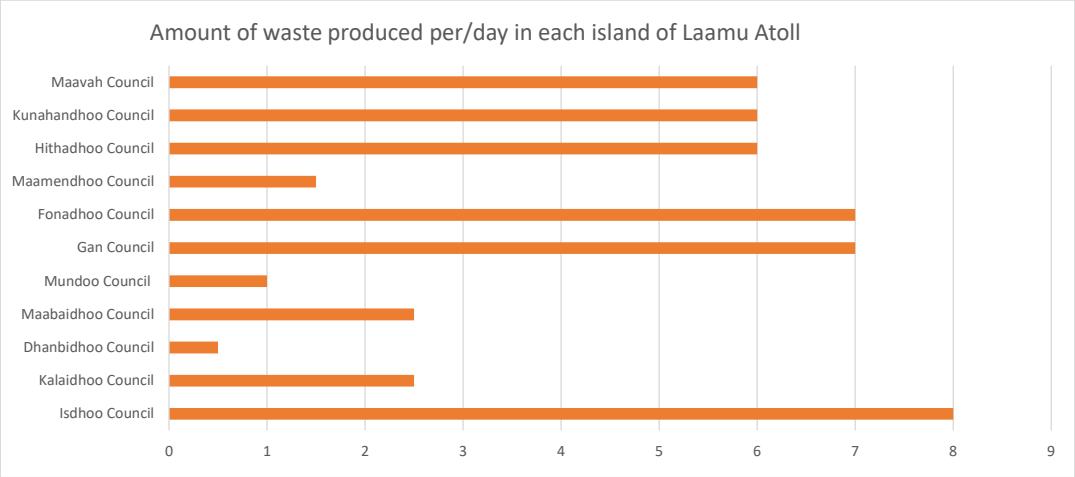



*Figure 2:Amount of waste produced in inhabited islands of Laamu Atoll*

## 5.3. Waste Management Fee:

Waste management fees are collected in 73% of islands in Laamu Atoll. These islands include Kalaidhoo, Maabaidhoo, Gan, Fonadhoo, Maamendhoo, Hithadhoo, Isdhoo and Kunahandhoo. In almost all islands waste management fee compensates for transport and salaries of the staff in the waste management centres according information gathered by island councils. In 18% of islands waste management fees are not collected according to information from the island councils. These include Maavah and Mundhoo. Since, L. Dhanbidhoo does not have IWRMC the collection and management are not carried out by the council, there is no fee charged. In Maavah, individual parties collect waste and transport to IWRMC, however no fee is collected by the council.

The amount of fee collected depends on the individual sector. Household waste collection fee varies from MVR 100 to MVR 150, while fee collected from private businesses varies from MVR 150 to MVR 200 and MVR 400 to MVR 500 from government institutions.


*Figure 3:Waste Management Fee Collection status in Laamu Atoll*

## 5.4. Waste Management Centers:

A designated area for waste collection and management are identified and demarcated in all islands except Dhanbidhoo. The area of IWRMC varies from 50,000 square feet to 1500 square feet, depending on location. The Figure 4 shows the area (in square feet) of IWRMC is individual islands.

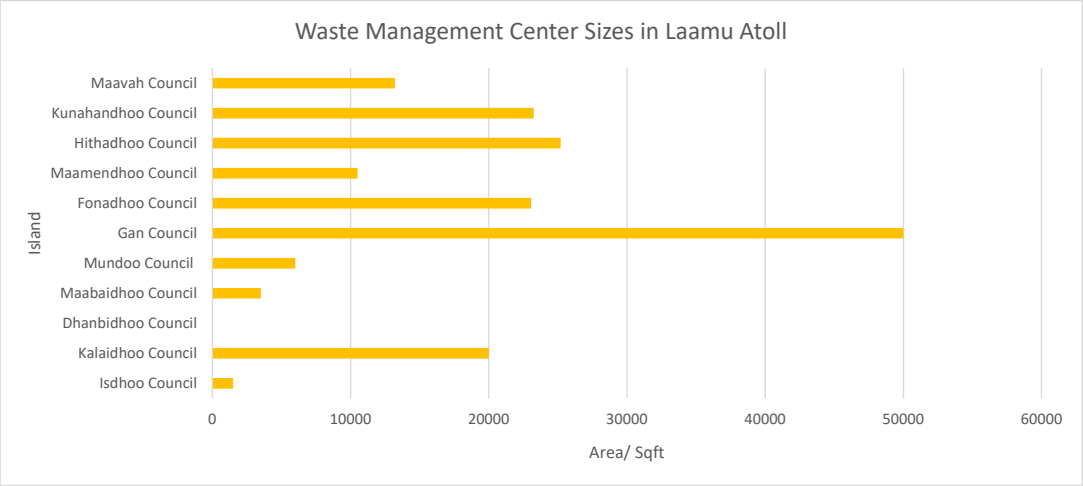



*Figure 4: Areas allocated for IWRMC in inhabited islands of Laamu Atoll*

## 5.5. Waste Segregation:

The data collected from the 10 inhabited islands where waste is managed (in some form), shows 9 islands segregate their waste at some level. The data shows 60% of islands segregated their waste at both household and IWRMC level, 30% of islands segregate waste at only household level and 10% of islands segregated waste in IWRMC.

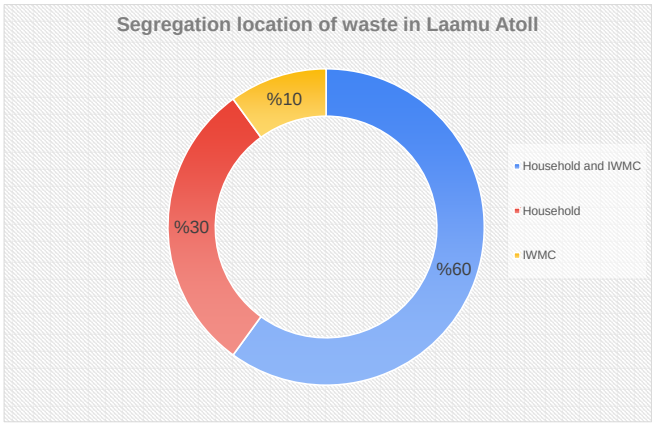




*Figure 5:Waste Segregation status and location of separation*

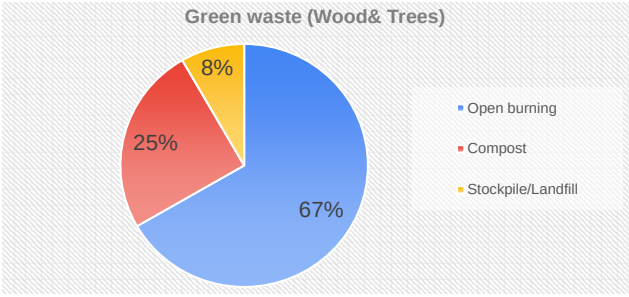
The field observation showed that, large percentage of the waste is stockpiled in mixed form in IWRMC. However, there have been attempts to segregate bulky waste materials such as construction waste, large metals such as roofing etc, and green waste in some islands. Additionally, attempts to segregate waste from the stockpile of mixed waste is observed in islands such as Hithadhoo.

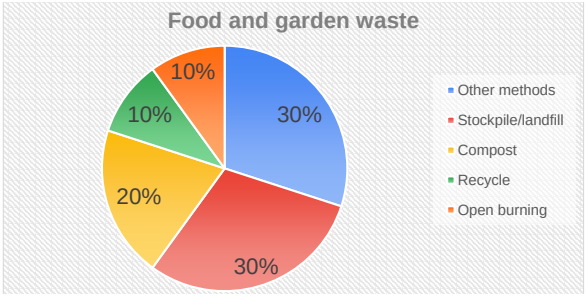
## 5.6. Waste Management and Disposal Methods:

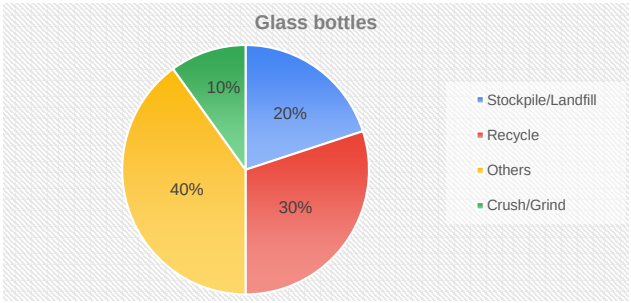
Waste management and disposal method for selected waste types were identified from the 10 inhabited islands, where waste is management is practiced. The categories of waste identified for this study includes domestic waste, construction waste and hazardous waste. The following list shows the category of waste included in the study

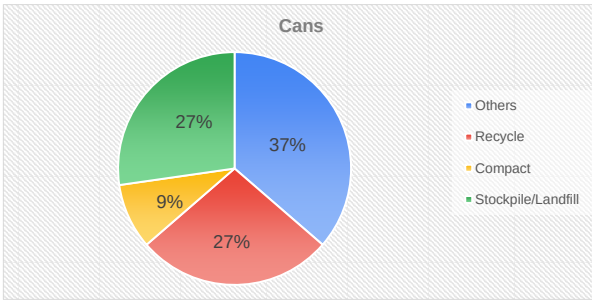
1. Green waste (Wood & Trees)
2. Food and Garden waste
3. Plastic
4. Construction/Demolition waste
5. Cans
6. Glass bottles
7. Electronics
8. Large metals (Roofing, Iron bars etc.)
9. Paper & Cardboard boxes
10. Waste Oil
11. Rubber
12. Hazardous waste

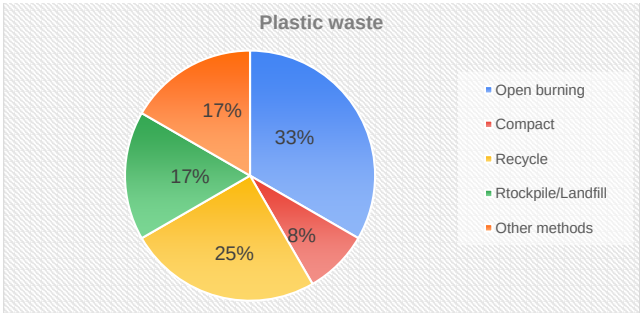
The following charts shows the disposal method practiced at in Laamu Atoll for the aforementioned categories of waste.

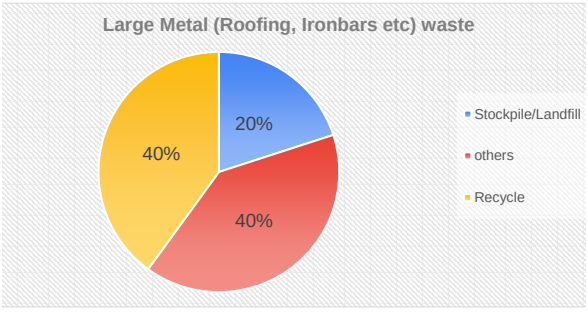


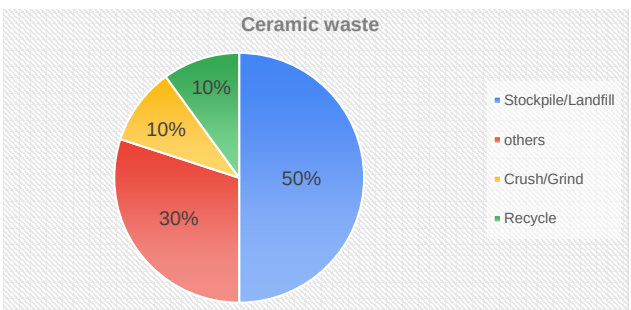



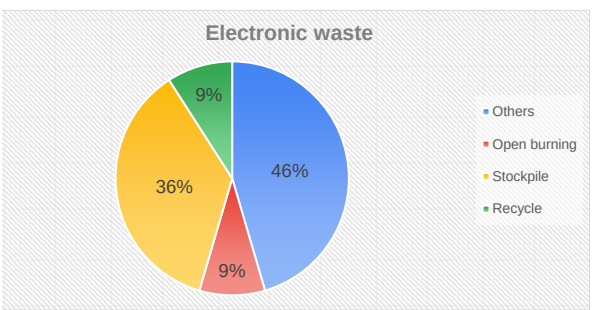



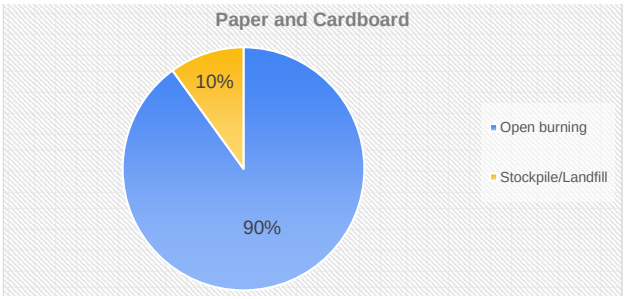



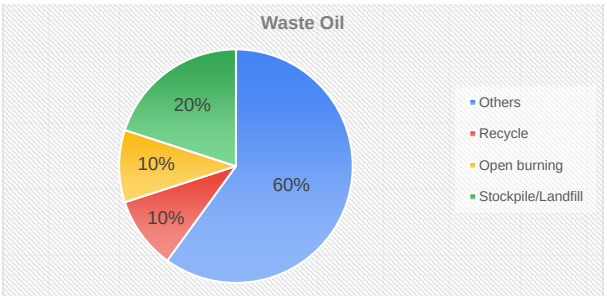



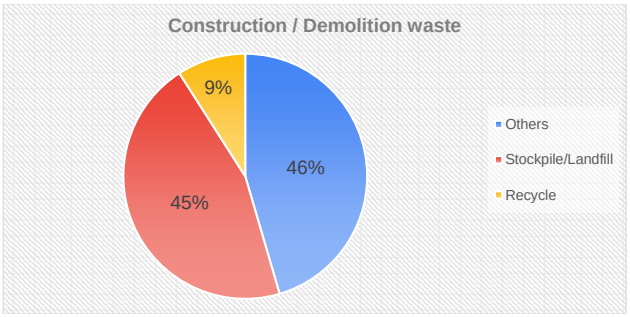



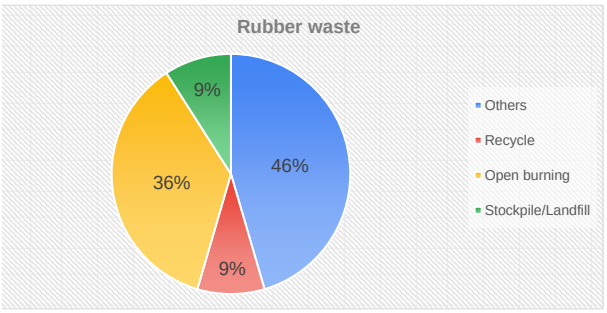





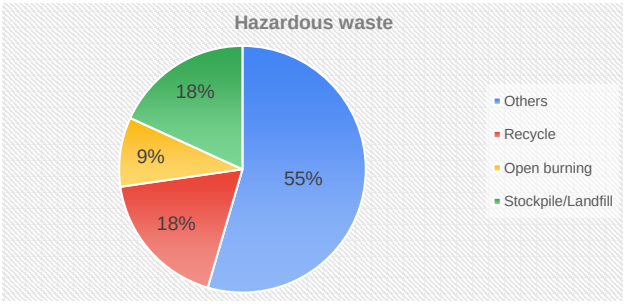




*Figure 6: Waste disposal and management practices in Laamu Atoll*

The data indicates the highest percentage of waste is stockpiled in waste management or collection area, regardless of the category. The data also shows that, open burning is common practice in employed in disposal of paper and cardboard, food and garden waste, green waste, plastic and rubber. It was evident from the field observation as well.  The bulky waste is stockpiled and, in some islands, metals are being sold, however there is no proper market established for it.

The field observation indicated that, even though waste management equipment is provided, except for a 1-2 islands, the equipment has not been used even once and most equipment are stored in IWRMC. The vehicle is utilized to collect waste from households registered in councils and most vehicles are operational, except for islands like Fonadhoo. Vehicle maintenance is a significant issue encountered by the councils, due to financial constraints and technical expertise in the island.

The field observation and consultation with councils indicated, kitchen waste and organic waste which are easily degradable are being disposed to the lagoon or the sea. In islands such as Fonadhoo, kitchen waste is manually disposed into the shallow lagoon area by waste management staff by removing non-biodegradable content. While islands such as Gan, Maabaidhoo and Kalaidhoo has a cage fenced with wire mesh to prevent the release of non-biodegradable waste into the sea. The non-biodegradable content such as plastic bags and packing is later removed and burnt along with mixed waste in IWRMC. In Hithadhoo island, kitchen waste is buried in layers while garden and green waste is burnt. The IWRMC has slab already constructed for composting purposes, however composting has not been started, due to lack of technical expertise, limited awareness on composting and marketing the product.

# 6 LOCAL WASTE MANAGEMENT AND CHALLENGES

## 6.1. Isdhoo:

An estimated 8 tons of waste is produced per day in the island of Isdhoo according to data provided by the council. A 1500 square feet, waste management center is built under the funding from UNDP, LECReD Project in the island.  According to data provided by waste department of MECCT the following machineries are provided to Isdhoo IWRMC.


*Figure 7: Map of L.Isdhoo indicating Location of IWRMC*

The waste management center consists of a built area with machineries. The glass and wood grinding machine and can crushing machine is being operational since 2018.  The council is facing challenges due to limited capacity of wood grinding machine and vehicle, to cater the waste management needs to Isdhoo island. The wood chips from the IWMC is used for agricultural purposes.

According to data provided by waste department of MECCT the following machineries are provided to Isdhoo IWRMC.

| # | Machinery | Received year | Quantity | Funding | Status |
|---|---|---|---|---|---|
| 1 | Glass Crusher | 2019 | 1 | LECReD | Functional |
| 3 | Compactor (Metal/Plastic) | 2018 | 1 | LECReD | Functional |
| 4 | Wood Chipper | 2018 | 1 | LECReD | Functional |
| 7 | 1.5Ton Lorry | 2016 | 1 | LECReD | Functional |
| 8 | Bins 120L | 2018 | 267 | LECReD | Functional |
| 11 | Wheel Barrow | 2018 | 1 | LECReD | Functional |

*Table 2:Inventory of waste management and transport equipment in Isdhoo (Source Waste Department, MECCT)*

The table below, (Table 3) shows the method of waste disposal, currently practiced in Isdhoo island based on data collected from the councils.

| Type of waste | Recycling | Stockpile/ Landfill | Open burning | Compost | Incinerate | Crushed/Grind | Compact | Others |
|---|---|---|---|---|---|---|---|---|
| Green waste (Wood and trees) | | | ✓ | ✓ | | | | |
| Food & garden waste | | | | ✓ | | | | |
| Plastic | | | | | | | ✓ | |
| Construction/ demolition waste | | | | | | | | ✓ |
| Cans | | | | | | | ✓ | |
| Glass Bottles | | | | | | ✓ | | |
| Ceramic | | | | | | ✓ | | |
| Electronics | | | | | | | | ✓ |
| Large Metals (Roofing, bulky metal) | | | | | | | | ✓ |
| Paper & Cardboard boxes | | | ✓ | | | | | |
| Waste Oil | | | | | | | | ✓ |
| Rubber | | | | | | | | ✓ |
| Hazardous waste (batteries) | | | | | | | | ✓ |

*Table 3:Waste Disposal Methods in Isdhoo*

## 6.2. Kalaidhoo:

An estimated 2.5 tons of waste is produced per day in the island of Kalaidhoo according to data provided by the council. A 20000 square feet, waste management center is built under the funding from UNDP, LECReD Project in the island. The IWRMC is located in Southeast side of the island, as shown in the Figure 8.


*Figure 8: Map of Kalaidhoo indicating location of IWRMC*

The waste management center consists of a built area to install machineries; however, the building design and size does not accommodate the operations of machineries provided. Therefore, some structural changes need to be brought to the building before installation of machineries. A waste collection fee is charged from households in Kalaidhoo. According to data provided by waste department of MECCT the following machineries are provided to Kalaidhoo IWRMC.

| # | Machinery | Received year | Quantity | Funding | Status |
|---|---|---|---|---|---|
| 1 | Glass Crusher | 2019 | 1 | LECReD | Functional |
| 2 | Chain saw | 2019 | 1 | LECReD | Not in proper use |
| 3 | 2 Ton Lorry | 2019 | 1 | LECReD | Functional |
| 4 | Bins 120L | 2019 | 48 | LECReD | Functional |
| 5 | Bins 240L | 2019 | 162 | LECReD | Functional |
| 6 | Bins 660L | 2019 | 06 | LECReD | Functional |
| 7 | Wheel Barrow | 2019 | 4 | LECReD | Functional |

*Table 4: Inventory of waste management and transport equipment in Kalaidhoo (Source Waste Department, MECCT)*

The table below, (Table 5) shows the method of waste disposal, currently practiced in Kalaidhoo island based on data collected from the councils.

| Type of waste | Recycling | Stockpile/ Landfill | Open burning | Compost | Incinerate | Crushed/Grind | Compact | Others |
|---|---|---|---|---|---|---|---|---|
| Green waste (Wood and trees) | | | ✓ | | | | | |
| Food & garden waste | | | | | | | | ✓ |
| Plastic | | ✓ | ✓ | | | | | |
| Construction/ demolition waste | | | | | | | | ✓ |
| Cans | | ✓ | | | | | | ✓ |
| Glass Bottles | | ✓ | | | | | | |
| Ceramic | | ✓ | | | | | | |
| Electronics | | ✓ | | | | | | |
| Large Metals (Roofing, bulky metal) | | ✓ | | | | | | |
| Paper & Cardboard boxes | | | ✓ | | | | | |
| Waste Oil | ✓ | | | | | | | |
| Rubber | | | ✓ | | | | | |
| Hazardous waste (batteries) | | ✓ | | | | | | ✓ |

*Table 5: Waste Disposal Methods in Kalaidhoo*

Other methods in waste disposal includes, disposal of waste into the sea, use of bulky waste such as construction waste to prevent erosion of the beach around IWMC and reuse or selling bulky metal. Food waste is disposed into the sea and surrounding lagoon area near IWRMC.

## 6.3. Dhanbidhoo:

L. Dhanbidhoo currently does not have a waste management center and waste is currently disposed to 4 beaches in the island. An estimated 0.5 tons of waste is disposed per day. According to LECReD Programme Final Report, Dhanbidhoo was included in the original SWM Investment plan, councils could not finalize a location for the new IWMC construction. The location finalized later on, was found unfeasible to build and operate waste management center due to remote location, environmental concerns and lack of access roads. According to data provided by waste department of MECCT the following machineries are provided to Dhanbidhoo Council.

| # | Machinery | Received year | Quantity | Funding | Status |
|---|---|---|---|---|---|
| **1** | Glass Crusher | 2018 | 1 | LECReD | Functional |
| **2** | Wood Chipper | 2018 | 1 | LECReD | Functional |
| **3** | Bins 120L | 2018 | 289 | LECReD | Functional |
| **4** | Bins 240L | 2018 | 19 | LECReD | Functional |
| **5** | Bins 660L | 2018 | 8 | LECReD | Functional |

*Table 6: Inventory of waste management and transport equipment in Dhanbidhoo (Source Waste Department, MECCT)*

## 6.4. Maabaidhoo:

An estimated 1.5 tons of waste is produced per day in the island of Maabaidhoo according to data provided by the council. A 3500 square feet, waste management center is built under the funding from UNDP, LECReD Project in the island. The IWRMC is located in South side of the island, as shown in the Figure 9.


*Figure 9: Map of Maabaidhoo indicating location of IWRMC*

The waste management center consists of a built area with machineries; however, the machineries are currently not operational due electricity issues encountered by IWMC which has been brought to attention of Fenaka Cooperation. Waste segregation is currently carried out in IWMC. Maabaidhoo council is currently charging a fee for collection of waste from households. According to data provided by waste department of MECCT the following machineries are provided to Maabaidhoo IWRMC.

| # | Machinery | Received year | Quantity | Funding | Status |
|---|---|---|---|---|---|
| **1** | Compactor (Metal/ Plastic) | 2016 | 1 | LECReD | Functional |
| **4** | Wood Chipper | 2016 | 1 | LECReD | Functional |
| **6** | Chain saw | 2016 | 1 | LECReD | Functional |
| **8** | Bins 120L | 2016 | 201 | LECReD | Functional |
| **9** | Bins 240L | 2016 | 15 | LECReD | Functional |
| **10** | Bins 660L | 2016 | 8 | LECReD | Functional |
| **11** | Wheel Barrow | 2016 | 4 | UNDP | Functional |

*Table 7:Inventory of waste management and transport equipment in Maabaidhoo (Source Waste Department, MECCT)*

The table below, (Table 8) shows the method of waste disposal, currently practiced in Maabaidhoo island based on data collected from the councils.

| Type of waste | Recycling | Stockpile/ Landfill | Open burning | Compost | Incinerate | Crushed/Grind | Compact | Others |
|---|---|---|---|---|---|---|---|---|
| Green waste (Wood and trees) | | | ✓ | | | | | |
| Food & garden waste | | | | | | | | ✓ |
| Plastic | | ✓ | ✓ | | | | | |
| Construction/ demolition waste | | | | | | | | ✓ |
| Cans | | ✓ | | | | | | ✓ |
| Glass Bottles | | ✓ | | | | | | |
| Ceramic | | ✓ | | | | | | |
| Electronics | | | | | | | | ✓ |
| Large Metals (Roofing, bulky metal) | | ✓ | | | | | | |
| Paper & Cardboard boxes | | | ✓ | | | | | |
| Waste Oil | | | ✓ | | | | | |
| Rubber | | | | | | | | ✓ |
| Hazardous waste (batteries) | | ✓ | | | | | | ✓ |

*Table 8: Waste Disposal Methods in Maabaidhoo*

The field observation and consultation with councils indicated, kitchen waste and organic waste which are easily degradable are being disposed to the lagoon or the sea. Kitchen waste is collected from households on plastic bags and the bags are disposed to a cage build in the lagoon area near waste collection center. The mesh retains the plastic packaging while the biodegradable contents are washed into the lagoon. The remaining plastic is collected and burnt. A large amount of mixed waste is stockpiled around the coastal zone next to waste collection center and large amount has been burnt.  Waste segregation up to some extent was observed and such waste was stockpiled, near IWRMC.

## 6.5. Mundoo:

Approximately 1 ton of waste is produced per day in the island of Mundoo according to data provided by the council. A 6000 square feet, waste management center is built under the funding from UNDP, LECReD Project in the island. The IWRMC is located in South side of the island, as shown in the Figure 10.

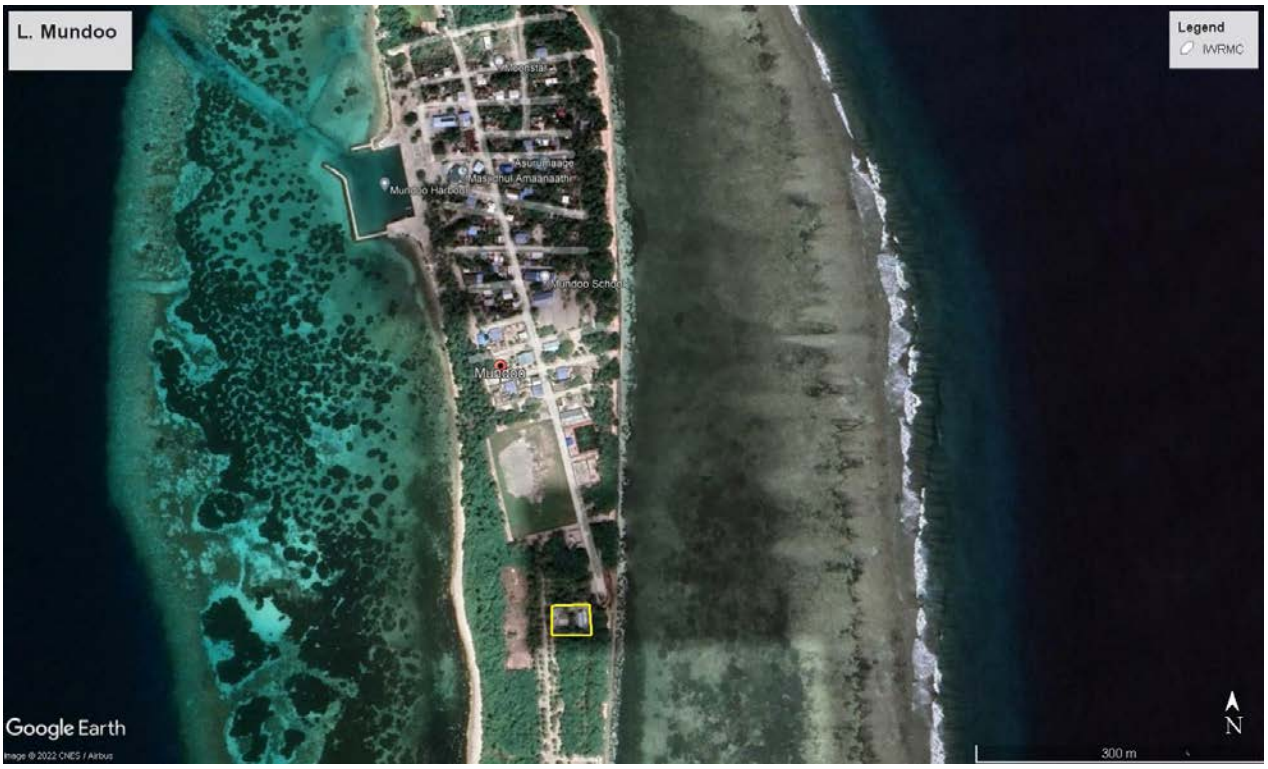



*Figure 10: Map of Mundoo indication location of IWRMC*

The waste management center consists of a built area with machineries and operations started on July 2021; however, most machineries are currently not operational. According to data provided by waste department of MECCT the following machineries are provided to Mundoo IWMC.

| # | Machinery | Received year | Quantity | Funding | Status |
|---|---|---|---|---|---|
| 1 | Plastic Shredder | 2019 | 1 | LECReD | |
| 2 | Glass Crusher | | 1 | | |
| 3 | Compactor (Metal/ Plastic) | | 1 | | |
| 4 | Wood Chipper | | 1 | | |
| 5 | 350kg Pickup | | 1 | | |
| 6 | Bins 120L | | 17 | | |

*Table 9:Inventory of waste management and transport equipment in Mundoo (Source Waste Department, MECCT)*

The table below, (Table 10) shows the method of waste disposal, currently practiced in Mundoo island based on data collected from the councils.

| Type of waste | Recycling | Stockpile/ Landfill | Open burning | Compost | Incinerate | Crushed/Grind | Compact | Others |
|---|---|---|---|---|---|---|---|---|
| Green waste (Wood and trees) | | | ✓ | | | | | |
| Food & garden waste | | | ✓ | | | | | |
| Plastic | ✓ | | | | | | | |
| Construction/demolition waste | ✓ | | | | | | | |
| Cans | ✓ | | | | | | | |
| Glass Bottles | ✓ | | | | | | | |
| Ceramic | ✓ | | | | | | | |
| Electronics | ✓ | | | | | | | |
| Large Metals (Roofing, bulky metal) | ✓ | | | | | | | |
| Paper & Cardboard boxes | | | ✓ | | | | | |
| Waste Oil | | ✓ | | | | | | |
| Rubber | ✓ | | | | | | | |
| Hazardous waste (batteries) | ✓ | | | | | | | |

*Table 10: Waste Disposal methods in Mundoo*

## 6.6. Gan:

An estimated 7 tons of waste is produced per day in the island of Gan according to data provided by the council. A 50,000 square feet, waste management center is built under the funding from UNDP, LECReD Project in the island. The waste collection area is located in East side of the island, as shown in the Figure 11.


*Figure 11: Map of Gan Indicating location of IWRMC*

The waste management center consists of a built area with machineries; however, the machineries are currently not operational due to lack of expertise in the council for installation and operation of machineries. Gan council is currently charging a fee for collection of waste from households. A locally built incinerator was established in L.Gan in 2016 under domestic budget, however it is not currently under operational. Further, present site at L.Gan for WM has just a boundary wall and waste burning area and does not embody key elements required in current model concept used by the MECCT.

According to data provided by waste department of MECCT the following machineries are provided to Gan IWMC.

| # | Machinery | Received year | Quantity | Funding | Status |
|---|---|---|---|---|---|
| **1** | Plastic Shredder | 2019 | 1 | LECReD | Functional |
| **2** | Glass Crusher | 2019 | 1 | LECReD | Functional |
| **3** | Compactor (Metal/ Plastic) | 2019 | 1 | LECReD | Functional |
| **4** | Wood Chipper | 2019 | 1 | LECReD | Functional |
| **5** | Weighing Scale | 2019 | 1 | LECReD | Functional |
| **6** | Chain saw | 2019 | 1 | LECReD | Functional |
| **7** | 350 kg pickup | 2019 | 2 | LECReD | Functional |
| **8** | 2 Ton Lorry | 2019 | 2 | LECReD | Functional |
| **8** | Bins 120L | 2019 | 14 | LECReD | Functional |
| **11** | Wheel Barrow | 2017 | 8 | LECReD | 2 Damaged |

*Table 11:Inventory of waste management and transport equipment in Gan (Source Waste Department, MECCT)*

The table below, (Table 12) shows the method of waste disposal, currently practiced in Gan island based on data collected from the councils.

| Type of waste | Recycling | Stockpile/ Landfill | Open burning | Compost | Incinerate | Crushed/Grind | Compact | Others |
|---|---|---|---|---|---|---|---|---|
| Green waste (Wood and trees) | | ✓ | | | | | | |
| Food & garden waste | | ✓ | | | | | | |
| Plastic | ✓ | | | | | | | |
| Construction/ demolition waste | | ✓ | | | | | | |
| Cans | | ✓ | | | | | | |
| Glass Bottles | | ✓ | | | | | | |
| Ceramic | | ✓ | | | | | | |
| Electronics | | ✓ | | | | | | |
| Large Metals (Roofing, bulky metal) | ✓ | | | | | | | |
| Paper & Cardboard boxes | | ✓ | | | | | | |
| Waste Oil | | ✓ | | | | | | |
| Rubber | | | ✓ | | | | | ✓ |
| Hazardous waste (batteries) | | | | | | | | ✓ |

*Table 12: Waste Disposal Methods in Gan*




The field observation and consultation with councils indicated, kitchen waste and organic waste which are easily degradable are being disposed to the lagoon or the sea. Kitchen waste is collected from households on plastic bags and the bags are disposed off to a cage build in the lagoon area near waste collection center. The mesh retains the plastic packaging while the biodegradable contents are washed into the lagoon. The remaining plastic is collected and burnt. The time of field visit, the waste was being actively burnt and large amount of mixed waste is stockpiled around the beach next to waste collection center.

## 6.7. Maavah:

Approximately 6 tons of waste is produced per day in the island of Maavah. A 13,200 square feet, waste management center is built under the funding from UNDP, LECReD Project in the island. The IWRMC is located in North Western side of the island, as shown in the Figure 12.


*Figure 12: Map of L. Maavah indicating location of IWRMC*

According to data provided by waste department of MECCT the following machineries are provided to Maavah IWRMC:

| # | Machinery | Received year | Quantity | Funding | Status |
|---|---|---|---|---|---|
| **1** | Plastic Shredder | 2018 | 1 | LECReD | Functional |
| **2** | Glass Crusher | 2018 | 1 | LECReD | Functional |
| **3** | Compactor (Metal/Plastic) | 2018 | 1 | LECReD | Functional |
| **4** | Wood Chipper | 2018 | 1 | LECReD | Functional |
| **5** | Weighing Scale | 2018 | 1 | LECReD | Functional |
| **6** | Chain saw | 2018 | 1 | LECReD | Functional |
| **7** | 2 Ton Lorry | 2019 | 1 | LECReD | Functional |
| **8** | Bins 120L | 2018 | 515 | LECReD | Functional |
| **9** | Bins 240L | 2018 | 35 | LECReD | Functional |
| **10** | Bins 660L | 2018 | 15 | LECReD | Functional |
| **11** | Wheel Barrow | 2018 | 8 | LECReD | Functional |

*Table 13:Inventory of waste management and transport equipment in Maavah (Source: Waste Department, MECCT)*

The waste management center consists of a built area to install machineries; however, the building design and size does not accommodate the operations of machineries provided. Therefore, some structural changes need to be brought to the building before installation of machineries. Maavah council is facing challenges in starting waste management process in the island due to installation challenges of machineries, mismanaged waste disposal at the waste management area and surrounding areas outside the boundary of IWRMC. The council does not have required expertise to operationalize the machineries as well. As of now, no fee is charged for waste management from the community.

| Type of waste | Recycling | Stockpile/ Landfill | Open burning | Compost | Incinerate | Crushed/ Grind | Compact | Others |
|---|---|---|---|---|---|---|---|---|
| Green waste (Wood and trees) | | | ✓ | | | | | |
| Food & garden waste | | | ✓ | | | | | |
| Plastic | | | | | | | | ✓ |
| Construction/ demolition waste | | | | | | | | ✓ |
| Cans | | | | | | | | ✓ |
| Glass Bottles | | | | | | | | ✓ |
| Ceramic | | | | | | | | ✓ |
| Electronics | | | | | | | | ✓ |
| Large Metals (Roofing, bulky metal) | | | | | | | | ✓ |
| Paper & Cardboard boxes | | | ✓ | | | | | |
| Waste Oil | | | | | | | | ✓ |
| Rubber | | | | | | | | ✓ |
| Hazardous waste (batteries) | | | | | | | | ✓ |

*Table 14: Waste Disposal Methods in Maavah*

Table 14 shows the method of waste disposal currently practiced in Maavah island based on data collected from the councils. Other methods in waste disposal includes, disposal of waste into the sea, use of bulky waste such as construction waste to prevent erosion of the beach around IWMC and reuse or selling bulky metal. The field observation showed that waste collected at IWRMC and surrounding area is burnt and accumulated around the coastal belt in the north west side of the island. Significant amount of waste has been disposed on to the beach and sea.

## 6.8. Fonadhoo:

An estimated seven tons of waste is produced per day in the island of Fonadhoo. A 23,063 square feet, waste management center is built under the funding from UNDP, LECReD Project in the island. The IWRMC is located in South side of the island, as shown in the Figure 13.


*Figure 13: Map of L.Fonadhoo indicating Location of IWRMC*

The waste management center consists of a built area with fencing and machineries; however, the machineries are currently not operational due to lack of expertise in the council for installation and operation of machineries. According to data provided by waste department of MECCT the following machineries are provided to Fonadhoo IWRMC.

| # | Machinery | Received year | Quantity | Funding | Status |
|---|---|---|---|---|---|
| 1 | Plastic Shredder | 2018 | 1 | LECReD | Functional |
| 2 | Glass Crusher | 2018 | 1 | LECReD | Functional |
| 3 | Wood Chipper | 2018 | 1 | LECReD | Functional |
| 4 | Incinerator | | 1 | | |

*Table 15:Inventory of waste management and transport equipment in Fonadhoo (Source Waste Department, MECCT)*

The table below, (Table 16) shows the method of waste disposal currently practiced in Fonadhoo island based on data collected from the councils.

| Type of waste | Recycling | Stockpile/ Landfill | Open burning | Compost | Incinerate | Crushed/ Grind | Compact | Others |
|---|---|---|---|---|---|---|---|---|
| Green waste (Wood and trees) | | | ✓ | | | | | |
| Food & garden waste | | | | | | | | ✓ |
| Plastic | | ✓ | | | | | | |
| Construction/ demolition waste | | ✓ | | | | | | |
| Cans | | ✓ | | | | | | |
| Glass Bottles | | | | | | | | ✓ |
| Ceramic | | ✓ | | | | | | |
| Electronics | | ✓ | | | | | | |
| Large Metals (Roofing, bulky metal) | | ✓ | | | | | | |
| Paper & Cardboard boxes | | | ✓ | | | | | |
| Waste Oil | | | | | | | | ✓ |
| Rubber | | | ✓ | | | | | ✓ |
| Hazardous waste (batteries) | | | | | | | | ✓ |

*Table 16: Waste Disposal Methods in Fonadhoo*

Other methods in waste disposal includes, disposal of waste into the sea, use of bulky waste such as construction waste to prevent erosion of the beach around IWMC and reuse or selling bulky metal. The field observation showed that waste collected at IWRMC and surrounding area is burnt and accumulated around the coastal belt around IWRMC. Significant amount of waste has been disposed on to the beach and sea. Food waste collected from households, are manually unpacked and disposed to the sea.

## 6.9. Maamendhoo:

Approximately 1.5 tons of waste is produced per day in the island of Maamendhoo according to data provided by the council. A 10,500 square feet, waste management center is built under the funding from UNDP, LECReD Project in the island. The IWRMC is located in Southeast side of the island, as shown in the Figure 14.


*Figure 14:Map of L. Maamendhoo indicating location of IWRMC*

According to data provided by waste department of MECCT the following machineries are provided to Maamendhoo IWRMC:

| # | Machinery | Received year | Quantity | Funding | Status |
|---|---|---|---|---|---|
| 1 | Glass Crusher | 2018 | 1 | LECReD | Functional |
| 2 | Compactor (Metal/ Plastic) | 2018 | 1 | LECReD | Functional |
| 3 | Wood Chipper | 2018 | 1 | LECReD | Functional |
| 4 | Weighing Scale | 2018 | 1 | LECReD | Functional |
| 5 | Chain saw | 2018 | 1 | LECReD | Functional |
| 6 | Bins 120L | 2018 | 16 | LECReD | 7 Damaged |
| 7 | Bins 240L | 2019 | 12 | LECReD | Functional |
| 8 | Bins 660L | 2018 | 8 | LECReD | 5 Damaged |
| 9 | Wheel Barrow | 2018 | 4 | LECReD | Functional |

*Table 17:Inventory of waste management and transport equipment in Maamendhoo (Source Waste Department, MECCT)*

The waste management center consists of a built area with installed machineries; however, the machineries are currently not operational due to high electricity requirement. The machineries in IWRMC require high voltage to operate, which can only be possible with 3-phase electricity. The existing generator in the island does not have the capacity to cater the electricity requirement for the machineries.

The table below, (Table 18) shows the method of waste disposal currently practiced in Maamendhoo island based on data collected from the councils.

| Type of waste | Recycling | Stockpile/ Landfill | Open burning | Compost | Incinerate | Crushed/Grind | Compact | Others |
|---|---|---|---|---|---|---|---|---|
| Green waste (Wood and trees) | | | | ✓ | | | | |
| Food & garden waste | | | | | | | | ✓ |
| Plastic | ✓ | | | | | | | ✓ |
| Construction/ demolition waste | | | | | | | | ✓ |
| Cans | | | | | | | | ✓ |
| Glass Bottles | | | | | | | | ✓ |
| Ceramic | | | | | | | | ✓ |
| Electronics | | | | | | | | ✓ |
| Large Metals (Roofing, bulky metal) | | | | | | | | ✓ |
| Paper & Cardboard boxes | | | ✓ | | | | | |
| Waste Oil | | | | | | | | ✓ |
| Rubber | | | | | | | | ✓ |
| Hazardous waste (batteries) | | | | | | | | ✓ |

*Table 18:Waste Disposal Methods in Maamendhoo*

Other methods in waste disposal includes, disposal of waste into the sea, use of bulky waste such as construction waste to prevent erosion of the beach around IWMC and reuse or selling bulky metal. Food waste is disposed off into the sea and surrounding lagoon area near IWRMC.

## 6.10. Hithadhoo:

Approximately 6 tons of waste is produced per day in the island of Hithadhoo. A 25200 square feet, waste management center is built under the funding from UNDP, LECReD Project in the island. The IWRMC is located in Eastern side of the island, as shown in the Figure 15.


*Figure 15:Map of L. Hithadhoo indicating location of IWRMC*

According to data provided by waste department of MECCT the following machineries are provided to Hithadhoo IWRMC:

| # | Machinery | Received year | Quantity | Funding | Status |
|---|---|---|---|---|---|
| 1 | Plastic Shredder | | 1 | LECReD | |
| 2 | Glass Crusher | | 1 | | |
| 3 | Compactor (Metal/Plastic) | | 1 | | |
| 4 | Wood Chipper | | 1 | | |
| 5 | 350 kg pickup | | | | |
| 6 | Bins 120L | | 53 | | |

*Table 19:Inventory of waste management and transport equipment in Hithadhoo (Source: Waste Department, MECCT)*

The waste management center consists of a built area with installed machineries and the machineries are operational in Hithadhoo IWRMC. Hithadhoo council is currently charging a fee for collection of waste from households. The field observation and consultation with councils indicated, biodegradable kitchen waste is buried in layers while garden and green waste is burnt. Presently,

waste collected are segregated and attempts to segregate previously stockpiled waste was being initiated by the council. Crushed glass and slabs of compacted metal cans were stored in IWRMC. Additionally, council reports that waste metal items have been sold in several occasions.

The table below, (Table 20) shows the method of waste disposal currently practiced in Hithadhoo island based on data collected from the councils.

| Type of waste | Recycling | Stockpile/ Landfill | Open burning | Compost | Incinerate | Crushed/ Grind | Compact | Others |
|---|---|---|---|---|---|---|---|---|
| Green waste (Wood and trees) | | | ✓ | ✓ | | | | |
| Food & garden waste | | | | ✓ | | | | |
| Plastic | | | ✓ | | | | | |
| Construction/ demolition waste | | | ✓ | | | | | |
| Cans | ✓ | | | | | | | |
| Glass Bottles | ✓ | | | | | | | |
| Ceramic | | ✓ | | | | | | |
| Electronics | | ✓ | | | | | | |
| Large Metals (Roofing, bulky metal) | ✓ | | | | | | | |
| Paper & Cardboard boxes | | | ✓ | | | | | |
| Waste Oil | | | ✓ | | | | | |
| Rubber | | | ✓ | | | | | |
| Hazardous waste (batteries) | | | ✓ | | | | | |

*Table 20: Waste Disposal Methods in Hithadhoo.*

## 6.11. Kunahandhoo:

Approximately 6 tons of waste is produced per day in the island of Kunahandhoo. A 23,250 square feet, waste management center is built under the funding from UNDP, LECReD Project in the island. The IWRMC is located in Eastern side of the island, as shown in the Figure 16.


*Figure 16: Map of L. Kunahandhoo indicating location of IWRMC*

According to data provided by waste department of MECCT the following machineries are provided to Kunahandhoo IWRMC:

| # | Machinery | Received year | Quantity | Funding | Status |
|---|---|---|---|---|---|
| 1 | Glass Crusher | 2018 | 1 | LECReD | Functional |
| 2 | Compactor (Metal/ Plastic) | 2018 | 1 | LECReD | Functional |
| 3 | Wood Chipper | 2018 | 1 | LECReD | Functional |
| 4 | Weighing Scale | 2017 | 1 | LECReD | Functional |
| 5 | Chain saw | 2017 | 1 | LECReD | Not in proper use |
| 6 | Sieving Trommel | | 1 | | Not in proper use |
| 7 | 1.5 Ton Lorry | 2020 | 1 | UNDP, Council | Functional, but repairs needed |
| 8 | Bins 120L | 2017 | 350 | UNDP | Functional |
| 9 | Bins 240L | 2017 | 21 | UNDP | Functional |
| 10 | Bins 660L | 2017 | 8 | LECReD | Functional |
| 11 | Wheel Barrow | 2017 | 4 | LECReD | Functional |

*Table 21:Inventory of waste management and transport equipment in Maavah (Source Waste Department, MECCT)*

The waste management center consists of a built area to install machineries; however, the building design and size does not accommodate the operations of machineries provided. Therefore, some structural changes need to be brought to the building before installation of machineries. Additionally, the council is facing challenges in providing 3- Phase electric wiring as the operation of the machineries require high voltage electricity. Kunahandhoo council is charging a fee for collection of waste from households.

| Type of waste | Recycling | Stockpile/ Landfill | Open burning | Compost | Incinerate | Crushed/ Grind | Compact | Others |
|---|---|---|---|---|---|---|---|---|
| Green waste (Wood and trees) | | | ✓ | | | | | |
| Food & garden waste | | | | | | | | |
| Plastic | | | ✓ | | | | | |
| Construction/ demolition waste | | | | | | | | ✓ |
| Cans | | | | | | | | ✓ |
| Glass Bottles | | | | | | | | ✓ |
| Ceramic | | | | | | | | ✓ |
| Electronics | | | | | | | | ✓ |
| Large Metals (Roofing, bulky metal) | | | | | | | | ✓ |
| Paper & Cardboard boxes | | | ✓ | | | | | |
| Waste Oil | | | | | | | | ✓ |
| Rubber | | | | | | | | ✓ |
| Hazardous waste (batteries) | | | | | | | | ✓ |

*Table 22:Waste Disposal Methods in Kunahandhoo*

Table 22 shows the method of waste disposal currently practiced in Kunahandhoo island based on data collected from the councils. Other methods in waste disposal includes, disposal of waste into the sea, use of bulky waste such as construction waste to prevent erosion of the beach around IWMC and reuse or selling bulky metal.

| # | Machinery | Received year | Quantity | Funding | Status |
|---|---|---|---|---|---|
| 1 | Plastic Shredder | | 1 | LECReD | |
| 2 | Glass Crusher | | 1 | | |
| 3 | Compactor (Metal/Plastic) | | 1 | | |
| 4 | Wood Chipper | | 1 | | |
| 5 | 350 kg pickup | | | | |
| 6 | Bins 120L | | 53 | | |

*Table 23: Inventory of waste management and transport equipment in Kalaidhoo (Source Waste Department, MECCT)*

# 7 CONCLUSIONS AND RECOMMENDATIONS:

1. Waste management in Laamu has been significantly further ahead compared to most islands of Maldives. Machinery and equipment for waste transport and management has been provided to 90% of islands under LECReD project by the end of 2018 and 2019. However, the islands are unable to properly manage waste. All the islands practice open burning of mixed waste and domestic waste is still disposed into the sea and lagoon area. Waste segregation is practiced in 50% of islands, however most waste is stockpiled outside the boundary of IWRMC or is disposed into the coastal zone next wot IWRMC.

2. and L. Dhanbidhoo and L. Gan island requires a waste management or collection center immediately. Since, disposal of waste to beaches and sea is prohibited under waste management regulation, current practice of waste disposal should be stopped immediately.

3. The islands with waste management centers are encountering challenges of catering to the needs to waste management especially with operationalization of equipment in the IWMC. The catering to electricity requirement, expertise for operations and training on management of waste management centers are required for the councils of Laamu Atoll, to fully operationalize the waste management centers.

4. The allocated size of waste management center and its location in islands like Maavah needs to be reviewed to cater to the amount of waste generated in the island.

5. Emphasis needs to be given to proper segregation methods at household level, especially for recyclables. Training and awareness program for households in segregation of waste, can improve the process of recycling at island level.

6. Environmentally friendly or sustainable waste management training and awareness must be given to councils to operate the IWMC in most efficient ways.

7. Methods of enhancing income from waste management must be explored, in order to address the additional costs incurred in operation of equipment and operation of waste management center.

8. Fenaka Corporation is presently carrying out a nationwide project for upgrading electricity grids in islands, it is essential to prioritize the project in Laamu Atoll in an effort to allow operationalization of IWMC.

# REFERENCES:

*Ministry of Environment Climate Change and Technology, MECCT (1993), Environment Protection and Preservation Act (4/93)*

*Ministry of Environment Climate Change and Technology, MECCT (2013), Regulation on Waste Management (R58/2013)*

*LECReD Programme Coordination Unit (PCU), Laamu Atoll with support from Thomas Lynge Jensen, Environment and Energy Specialist, UNDP Pacific Centre, (2014). The UN Joint Maldives Low Emission Climate Resilient Development (LECReD) Programme, Inception Report*

*Ministry of Environment Climate Change and Technology, MECCT (2015), National Waste Management Policy 2015*

*UNDP Maldives, (2018). Implementation of the LECReD Stage Two Component, Final Report*

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ANNEX 1: Literature Review, LECReD Report


# Literature review on

INCEPTION REPORT AND FINAL REPORT PUBLISHED BY
LOW EMMISSION CLIMATE RESILIENT DEVELOPMENT (LECRED)
PROGRAMME

## INTRODUCTION

This literature review is made to provide understanding behind both the inception and final report published by LECReD program conducted in Laamu Atoll. This program was conducted in Laamu Atoll from 2014 till 2018.

The 4-year, US$9.2 million United Nations (UN) Joint Programme, "Low Emission and Climate Resilient Development" (LECReD) funded by the Government of Denmark.

The programme will assist the Laamu Atoll and its islands to realize low emission and climate resilient development (LECReD). The programme seeks to mainstream LECReD issues into local level development planning and service delivery for greater community-level ownership and sustainability of programme benefits.

Towards this objective, the programme will support local councils, civil society, private sector and other local stakeholders to establish platforms for stronger partnerships, improved coordination, and enhanced participation in local planning for LECReD; it will strengthen data and knowledge systems for LECReD; improve local level LECReD development planning and management of service delivery; and through a learning-by-doing approach establish early lessons and build demand for LECReD planning and management for replication and scaling-up.

In pursuit of the core objective, the programme will achieve the following outputs:

> Output 1: Partnership, coordination, and participation platform for local LECReD planning and action is strengthened.
> Output 2: Data and knowledge systems established or identified to support evidence-based planning and policy development for LECReD at the local level.
> Output 3: Improved Local Level Planning and Management for LECReD.
> Output 4: Practical local experience in LECReDs interventions leads to learning and promotes replication.

## INCEPTION REPORT

The program establishment and start-up activities in Maldives started with the contract signing of LECReD Programme Coordination Unit (PCU). A two-week induction for PCU staff held at UN Offices in Male' from 23 March 2014 to 3 April 2014. Meetings with participating United Nations Organizations, Maldives government officials and authorities were held during this. The PCU team arrived at Laamu Fonadhoo on Friday the 4 April 2014. The office was established at Laamu Atoll Council Secretariat.

PCU team had several meetings with stakeholders in the atoll including councils, schools, etc. Also works were done by PCU team regarding management, coordination and advisory arrangements of the team. Further annual work plan, budget, procurement plan with monitoring and evaluation work was formed.

Some issues and challenges were faced to the PCU team in terms of unavailability of a permanent PCU office, communication with PUNOs (Participating United Nation Organizations), logistic and travel arrangements to Laamu Atoll, etc. Therefore, recommendation of a permanent PCU office and effective communication mechanisms with PUNOs were recommended for effective operation. And TOR (Terms of References) were formed for all technical teams to give proper understanding on their purposes, roles and responsibilities to carry on with the 4-year program at Laamu Atoll.

## FINAL REPORT

One of the key environmental challenges in the Maldives is waste management. The quantity of waste generated continues to rise with potential increase of non-biodegradable waste, growing tourism industry, increase population and changes in lifestyle and consumption patterns, etc.

As part of Output 4, Activity 4.5.1 involves establishing proper waste management systems in place for waste segregation, composting, recycling, transport and storage in Laamu atoll, as an effort to improve the ecosystem resilience of the atoll. A Draftsman is required by UNDP to support the process of reviewing and developing drawings for these Island Waste Management Centers (IWMCs) of selected islands of the atoll, as per the standards set by the Government of the Maldives.

The most visible pressing environmental challenge faced by the communities in Laamu Atoll is Solid Waste Management. The limited space in the island combined with population growth, changes in lifestyle and lack of proper waste management systems has exacerbated the situation in the atoll. Moreover, lack of trained personnel, and a formal transport mechanism has added to the issue.

Prior to the LECReD Programme, six waste management centers existed in the atoll. These infrastructures were mainly donations through various international aid agencies following the 2004 Asian Tsunami. During the initial scoping, such structures were observed in Fonadhoo, Isdhoo, Mundoo, Kalaidhoo and Dhanbidhoo. However, only the Fonadhoo waste management center was partially functional. All other structures were either full, unutilized, or deteriorating.

The Solid Waste Management Investment Plan focused on an island level waste management system with the following elements:

- Segregation of waste at source
- Waste collection service
- Island Waste Management Centre (IWMC)
- Management of healthcare waste (Through WHO support)

The IWMCs make up the most crucial component of the SWM Investment Plan. Laamu Atoll had six IWMCs prior to LECReD, however, most of them were deteriorating. The SWM Investment Plan identified the following work required for each island.

| Island | Existing IWMC | Work required |
|---|---|---|
| **Isdhoo** | Yes, but does not meet the EPA requirements. Partially built IWMC from LECReD Small grants | Extension work including an equipment and machinery room, rainwater tank, composting bed and fence. |
| **Kalaidhoo** | Yes, but the IWMC is not accessible and has badly deteriorated | New IWMC |
| **Dhanbidhoo** | Yes, but does not meet EPA requirements and council wishes to relocate | New IWMC |
| **Maabaidhoo** | No | New IWMC |
| **Mundoo** | Yes | Extension work including an equipment and machinery room, rainwater tank, composting bed and fence. |
| **Gan** | Yes, and council is building new IWMC through a Private Sector Partnership | No work |
| **Fonadhoo** | Yes | Extension work including an equipment and machinery room, rainwater tank, composting bed and fence. |
| **Hithadhoo** | Yes, through LECReD Small Grants | Extension work including an equipment and machinery room, rainwater tank, composting bed and fence. |
| **Maamendhoo** | | Extension work including an equipment and machinery room, rainwater tank, composting bed and fence. |
| **Kunahandhoo** | No | New IWMC |
| **Maavah** | No | New IWMC |

Although Dhanbidhoo was included in the original SWM Investment plan, councils could not finalize a location for the new IWMC construction. The location finalized later on, was found unfeasible to build and operate waste management center due to remote location, environmental concerns and lack of access roads. Also, Gan Island council was building a new IWMC through a private sector partnership.

To initiate the process of construction of IWMC, UNDP conducted a scoping visit to all islands in November 2016 and visited all existing and proposed sites and met with the local councils. A risk analysis matrix was prepared for the work. The invitation to Bid Process was opened to select construction companies.

Bid awarded after the evaluation process and companies started construction work of IWMC. However, one of the main changes brought to the SWM Investment Plan was to change the proposed solar panel systems to three phase electricity connection to all centers. This change was brought about at the Ministry's request.

A main concern highlighted by the Ministry was the delays incurred to the overall construction project when the electricity connection was included in the construction contracts. It was anticipated that only smaller companies with limited financial and administrative capabilities, and limited experience in manufacturing and importing the street distribution boxes and electricity cables, will be interested in this type of construction work.

Therefore, it was decided that the electricity drawings and the technical specifications street distribution boxes and electricity cables will be produced by the UNDP's Civil Engineer, and the work will be contracted to a third party. The construction companies will only be required to carry out the excavation and installation work once the cables have been delivered to the islands.

UNDP conducted a site handover visit, and one monitoring trip between the contract awarding and March 2018. The objective of these missions was to monitor the progress of the work carried out by the contractors and ensure that the technical requirements were being met. The trips also allowed an opportunity to discuss about issues and concerns raised by the councils, the contractors and the Ministry of Environment and Energy. As per the report a final monitoring visit needs to be carried out before the final payment to the contractors and handover to the Government.

The programme faces many challenges and issues including the budgetary constraints, new council elections falling on to the project period, delays from contractors and vendors in constructing IWMCs and some individual challenges and issues from islands.

The report concluded providing many recommendations on how to improve things and implement them better in future projects.

## REFERENCES

LECReD Programme Coordination Unit (PCU), Laamu Atoll with support from Thomas Lynge Jensen, Environment and Energy Specialist, UNDP Pacific Centre, (2014). *The UN Joint Maldives Low Emission Climate Resilient Development (LECReD) Programme, Inception Report*
UNDP Maldives, (2018). *Implementation of the LECReD Stage Two Component, Final Report*

## Waste Disposal Methods
## Data Sheet

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Part 1: Location** | | | | | | | | | |
| Island Name | | | | | | | | | |
| **Part 2: Waste Segregation** | | | | | | | | | |
| Waste Segregated (Yes/No) | | | | | | | | | |
| If yes, household segregation/ at IWMC | | | | | | | | | |
| Type of waste Segregated | | | | | | | | | |
| **Part 3: Disposal Methods based on Type of waste** | | | | | | | | | |
| **#** | **Type of waste** | **Recycling** | **Stockpile/ Landfill** | **Open burning** | **Compost** | **Incinerate** | **Crushed/ Grind** | **Compact** | **Others/Please specify** |
| 1 | Green waste (Wood and trees) | | | | | | | | |
| 2 | Food & garden waste | | | | | | | | |
| 3 | Plastic | | | | | | | | |
| 4 | Construction/ demolition waste | | | | | | | | |
| 5 | Cans | | | | | | | | |
| 6 | Glass Bottles | | | | | | | | |
| 7 | Ceramic | | | | | | | | |
| 8 | Electronics | | | | | | | | |
| 9 | Large Metals (Roofing, iron bars etc) | | | | | | | | |
| 10 | Paper & Cardboard boxes | | | | | | | | |
| 11 | Waste Oil | | | | | | | | |
| 12 | Rubber | | | | | | | | |
| 13 | Hazardous waste (batteries) | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| Island | Waste Segregated? Yes/No | Location of waste segregation | Green waste (Wood and trees) | Food & garden waste | Plastic | Construction/ demolition waste | Cans | Glass Bottles | Ceramic | Electronics | Large Metals (Roofing, iron bars etc) | Paper & Cardboard boxes | Waste Oil | Rubber | Hazardous waste (batteries) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L.Maabaidhoo | Yes | Both | Open burning | Others/Please specify | Open burning and Stockpile/ Landfill | Others/Please specify | Others/Please specify and Stockpile/ Landfill | Stockpile/ Landfill | Stockpile/ Landfill | Others/Please specify and Stockpile/ Landfill | Stockpile/ Landfill | Open burning | Others/Please specify | Open burning | Others/Please specify and Stockpile/ Landfill |
| l.Kalaidhoo | Yes | IWMC | Open burning | Stockpile/ Landfill | Open burning | Stockpile/ Landfill | Recycling | Recycling | Stockpile/ Landfill | Open burning | Recycling | Open burning | Recycling | Open burning | Recycling |
| L.Kunahandhoo | Yes | Household | Open burning | | Open burning | Others/Please specify and Stockpile/ Landfill | Others/Please specify | Others/Please specify | Others/Please specify | Others/Please specify | Others/Please specify | Open burning | Others/Please specify | Others/Please specify | Others/Please specify |
| L.Hithadhoo | Yes | Household | Open burning and Compost | Compost | Open burning | Stockpile/ Landfill | Recycling | Recycling | Stockpile/ Landfill | Stockpile/ Landfill | Recycling | Open burning | Open burning | Open burning | Open burning |
| L.Isdhoo | Yes | Both | Open burning and Compost | Compost | Compact | Others/Please specify | Compact | Crushed/Grind | Crushed/Grind | Others/Please specify | Others/Please specify | Open burning | Others/Please specify | Others/Please specify | Others/Please specify |
| L.Mundoo | Yes | Household | Open burning | Stockpile/ Landfill and Recycling | Recycling | Recycling | Recycling | Recycling | Recycling | Recycling | Recycling | Open burning | Stockpile/ Landfill | Recycling | Recycling |
| L.Maamendhoo | Yes | Both | Compost | Others/Please specify | Others/Please specify and Recycling | Others/Please specify | Others/Please specify | Others/Please specify | Others/Please specify | Others/Please specify | Others/Please specify | Open burning | Others/Please specify | Others/Please specify | Others/Please specify |
| L.Maavah | No | Both | Open burning | Open burning | Others/Please specify | Others/Please specify | Others/Please specify | Others/Please specify | Others/Please specify | Others/Please specify | Others/Please specify | Open burning | Others/Please specify | Others/Please specify | Others/Please specify |
| L.Gan | Yes | Both | Stockpile/ Landfill | Stockpile/ Landfill | Recycling | Stockpile/ Landfill | Stockpile/ Landfill | Stockpile/ Landfill | Stockpile/ Landfill | Stockpile/ Landfill | Recycling | Stockpile/ Landfill | Stockpile/ Landfill | Stockpile/ Landfill | Stockpile/ Landfill |
| L.Fonadhoo | Yes | Both | Open burning | Others/Please specify | Stockpile/ Landfill | Stockpile/ Landfill | Stockpile/ Landfill | Others/Please specify | Stockpile/ Landfill | Stockpile/ Landfill | Stockpile/ Landfill | Open burning | Others/Please specify | Open burning and Others/Please specify | Others/Please specify |

# ANNEX 3: Waste Management General Information

Waste Management Details in Laamu Atoll Islands

| Councils | Information Given By | Waste management centre | Centre Built by | Centre usage level | The current challenges in opperating | Income generated from council by managing the waste management system | Size of waste management center/ dumping site | Estimated amount of waste produced per day | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| Isdhoo Council | Ibrahim Haleel (president of Isdhoo council) | Waste Management centre available at the Island | Built under by UNDP project | Using the machineries from 2018. Glass, Cane and wood grainding machines are in good condition and opperating at the centre | Wood grainding machine capacity and vehicles for collecting waste is too small for the popiulation of the island right now. | Grainded wood materials is used in Agriculture. Fees taking for waste collection | 200 * 250 ft | 2 Tonnes pickup 3-4 full load per day | Right now building a accomodation block for workers in the Waste managing centre by council budget. |
| Kalaidhoo Council | Ahmed Shiyam (president of Isdhoo council) | Waste Management centre available at the Islan | Built under by UNDP project | Centre Building is built but some changes has to be made to the building before installing machineries. | Managing waste at the site of the waste managing centre. | Fees taken from houses for collecting waste by council. | 100 * 200 ft | 2 to 2.5 tonnes per day | |
| Dhanbidhoo Council | Ali Hafeez from L.Danbidhoo Council | No waste Management centre, Currently using 4 beach areas to dump waste. | No Island Waste M | No Island Waste Management Centre | No Island Waste Management Centre | No Island Waste Management Centre | No specific area | Half tonne | There is no Budget plan from the council or a project for waste management facility. |
| Maabaidhoo Council | Information given by Azuma (vice president of L. Maabaidhoo) | Waste Management centre available at the Island. | Built under by UNDP project | Using machineries at waste managing centre has not started. Just sparating different types of waste near the centre. | Problems in starting the machineries due to electric issues in the waste management centre, the issue is informed to Penaka copporation. | Fees taken from houses for collecting waste by council. | 50ft x 70ft | 2.5 Tonnes per day | Planned to start using michineries from November 2021. |
| Mundoo Council | Information given by Ali shafeeu from L. Mundoo council. | Waste Management centre available at the Island. | Built under by UNDP project | From July 2021 waste managing centre started opperating but the machineries is not used at the moment. | Only cane grinding machine is available at the centre, glass and wood grainding machines is much needed for the centre. | At the moment no income is generated to the council from the waste managing system. A fee is also taken from households. | 100 * 60 ft | 1 Tonne | |
| Gan Council | Information given by Shuaau Gan council member. | Waste Management centre available at the Island. | Built under by UNDP project | Centre Building not fully finished and machineries not installed. | Need experts in Installing the machineries. | Fees taken from houses for collecting waste by council. | 50000 square ft | 7 tonnes | Waste managing centre building will be finished by up coming project by council. |
| Fonadhoo Council | Information given by Abdulla Ali council member. | Waste Management centre available at the Island. | | Using machineries at waste managing centre has not started. | Need experts in Installing the machineries. | Fees taken from houses for collecting waste by council. | 200 * 50 * 75 ft | 7 tonnes | Centre is using from 2016 |
| Maamendhoo Council | Information given by Ibrahim Rameez Council vice president. | Waste Management centre available at the Island. | Built under by UNDP project | Machineries is installed at the centre but the machines is not used due electric issue. | Difficulty in starting to opperate the machineries in high woltage, to supply high woltage of electric they need extra engine. | Fees taken from houses for collecting wast | 105 * 100.0 ft | 2 tonnes | |