Waste Diagnostic Study

Prepared by: Geotech Maldives

Initiative for Climate Action Transparency

Ministry of Environment

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Abbreviations and Acronyms

ADB	Asian Development Bank
BUR	Biannual Update Report
CCD	Climate Change Department
EIA	Environment Impact Assessment Report
EPA	Environmental Protection Agency
GHG	Green House Gas
IC	Island Council
ICAT	Initiative for Climate Action Transparency
IPCC	Intergovernmental Panel on Climate Change
IWMC	Island Waste Management Center
LGA	Local Government Authority
MEMP	Maldives Environment Management Project
MoEn	Ministry of Environment
MoT	Ministry of Tourism
MVR	Maldivian Rufiyaa
NBS	National Bureau of Statistics
RWMC	Regional Waste Management Centre
SWM	Solid Waste Management
Tpd	Tons Per day
UNFCCC	United Nations Framework Convention of Climate Change
WAMCO	Waste Management Cooperation

1 Introduction

Waste management is a particular challenge in the Maldives because of the especially high economic and social dependence on a healthy marine and island environment (MEE 2017b; ME 2019a). Waste management has been described as in the First Biannual Report to the UNFCCC as "one of the biggest environmental threats the country faces". The amount of waste generated in the country is estimated to be approximately 170,000 tons annually (ME 2019a). Due to the small economies and limited capital, geographic dispersion, small size and limited space available, and the vulnerability to climate change make it difficult to implement waste management strategies.in Small Island Developing States. In the Maldives, until recently the lifestyles were relatively simple and the impact on the environment was minimal. However, the economic expansion, increase in number of tourists, changes in life styles and consumption patterns of locals with increased dependence of on the importation of products, single use plastics, public littering, have greatly contributed to the degradation of the environment(Khaleel and Saeed 1996; GOM 2019). The diseconomies of scales associated with providing efficient waste management solutions for sparsely populated remote islands, and reducing littering in urban areas that have witnessed rapid increase in population require innovation in technology and management. Addressing waste management problems has become a fundamental to the Government's commitment to promote sustainable development and address global climate change issues. Hence, Solid Waste Management (SWM) is a priority sector for the Maldives due to high economic and social dependence on a healthy environment as (GOM 2019). This is crucial as the resident population of the Maldives is expected to increase by 37 percent between 2014 and 2054 (Table 1). With the expatriate population and tourists, the total population of the Maldives is expected to increase significantly higher.

Table 1 Population projects for the localities of the Maldives. Source: (UNFPA and NBS 2018)

Zone	Locality	Year 2014	Year 2054 (projection)
Zone 1	Haa Alif Atoll	12,939	7,801
Zone 1	Haa Dhal Atoll	18,569	21,451
Zone 1	Shaviyani Atoll	12,091	13,361
Zone 2	Noonu Atoll	10,483	9,925
Zone 2	Raa Atoll	14,862	14,642
Zone 2	Baa Atoll	8,878	4,618
Zone 2	Lhaviyani Atoll	7,905	5,047
Zone 3	Kaafu Atoll (exluding Male')	12,221	12,953
Zone 3	Male'	130,465	356,243
Zone 3	Alif Alif Atoll	5,907	6,467
Zone 3	Alf Dhaal Atoll	8,150	10,292
Zone 3	Vaavu Atoll	1,601	543
Zone 4	Meemu Atoll	4,705	2,813
Zone 4	Faafu Atoll	4,119	5,824

Zone 4	Dhaalu Atoll	5,305	4,373
Zone 5	Thaa Atoll	8,901	3,362
Zone 5	Laamu Atoll	11,795	11,279
Zone 6	Gaaf Alif Atoll	8,334	2,722
Zone 6	Gaaf Dhaal Atoll	11,587	3,313
Zone 7	Gnaviyani Atoll	7,984	8,604
Zone 7	Seenu Atoll	19,329	13,339

The aim of this report is to assess the existing practices and procedures for data management in waste sector (Diagnostic Study). In doing so, review of the legal, policy, guideline, institutional arrangement of the waste data collection and data management in the Maldives is analyzed. Furthermore, a desk review on the current institutional arrangements of the waste sector (intra-sectorial and inter sectorial structures, if relevant) for data collection and data management was undertaken. The study also evaluates existing formal and informal waste management practices and procedures for data collection and data management in the country.

2 Institutional arrangements waste data collection and management

Institutional arrangements on waste management are presented by a description of the waste management actors and governance. This is followed by a description of data collection and management systems in the country, while relating it to collection and management of data relevant for waste management.

2.1 Institutional arrangements of the waste sector

2.1.1 Legislative body

The People's Majlis (Parliament) is the legislative body of the Maldives. The Majlis has the authority to enact, amend and revise laws. Besides national considerations, international agreements provide directions for national legislative work. International agreements are also signed with approval from the Majlis. In order to implement the task of the Majlis, several Parliamentary work-related Standing Committees are established. The number of committees and its related mandates are decided by the Parliament. The current Majlis has number of such committees that directly and indirectly relate to waste management sector. Parliament Committee on State Owned Enterprises monitor the works of waste management companies under state ownership. The Committee on Environment and Climate Change monitor policies and activities on waste management. Committee on Decentralization monitor roles of island councils and the Parliament Budget Committee can monitor expenditures on projects, including that on waste management. Therefore, People's Majlis is able to questions and make the relevant ministries and corporations accountable to their roles.

2.1.2 Institutional Setup

The Ministry of Environment (MoEn) is the lead agency that responsible for all environmental policies including development policies related to sustainable management of waste in the country. Figure 1, shows the institutional arrangement of waste sector at policy level. While Environmental Protection Agency (EPA) is responsible for implementation of the National Waste Management Regulations. Some sectorial waste management practices are handled by other line ministries.

- Ministry of Health has policies on the health sector waste, but however at present there is no specific regulation for the health sector waste management implemented by the Ministry of Health.
- In the recent few years there have been an increase in pesticide usage. Different types of hazardous waste need to be dealt differently and institutes that have expertise on specific types of hazardous waste has a role. At the moment there is no specific guideline prepared by Ministry of Marine Resources, Fisheries and Agriculture for disposal of pesticide waste. As a result, often such hazardous waste ends up on the Island Waste Management Centers that are not prepared to handle such waste.
- For import, manufacture and safe dispose, special permission is required from Ministry of Defense. According to the National Chemical Profile (2015) the fragmented nature of governance and regulations in relation to chemicals management in the country remain the major hurdle in addressing chemical management issues.

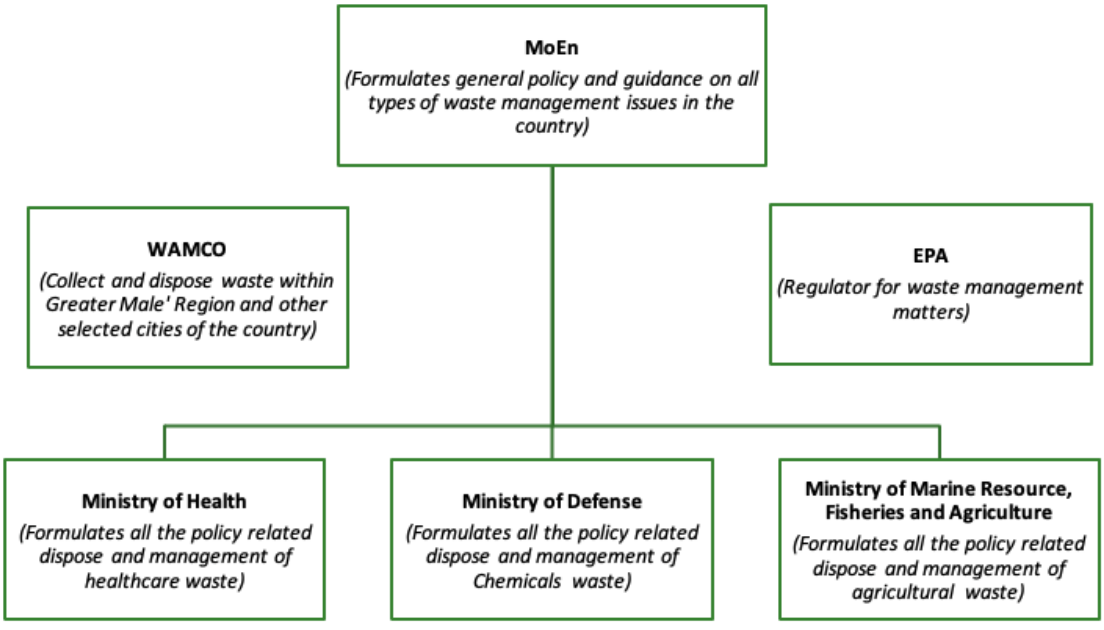

Figure 1 Institutional arrangements for waste management matters at ministerial level.

Ministry of Environment (MoEn)

MoEn implements policies, regulations, programmes and projects related to climate change, clean water, sewerage services, energy services, pollution control and waste management, coastal protection and preservation of natural environment, and acts as a coordinator for climate change policies and sustainable development goals. In 2014, a specific Waste Management Department, was formed under the MoEn with the following tasks:

- Design and implement waste management planning
- Facilitate necessary equipment and monitor its use and improve waste management system
- Conduct public awareness programmes
- Gather regular statistics and inventories on waste management facilities
- Establish regional waste management centres and ensure safe transfer and disposal of waste
- Research on waste management and technologies
- Ensure waste management is properly conducted in industrial facilities

Local councils and civil society

The role of local governments in waste management activities and responsibility varies greatly between island. However, as per Decentralisation Act (2010/7) island councils, atoll councils and city councils can prepare regulations specific to their communities, and facilitate waste management at local level. In the past, some island councils have received President's Green Leaf award for exemplary waste management initiatives. It is noteworthy to mention that through facilitation by the Local Government Authority, United Nations Development Programme (UNDP), MoEn, and civil society groups, training workshops have been held to exchange knowledge and good practices on waste management between island councils. Civil society groups in a number of islands have been an integral actor in cooperating with island councils. Womens' Development Committees have also involved in sweeping of streets and public areas, and keeping the islands clean.

According to the 2019 Annual Report of the MoEn, challenges of waste management can only be solved adequately by carrying out activities at various levels including at geographically regional levels and at an individual level (MEE, 2020). Therefore, it is very important for empowering island, atoll and city councils on waste management. Figure 2, discuss the institutional arrangements of waste management in the local council.

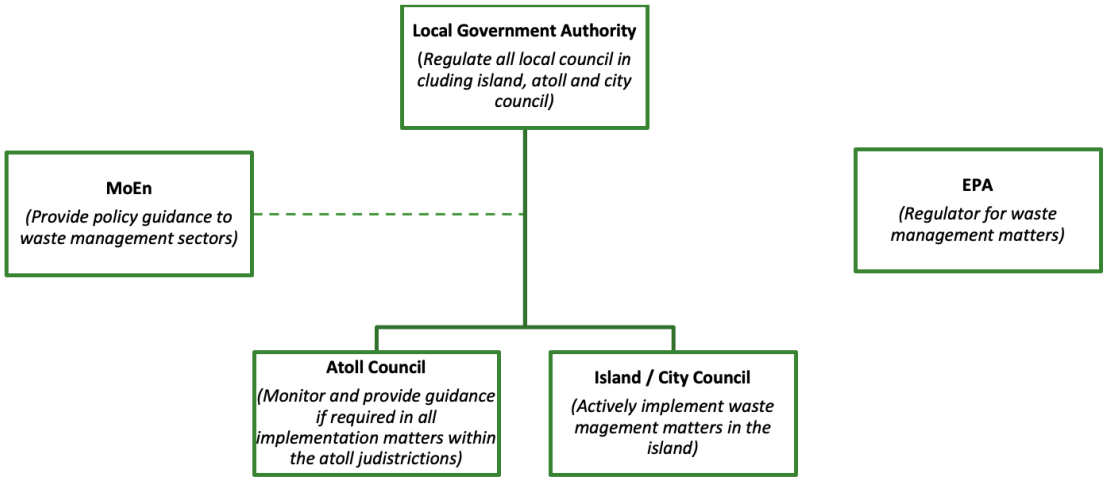

Figure 2 Institutional arrangements for waste management matters in the local council.

Roles of local councils

The role of local councils, distinctions can be made between island councils, atoll councils and city councils. Islands of the Maldives is formed within a group of 26 natural atolls, but grouped as 20 atolls for administrative purposes. Atoll Councils are required to provide support and recommendations in planning island development plans for the respective islands within the atoll. Atolls councils are required to coordinate the activities of the island councils and monitor the functioning of the councils.

Every inhabited island in the Maldives, except islands where City councils are being established under this the Decentralization Act (2010), an Island Council is formed. Among the services required by the councils, it is required to facilitate disposal of waste in a reasonably safe manner at the island level in way that does not cause inconvenience to the community. Island councils are also required to assist government ministries, and atoll councils in monitoring the progress of development projects, and be accountable to the atoll council during implementation of projects and submit reports as per the requirements of the ministries and atoll councils.

City councils are also required to provide disposal of waste in a reasonable safe manner, and carry out planning, and provide suggestions to the government ministries, and assist in monitoring projects. City councils are accountable to the ministries and are required to submit reports to the ministries. As such a city can be one island or a cluster of islands, but in contrast to island councils, city councils are not to report to an atoll council even though a city can be situated in an atoll. To be demarcated as a city, the population of the island, ward or the division must not be less than 25,000 people. The 6th amendment (40/2015) to the Decentralization Act (2010/7) reduced the population requirement to 10,000 people.

Waste handlers/operators

Waste Management Company (WAMCO) as a state-owned company, handles waste management in Malé, Fuvahmulah and Addu City from collection to disposal. In other islands, councils or civil society groups or private companies have been involved and there are other islands where no collection system is in place. In these islands waste is handled and taken to waste management centers by households themselves, or by individuals hired by the households. In these informal arrangements as well as in other formal arrangements by councils, there are expatriate labour are also involved, in addition to the Maldivians. Both councils and EPA have duties to monitor how waste are handled.

In the informal arrangements waste management sites may be areas demarcated by the island council. In some islands these same as the compound of the Island Waste Management Centres (IWMCs) but in other islands it may be additional sites, and not where IWMCs are located. Not all the islands have IWMCs, or in some islands WMC facilities are not utilized. There are no published reports on the status of IWMCs or related to monitoring by the councils or the EPA. In some islands private contractors or civil society organisations engage in waste management with permission from the island councils. However, the rules and practices vary on waste collection and disposal depending on the island.

2.2 Institutional arrangement for data collection and management

National Bureau of Statistics

The National Statistical System (NSS) of the Maldives report compiled by the United Nations (2017) provide an analysis on the institutional capacity of the country to produce and disseminate statistics in an international standard. As the lead agency, the National Bureau of Statistics (NBS), is required for monitoring the national statistical system, and to take responsibility for major statistical operations such as the population census, poverty monitoring, and national accounts production (See Figure 3 for more details on roles and responsibilities within the waste sector). Prior to public surveys, approval is required from the lead agency. NBS publishes an annual statistical year book with various categories of data. An observation of the website show that environment is one of the categories included and data on waste has been included in some of the years. This includes data on the IWMCs in islands, and on the waste transported from Malé to Thilafushi. There are no data on the generation of waste transported from other islands to Thilafushi or other islands. Currently Thilafushi receives waste mainly from the Kaafu, Vaavu, Alifu Alifu and Alif Dhaalu atoll. Except for Malé, Vilingili and Hulhumalé, this is mainly from the resorts as they have their own arrangements for transportation. There is no systematic waste removal from most other islands. The regional waste management facility in Vandhoo in Raa Atoll is designed to receive waste from Noon, Raa, Baa, and Lhaviyani atoll.

The NSS report takes note of data collection requirements by regulations such as the "Regulation on Collection of Data for the Compilation of Tourism Statistics", and comments that data responses are only from 40 to 50 percent of the establishments. The reason cited for this is that lack of staff

available to properly monitor the statistics of the facilities from the guesthouses and safaris. From resorts and hotels, the response rate is noted to be 100 percent. The human resource constraints are noted for challenges in the NSB as well as in the case of guest houses on reporting. This indicates that for any statistical system, it is important to strengthen human resource capacity.

The NSS report indicate that there are challenges in disseminations of data in a timely manner, mainly due to shortage of staffs. However, the report points out that there is a policy priority on environmental protection and climate change, and alternative systems can be used for data collection such as the use of GIS, which may be useful for the development of land accounts or system of environmental economic accounts.

The United Nations Development Assistance Framework (UNDAF) is a strategic, medium term results framework that guides UN system in planning assistance to address risks and sustain development in the countries. The UNDAF Framework for 2016-2020 is current strategic programme framework between the United Nations and the Government of the Maldives. The report notes that the United Nations will strengthen capacities of national statistical agencies and environmental institutions on producing and sharing environmental indicators in line with international practices and preparing sound environmental assessment based on indicator analysis. The report notes that evidence-based decision making with quality environmental data is needed, including for planning related to economic development, land use and overall service delivery; in addition to legislative standards and regulations require particular strengthening with regard to environmental service delivery including waste management. The framework had recommended to have a pilot program on data management on one atoll(UN and GOM 2015).

An evaluation of the framework a data management portal known as Laamu Koshaaru was developed in 2019 as a pilot project for local councils to maintain data and to use for policy planning indicated that has relevant for waste management data even though they these data base management portal is general in nature. However, it has not been utilized as data is not entered by the local councils citing lack of human resources. As island councils have usually 3 to 5 staff and are usually weak in overall competency, the NSB maintained an officer in the atoll capital to visit all islands, to collect and enter data. However, funds for travel expenses were not allocated and now the staff is no longer in the atoll(Naeem 2019). From the evaluation it can be concluded that lack of human resources is a reason for lack of data management. However, if internal efficiency and coordination is increased with improvement of communication between other stakeholder's data collection and management could be improved.

Previously a similar initiative was established for a national level, by adopting the UN Devinfo platform as Maldivinfo platform. It was established in 2007 by the Department of National Planning, with 282 indicators. The objective was to provide statistical data collected across Maldives. However, the only data on waste was available for total waste amount generated in Male and other islands for 2014. Such platforms can be used in future for dissemination of data in integral manner.

However, this would be only possible if data are collected by line ministries and shared with the lead agencies, and only if data base systems are utilized.

Data Collection and Management at MoEn

Data collection and management can be strengthened in the MoEn if a special section and a database system is utilized. Currently the MoEn has 39 mandates. None of the mandates explicitly mainstream the need for data collection in any of the areas on environment. However, establishing a knowledge base is included in the mandates of the EPA. If data collection and maintaining databases are mainstreamed in the mandate of the MoEn, it could strengthen implementation of data collection. For example, in the mandate of Ministry of Gender, Family and Social Service, the need for data collection is explicitly mentioned in the mandates. An emphasis on the data collection, and procedures to implement could be the next step for the waste management planning.

Currently, the Waste Management Planning Guide (2016) prepared by the MoEn is an important a toolkit for waste management in the islands. According to the guideline, it is important to identify the types and volume of waste generated; where the waste is generated; and how it could be reduced and managed. It also emphasizes on increasing awareness on the individual responsibilities for sustainable improvement of waste management in a community. The island community waste management planning is to be revised on an annual or a 5-year basis. There is no particular mention on how the island community could contribute in data collection and record keeping on the waste.

The WAMCO and other utility companies that are involved in the waste management sector are also important stakeholders for data on waste management. The statistical data on the waste transported to Thilafushi is sourced from the annual reports of the WAMCO, for the Statistical Year Book published by the NSB. However, the last data is available for 2017 as published in Statistical Year Book for 2019 only as a total amount of 431,871 metric tons of waste (NBS, 2019). Therefore, the amount of waste transported from Malé, Vilingili, Hulhumalé and other nearby resorts are not available separately. Not data on waste was included in the Statistical Year Book for 2020. No other data is available on the website of the WAMCO. EPA is in the process of implementing a licensing system and through this waste management operators will be required to provide data reports on a regular basis.

WAMCO collect chemical and health care waste, but no records are kept on it. Moreover, solid waste management data is only limited to the volume of the carrying capacity of the vehicles that WAMCO uses to collect and transport the waste. Although waste are collected from resorts, at present the Ministry of Tourism do not maintain any statistics on waste(MoT 2016).

3 Analysis of existing relevant laws, regulations

3.1 Environmental Protection and Preservation Act

The Environmental Protection and Preservation Act (Law No. 4/93) provides guidance for environmental protection as the main legal framework. According to the Article 7 (a) any type of

waste that may have harmful effects on the environment shall not be disposed within the Maldives. In the same article (b) it is stated that where disposal of the substance in (a) becomes necessary, they shall be disposed only within areas designated for the purpose by the government, and if such a waste is to be incinerated, precaution should be taken to avoid harm to the health of the population. According to article 8, hazardous waste that is harmful to human health and the environment shall not be disposed anywhere in the Maldives. The Act did not define the meaning of harmful, and there is no specific reference to burning of waste. It is possible that burning was not considered as a serious issue then as things like plastic were relatively less compared to the generation of plastic waste.

3.2 Maldives Tourism Act

Maldives Tourism Act (Law No. 2/99) provides a legal framework on the determination of zones and islands for the development of tourism management of such facilities. The Act did not include any element on the waste management. However, Regulation on the Protection and Conservation of Environment in the Tourism Industry made pursuant to Law No. 2/99 (Maldives Tourism Act) stipulates the standards for the protection and conservation of environment in the tourism industry. Clause No 5 of the regulations provide guidelines on segregations (namely paper, glass, iron, cans and toxic or hazardous waste). The regulations also stipulate that burning is prohibited in open areas, and instead incinerators should be used. Under this regulation, resorts are also required to keep records of transportation of wastes if they are taken to other islands for disposal of waste. Only food and biodegradable waste are permitted to be dumped to the sea, with the conditions that such items are dumped outside of the atoll, to ensure that it will not land on the shores of other islands. The regulation however did not specify a definition of biodegradable waste. Some of the resorts do contract out councils from nearby islands to take waste from resort and dispose it in these islands. Often this leads to an increase in open burning in these islands. There are few cases where food waste from resorts have been used with the waste in the islands to produce compost. While such complementary benefits exist, there is a need to monitoring on the effects. As guest house tourism has been increasing in the islands, this is an additional area where attention need to be given. Currently the Guest House Regulations (Law No. 2/99) only specifies on keeping dustbins with regard to waste.

How resorts and guest houses are meant in Maldives may differ most countries. Most of the resorts in the Maldives were developed in the concept of one island one resort concept and was physically separate from other inhabited islands. Most of the guesthouses have been recently built-in islands with local inhabited populations. As per the Tourism Act (1993):

- A tourist resort is an island or a designated area of an island that has been developed to accommodate tourists and to provide board and lodging facilities for them;
- A tourist hotel is an establishment, other than a tourist resort or tourist guesthouse, that has been developed to provide board and lodging or [only] lodging for tourists for a payment decided at a certain rate per day of stay;

- A tourist guesthouse is an establishment, other than a tourist resort or a tourist hotel, that has been developed, in compliance with standards determined by the Ministry of Tourism, to provide board and lodging or lodging for tourists for a payment decided at a certain rate per day of stay;
- A tourist vessel is a seagoing vessel that has been developed, in compliance with standards determined by the Ministry of Tourism, to provide board and lodging for tourists for a payment decided at a certain rate per day of stay on board such vessel;

3.3 Decentralization Act

The Decentralization Act (Law No. 2010/7) governs the powers and responsibilities of the local authorities empowered to carry out certain functions as set out in the Act. The Act lists the public services that are to be provided by the local government sub-divisions to the people, the composition of the city, atoll and island councils and the responsibility of the councils to formulate and carry out plans for development of its constituencies. Amongst these, Articles 24 (b) and 42 (b) of the Act mandate Island Councils and City Councils to provide adequate waste management services, and chapter 14, article 151 (b) mention that the Island Councils, Atoll Councils and City Councils have the authority to make and implement waste management regulations specific to their communities, with consultation of the Local Government Authority. The role of atoll councils can be further empowered on marine litter or air pollution as atoll councils have the opportunity to monitor the island councils. It is not clear whether atoll councils can impose regulations on an individual city council even though actions of cities may have impacts on the wider atoll area due burning of waste at large scale (as it used to be in Thilafushi) or if waste are dumped or spilled in into the sea.

3.4 Regulation on Collection of Data for the Compilation of Tourism Statistics Regulation

The Regulation on Collection of Data for the Compilation of Tourism Statistics Regulation No: 2011/R-19 is made pursuant to the Section 14 of the Maldives Tourism Act, Law No. 2/99, regarding collection of data for the compilation of tourism statistics. All tourist accommodating establishments registered in the Maldives, from the date of registration, are to provide information on the weekly and monthly occupancy reports, monthly report on tourist arrivals by nationality and tour operator. There is no requirement to provide any data on an element related to the environment or energy or waste generation. If the regulation could be amended to include requirement to provide data on water, waste and energy, this could help integrated planning in environment sector.

3.5 Waste Management Regulation

Waste Management Regulation (Law No. 2013/R-58) was published in August 2013 and came into effect in February 2014. According to it, the purpose of the regulation is to implement national waste management policy and through the implementation of the regulation to protect the environment. Specific objectives are to reduce negative impact to health and environment; establish standards, establish an integrated framework for managing waste in a sustainable manner; to

encourage reduce, reuse and recycling of waste; implement polluter pays principle; and introduce the concept of extended producer responsibility.

In chapter 2 under the standards, in article 7 (a) it is specified that city councils and island councils should take responsibility for waste management plans, and should be prepared for the respective communities. It submitted to EPA. In chapter 5, article 32 requires EPA to establish a national waste database with data on waste generation in national, regional, island level with detailing information on types and amount of waste. Article 33 (a) specifies that EPA should prepare an annual report and sent to the Ministry. The report is to be compiled with inclusion information on actors involved in waste management and information on waste generation on types and amounts, how waste is treated, and other important information. Regulation also includes a guideline on waste management and point 3.3. of it indicate that burning can is to be permitted to situations where there is a necessity to burn, if it is only biodegradable waste. However, there is a gap in the regulations as it is not clear which organisation(s) will collect the data.

3.6 Strategic Action Plan 2019 - 2023

This Strategic Action Plan (SAP) 2019-2023, outlines the developmental targets and priorities of the government of the Maldives for the five-year period 2019 – 2023. It sets out strategic goals for key developmental milestones of the current government. The SAP targets for open burning to be reduced by 50% by 2023. It also targets to have better ways on handling, storage and transport of non-medical waste and chemicals by 2021. Another target is to enforce phasing out of importation, production and use of single use plastic in the country by 2023. It calls for establishment of local organic fertilizer producing facilities in line with national waste management policies. One of the strategies relevant for data management on waste sector is that the SAP calls for strengthening waste management through evidence-based policies.

3.7 The National Healthcare Waste Management Policy

The National Healthcare Waste Management Policy (2016) stresses that sound management of healthcare waste is a crucial component of environmental health protection. The policy document recognizes that in both short term and long term, the actions involved in implementing effective healthcare waste management programmes require multi-sectoral cooperation and interaction. Section 3.6 indicate that a monitoring and evaluation system needs to be established, and (3.6.1) data shall be collected on health care facilities, and also acknowledges that (3.6.2) health sectoral waste management monitoring reports has to be submitted to EPA on an annual basis as per the requirements of the National Waste Management Regulation (2013). According the policy document, it should be revised in every 2 years in consultation with Ministry of Environment.

3.8 National Waste Management Policy

National Waste Management Policy (2015) has 10 policy directions that includes fostering individual and communal responsibilities on waste management; household waste management in accordance with plans set by respective island councils; prepare island waste management plans and approve it

from relevant authorities; charging for waste generation and use the revenue for waste management; involvement of utility companies in waste management, establishment of appropriate island waste management systems; establish regional centers for waste management based on zones; establish a system for removal of waste that cannot be managed at island level; identify and facilitate ways of how waste can be used as a resource for income generation; and increase awareness on waste management. The waste management policy also recognizes the importance on data collection of waste generation. This include compilation and management of data on waste management at island and national level and make it available for the public; establish a system to monitor whether waste management is implemented according to the waste management plans; establish a baseline with relation to waste and clinical infections and make a plan to manage such waste; establish a system to monitor industrial waste. The policy also makes it a requirement for the councils to compile data on waste management in islands, and report it. The policy document indicate that it was directed for 5 years, and therefore a revised policy document is expected for 2021.

3.9 International conventions

Among the international conventions, Maldives is a party to, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989), (Basel Convention), is an international treaty that was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries Maldives being a party to the Basel Convention, exporters of hazardous wastes are required to notify Environmental Protection Agency, prior to the export of hazardous wastes .

Stockholm Convention on Persistent Organic Pollutants (effective from 2004) aims to eliminate or restrict the production and use of persistent organic pollutants (POPs). POPs are chemicals that remain intact for long periods, and become accumulated in the fatty tissue of living organisms and are toxic. The National Chemical Profile (2016) calls for an integrated mechanism to facilitate various actors exchange information, coordinate activities that are complementary or inter-related, and, in certain instances, make joint decisions or, in the longer-term, develop national policy. This report highlights that although the Environment Protection and Preservation Act (Law no. 4/93) has special provisions for the environmentally sound management of hazardous waste, chemicals, and oil, it is challenging to monitor due to lack of coordination mechanisms, the lack of a national chemicals database and lack of a general baseline indicating the usage and disposal of these chemicals

The Convention on Biological Diversity (CBD) or Biodiversity Convention (effective from 1993), is a multilateral treaty, with goals on the conservation of biological diversity (or biodiversity); the sustainable use of its components; and the fair and equitable sharing of benefits arising from genetic resources. Its objective is to develop national strategies for the conservation and sustainable use of biological diversity, and it is often seen as the key document regarding sustainable development. With reference to CBD, the Maldives National Biodiversity Strategy and Action Plan 2016 – 2025 indicates the need for change in the condition of improper waste management throughout the

country, and includes a target to reduce pollution from waste to a level not detrimental to ecosystem functions and biodiversity by 2020, and suggest to enforce waste management regulations nationally by involving decentralized systems in the islands, and to increase options for recycling, particularly for common packaging items such as drinking water bottles.

United Nations Framework Convention on Climate Change (UNFCCC) is a multilateral environmental agreement which deals with mitigation and adaptation for the climate change. The Kyoto protocol which entered into force in 2005, had called for Annex I Parties to commit to individual, legally-binding targets to achieve limitations or reductions in their greenhouse gas (GHG) emissions. Under the UNFCCC, a new climate agreement known as Paris Agreement was negotiated on the Conference of the Parties. Maldives ratified the Paris Agreement in 2016, and has pledged to reduce GHG emissions by 10 percent before 2030.

4 Existing formal and informal waste management practices

Geographic dispersion islands of the Maldives being separated from each other by the sea nature, and limited available land present unique challenges for solid waste management. Waste management practices vary among islands depending on access to disposal facilities, local customs and national government/municipal interventions. This section discusses the current waste management practices in the Maldives.

4.1 General waste management practices

4.1.1 Waste generation

One of the statistical databases systems that is maintained and updated is the statistical system maintained by the Maldives Customs Services. Compilation of trade statistics has been one of the key responsibilities of the Maldives Customs Services (Zubair 2017)). The statistical capability was improved with the establishment of ASYCUDA system, which is a computerized customs management system which covers most foreign trade procedures. The system handles manifests and customs declarations, accounting procedures, transit and suspense procedures. It generates trade data that can be used for statistical economic analysis. Customs data is relevant for the waste management in identifying the amount and value of exports of recyclable items. Recyclable items exported from the Maldives add up to 97675.70 tons (97,675,700 Kg) and values at MVR 54,755,256.89 in 2019 (see Table 2) Customs data indicate that there are also imports of waste recyclable items imported to the Maldives. However, it is difficult to figure out the exact quantity and types because it is possible that items may have been imported without specifying as waste items.

Table 3 show some items that were indicated as waste items imported.

Table 2 Recyclable items exported in 2019 . Source: (MCS 2020)

Description	Destination	Quantity (liters and Kg)	fob(mvr)
Waste oil	UAE	100,000	414,356.25
Waste oil	India	208,400	713,029.56
Plastics	Taiwan	167,000	958,434.51
Plastics	India	70,000	32,298.00
Paper	India	175,000	217,298.75
Cast iron	India	64,099,000	31,872,804.75
Alloy steel	India	9,022,000	14,108,377.70
Alloy steel	Malaysia	627,000	800,060.00
Copper	India	23,035,000	4,211,542.80
Aluminum	India	99,300	775,809.12
Primary cells, batteries, accumulators, spent primary cells	India	48,000	343,645.45
Primary cells, batteries, accumulators, spent primary cells	South Korea	25,000	307,600.00

Table 3 Recyclable items imported in 2019 . Source: (MCS 2020)(CIF represent Cost Insurance Freight).

Description	Country of consignment	quantity	cif (mvr)
Saw dust, wood waste and scrap	Thailand	34886.65	73132.99
Saw dust, wood waste and scrap	Sri Lanka	21390.46	97012.55
Saw dust, wood waste and scrap	China	11500	24296.33
Saw dust, wood waste and scrap	Germany	8908	347805.3
Saw dust, wood waste and scrap	Australia	416.9	54234.79
Saw dust, wood waste and scrap	Belgium	302.8	12081.77
Saw dust, wood waste and scrap	Singapore	272.5	2826.09
Saw dust, wood waste and scrap	Malaysia	100	1753.18
Saw dust, wood waste and scrap	Canada	72	1861.59
Saw dust, wood waste and scrap	United Arab Emirates	66.4	11274.84
Saw dust, wood waste and scrap	Turkey	57	5480.45
Saw dust, wood waste and scrap	France	15	643.29
Saw dust, wood waste and scrap	United States	2	2127.58
Saw dust, wood waste and scrap	Japan	0.2	837.37
Waste, paring and scraps of rubber	China	401498	888379
Waste, paring and scraps of rubber	Thailand	25020	201223.2
Waste, paring and scraps of rubber	Singapore	13500	80526.94
Waste, paring and scraps of rubber	Hong Kong	1500	4922.65
Waste, paring and scraps of rubber	Sri Lanka	1150	22837.58
Waste, paring and scraps of rubber	Malaysia	6	632.25

Waste, paring and scraps of rubber	Italy	1	117.79
Cotton waste	Hong Kong	80000	28671.26
Cotton waste	Sri Lanka	52909.7	374600
Cotton waste	India	15327.97	451126.9
Cotton waste	Canada	1300	19997.41
Cotton waste	Thailand	1180	14716.91
Cotton waste	China	670	35930.23
Cotton waste	United Arab Emirates	585	11903.66
Cotton waste	Singapore	286	19756.69
Cotton waste	Kazakhstan	10	12.61
Cotton waste	United States	0.5	1140.55
Cullet and other waste and scrap of glass	Germany	29.2	11932.03
Cullet and other waste and scrap of glass	Turkey	9	227.92
Waste and scrap of alloy steel (exluding stainless)	China	21000	18466.99
Copper waste and scrap	United Arab Emirates	6	1453.61
Lead waste and scrap	Thailand	460.05	16095.71

Accurate estimates of total quantity of waste generated in the country is currently unavailable and figures are different in literature (SoE 2016). The most recent figure on waste generation estimated 774 tons per day (tpd) of mixed solid waste generated in the country (PID/PIS, 2016). The World Bank (PID/PIS, 2016) document provided 365,000 metric tons as the estimated annual waste generation amount Greater Malé Region. The urban regions, particularly the Greater Malé Region is estimated to generate 51%, inhabited islands 28% and tourism industry 21% of the total waste generated within the country (MoT 2015). With the rapid urbanization and tourism development in the Greater Malé Region waste generation is estimated to grow 19% to 924 tpd 2022 (ADB, n.d.). According to the Kaza et al. (2018)Predicted annual waste generation for Malé region as 300,525 and 393 metric tons in 2030 and 2050 respectively.

Table 4 Per Capita Waste Generation

Study	Urban Areas	Island communities	Tourist Resorts
Per capita waste generation (kg/ capita/day) based on (JICA 1999)	2.3	0.66	6.8 – 8.1
Per capita waste generation (kg/capita/ day) based on Ministry of (MoT, 2015 & MEE 2016)	2.8	1.0	7.2
Per capita waste generation (kg/ capita/day) World Bank (2018) (Kaza et al. 2018)	1.7	0.8	3.5
Per capita waste generation (kg/ capita/day) (IPCC 2019)	0.91		
Per capita waste generation (kg/ capita/day) (Malatesta et al. 2015)	0.8-2.48	0.8-1	2.5-7.5

Apart from the above figures on Per capita waste generation (kg/capita/day) other figures are used in literature for example (Aboobakur and Samarakoon 2019) has estimated Average waste generation rate of 1.13 – 1.55kg per capita per day in Kulhudhufishi island. Zahid (2013; 2013)has

used 0.8 kg per capita per day to estimate waste generation for AA Thoddoo and Th Veymandoo IWMC development EIA report and Hamdhaan (2016)used same figure to estimate waste generation in the EIA report on Hulhudhoo Meedhoo IWMC upgrading project . CDE (2017)estimated waste generation per capita rate of 0.85kg tpd for L. Maavah in the Environmental Management Plan (EMP) for IWMC development project. Riyan and Niras (2012)estimated waste generation in the EIA report for the development of Regional Waste Management Centres (RWMC) in Vandhoo Zone II, 50 tons/day at the rate of 1.1kg per capita per day based on the population of the region at the time. This shows that there is no accurate reliable and consistency in estimate of the total quantity of waste generated in the country.

4.1.2 Healthcare waste

Healthcare Waste Management Policy 2016-2021 was developed to ensure that all waste generated within the health sector is managed without adverse effects on human health and environment in an integrated manner that is environmentally and economically sustainable. The amount of medical waste generated in the country has been estimated as 119 tons/year (ME 2019b). According to MoEn (2019) Minimata initial assessment report only in Kulhudhufushi regional hospital and ADK Hospital, medical waste is separately collected, autoclaved, and sent to the municipal waste dumpsite where it is burned with the municipal waste. Is some regional Hospitals such as Gan, R. Ungoofaaru and Gn. Fuvahmulah, biomedical waste is separately collected and burned daily in a closed furnace within the hospital premises? In most of the hospitals, including the largest hospital IGMH and S. Hithadhoo Regional Hospital, biomedical waste is separately collected and taken to a municipal waste management area for final disposal and open burning (ME 2019b).

4.1.3 Waste Composition

Based on the various source's composition of the waste stream broadly can be divided into following categories shown in Table 5.

Table 5 Waste composition based on island communities, resorts and tourist /vessels (MoT 2015)

Total	Inhabited islands	Resorts	Safari Vessels
Food, Garden/Yard Waste, Paper	70%	80%	67
Recyclables – Metals, Plastic	3%	5%	9
Residuals	27%	15%	24

A more comprehensive composition of waste stream in Maldives with more waste categories was presented (MEE 2017b)based on waste audits conducted in 46 islands in four atolls by the Maldives Environment Management Project (MEMP) in 2010 and a survey of 79 islands carried out by MEE in 2015. Also ADB has presented a breakdown of waste by quantity (tpd) based on the MEE (2017a) Draft Feasibility Study for an Integrated Solid Waste Management System for Zone III

(including Greater Malé) and Preparation of Engineering Design of the Regional Waste Management Facility at Thilafushi. Malé. Compilation from the above-mentioned studies are shown in Table 6

Table 6 Waste Composition

Waste Composition (MEE 2017b)		Waste Composition (Draft Feasibility Study for an Integrated Solid Waste Management System for Zone III (MEE 2017a)			
Composition	Percentage (%) (MEE 2017b)	Greater Malé Region Waste composition	Percentage	Greater Malé Region Waste Types	Tons per day (tpd)& %
Total compostable waste	79.45	Organic	(53%),	Construction and Demolition	530 tpd (68%)
Yard waste	50.85	Paper and Cardboard	(12%),	Household	149 tpd (19%)
Food waste	22.22	Plastic	(11%)	Resort	48 tpd (6%)
Dirt, ash, stone, sand	7.60	Hazardous (medical) waste	(8%)	Commercial	27 tpd (3%)
Other organic waste	4.64	Metal	(3%)	Airport	9.3 tpd (1.2%)
Steel cans	2.35	Glass	(3%)	industrial	6 tpd (0.8%)
Paper	1.87	Others.	(11%)	market	2.5 tpd (0.3%),
Plastic films	1.84			hazardous	1.5 (0.2%),
Textiles	1.75			end-of-life vehicles	0.65 tpd (0.1%)
Wood	1.74				
Cardboard	0.77				
Glass	0.66				
Rubber & leather	0.34				
Other plastics	1.55				
Other metals	1.37				
Hazardous waste (batteries)	0.17				
Aluminum cans	0.15				
Pet	0.14				

An earlier detailed analysis on the composition of waste is available from the Malé Waste Audit conducted by the Environment Research Centre between December 2007 and January 2008. The results show that most of the waste was organic. According to the analysis, 2.97kg of organic waste is generated each day per household, constituting 53% of all waste. Paper and cardboard come next, which is 12% of waste. Most of the weight in this category is due to books and magazines and a significant amount of printed paper is also found. Plastics make only 10% of the weight. It is a significant amount considering the fact that plastic bags are light in weight compared to actual quantity. Most of the plastics are recyclable, PET makes 29% of all plastics. Hazardous waste constitutes 8% of the waste audited. Nappies were categorized as special infectious and nappies as a subcategory in the hazardous waste category. If this is separated then infectious and nappies constitute 7% of the total waste sample. According to the study 0.55kg of waste is produced by per person per day or 5.63kg per household per day in Male in average (Ewers 2008).

Table 7 Results of Male Waste Audit (2008). Source: Adapted from Ewers (2008)

CATEGORY	Annual totals	
Paper & Cardboard	per person (kg)	Percent
Newspaper	2.27	

CATEGORY	Annual totals	
Plain Cardboard	3.43	
Printed cardboard	4.83	
Glossy Paper	1.90	
Tissue	1.10	
Printed paper	3.20	
Other paper - books	7.74	
Total (kg)	24.48	12.28
Organics		
Kitchen waste	83.56	
Garden waste	8.62	
Coconut	12.96	
Total (kg)	105.14	52.77
Glass		
Recyclable glass (mixed cullet)	5.20	
Non-recyclable glass (plate)	0.22	
Total (kg)	5.42	2.72
Plastics		
PET containers (#1)	5.88	
HDPE containers (#2)	0.63	
LDPE (#4)	0.21	
Polypropylene (#5)	0.28	
All Polystyrene (#6)	0.30	
Polystyrene (foam) (6F)	0.18	
Other foams	0.03	
Linoleum	0.20	
Melamine	0.59	
Other plastics	3.31	
Primary packaging (mainly plastic)	4.33	
Contaminated plastics (bags etc.)	4.00	
Total (kg)	19.95	10.01
Metals		
Steel cans	3.81	
Composite metals	0.56	
Aerosol cans	0.32	
Aluminum Cans	0.30	
Aluminum (foil)	0.08	
Total (kg)	5.09	2.55
Chemicals & Haz		
Fluoro	0.15	
Mercury/Lithium batteries	0.05	
Medicines	1.69	
Special (infectious, nappies, etc.)	14.44	
Total (kg)	16.34	8.2
Other		
Inert - dust, dirt, ash, rock	4.78	
construction	0.78	
Pottery	0.41	

CATEGORY	Annual totals	
Electrical	2.91	
Textiles	8.30	
Footwear (mixed)	4.11	
Wood	0.63	
Miscellaneous	0.90	
Total (kg)	22.83	11.46

4.1.4 Waste management Strategy

Waste Management became an important environmental priority after the 2004 Indian Ocean Tsunami. MoEn under the Saafu Raajje National Waste Management policy divided the country into seven distinctive zones for waste management. The objective is to establish Regional Waste Management Center in each zone and appropriate Integrated Waste Management Center in each island. ME with financial assistance from both bilateral and multilateral donors was actively involved in establishing RWMCs and IWMCs in some of the island councils in the country.

The overall development concept of the integrated waste management approach in each zone/region is to let Island Councils (IC) collect all household, hazardous, and other waste on their respective islands and transport it to the IWMC for processing and treatment. At the IWMC, the waste is separated into two streams, organic (biodegradable) and inorganic (non-biodegradable). IWMCs compost organic waste in-situ on the islands and transport all inorganic and hazardous waste by sea vessel to the shared RWMC for final disposal.

Table 8 Waste management zones status of RWMC development. Source: (NBS 2020)

Zone #	Atolls	Inhabited islands*	Resident Population*	Regional Waste Management Centre (RWMC) Status
Zone 1	HA, Hdh &Sh	41	55,904	
Zone 2	N, Ra, Ba Lh	45	71,518	Vandhoo RWMC
Zone 3	Aa Adh K, & V	32	305,442	Thilafushi
Zone 4	M, F and Dh	19	23,323	
Zone 5	Th, & L	23	28,301	
Zone 6	Ga & Gdh	18	30,061	Plan Formulated
Zone 7	Gn & S	7	36,508	RWMC development process started

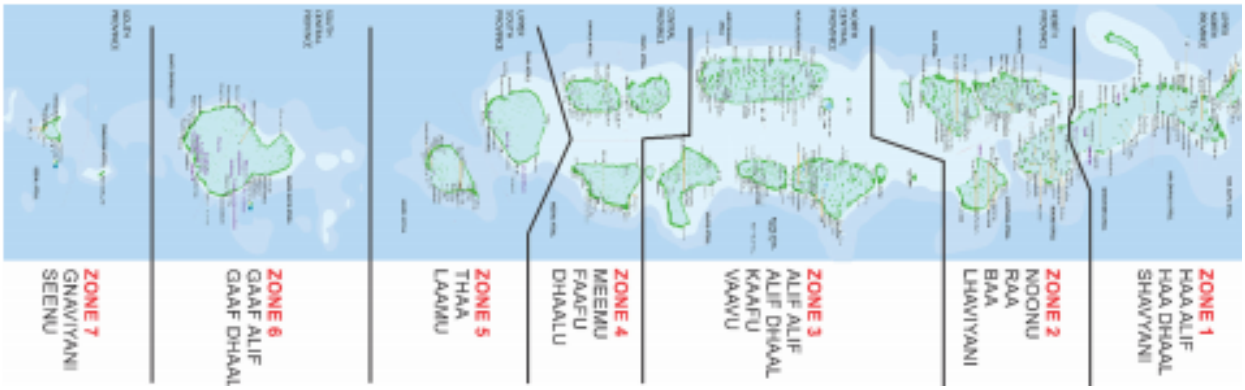

Figure 3 Map showing the Waste Management zones

4.2 Greater Malé Region

The capital of the Maldives, Malé City with a population of over 227,000 residents exhausted available areas for land filling by using Solid waste generated on the island in early 1990's (MoTAC and Peterson 2013).Thus, in 1992 government of the Maldives decided to fill the lagoon of Thilafushi Reef, located 6 km North West of Malé, with waste and ferry waste there (MoTAC and Peterson 2013; Evans 2015; Ramesh 2009). Since then, waste has been used to fill the lagoon on Thilafushi, which is a constructed island used for industrial activities. Part of the island is used as a waste treatment and disposal facility for the waste from Malé and other areas of the Maldives, including resorts and construction and demolition sites. The land for the waste treatment and disposal site is leased from the Thilafushi Corporation, and is currently leased to the Malé City Council (MCC). The site was reported to have a total surface area of 230 ha with a remaining area to be filled of 20 ha. It has been estimated to have a useful life of 25 years with proper waste management practices. Thilafushi landfill is a 30-year-old 10-hectare non-engineered low-lying dumpsite operated by MCC. The site has no pollution controls measures and it is frequently burned sending massive Plumes of smoke visible from Malé, the international airport, and surrounding resorts compromise air quality and pose a daily nuisance aesthetically unpleasant view accompanied by foul smell to residents and tourists in nearby island creating a potential public health and an environmental hazard.

In terms of waste management, Malé zone consists of 32 inhabited islands in four atolls (Kaafu, Alif Alif, Alif Dhaalu and Vaavu) including Malé, the capital city. The region lacks an organized and sustainable waste management system for the estimated 774 tons per day (tpd) of mixed solid waste generated in this area. With rapid urbanization and tourism development in the region, the amount of waste is projected to grow 19% to 924 tpd by 2022 (MEE 2017a)). There is an ongoing project to establish Waste to Energy (WTE) project known as the Greater Male Environmental Improvement and Waste Management with the assistance from ADB in Thilafushi. The project will install two lines of moving grate incinerators, each with capacity of 250 TPD and other related capacities for management of waste in the facility.

Most waste generated in the Malé region is mixed and untreated. Waste that is generated in Male, Hulhumalé and Villingili islands are collected and transported to Thilafushi waste disposal site by the state-owned Waste Management Corporation (WAMCO) since December 2016. WAMCO divided Malé into several zones and began collecting waste from both residential and commercial premises. WAMCO charges a monthly fee of MVR150 (USD10) for collection of waste from the doorsteps of apartments directly. WAMCO also provides its service to all households in Villimalé, Hulhumalé, Addu City and Fuvahmulah City. WAMCO also manages Vandhoo Regional Waste Management Center in Raa Atoll (Zone II) which is built with an advanced incineration system and a fully engineered landfill that established an integrated waste management system first ever known to the country. As of January 2020, thirteen resorts in zone 2 have MOUs signed with WAMCO enabling

them to deliver waste to Vandhoo (World Bank 2017). WAMCO is currently in the process of expanding its services for other islands.

4.3 Waste management in other inhabited Islands

Waste management in inhabited islands very much depends on the type of disposal site. Some islands have designated waste disposal sites fenced /unfenced and uncontrolled dumpsites. More recently Government has established IWMCs in several islands. Unfortunately, very few IWMCs are functional due to various reasons, ranging from lack of human and financial resources to equipment, collection and transportation system, inappropriate size etc. Large number of island councils have already developed island specific regulations on waste management but enforcement is yet to be realized.

In general, most of the inhabited islands rarely practice systematic waste management. Regular waste collection from waste generators (households, businesses, and schools and other institutions) does not exist on most islands. Households and businesses generally use their own means to dump their waste into the designated disposal sites, IWMC or uncontrolled open dumpsites. On most of the islands, women of the households carry the waste to the disposal site. Due to the lack of a waste management system and non-enforcement, there is widespread dumping of waste onto the island foreshore or open burning of combustible waste. The cost of transportation prohibits the shipment of waste to RWMC such as Thilafushi and Raa.Vandhoo. However now in Zone II WAMCO is embarking on transportation of waste from IWMC to RMWC in Raa Vandhoo.

Most waste generated on the islands consists of organic materials, but households generally do not practice composting because of the odor (worse in the hot climate) and rodent problems. Plastic water bottles are increasingly used by inhabitants who mistrust the quality of local water. Recycling and waste minimization efforts are often ad hoc, driven by individuals rather than systematic support from local councils or residents.

Common methods of waste disposal used at household level in Atolls based on the Census 2004 and 2014 (MEE 2011; 2017b) is shown in Table 9.

Table 9 Existing methods of waste disposal

Year	2016	2006
Dump into Dedicated disposal site (%)	79.13	60.8
Dump into beach /seaside (%)	7.19	10.2
Taken to the land reclamation site (%)	0.29	0.6
Thrown away into the bush (%)	6.46	12.5
Burry in the house compound (%)	0.29	0.6
Burn in the house compound	4.70	12.5
Burn using incineration (%)	0.53	0.4
Not stated (%)	1.41	2.4

Table 9 shows notable increase in waste dump into dedicated disposal site, and decrease in disposal categories; waste dumps into beach/seaside, thrown away into the bush, burn in the house

compound from 2004 to 2014. MEE (2017b)reported that most common methods for managing kitchen waste in inhabited island is by dumping into sea/beach (63%), burying in the back yard (17%), open burning (7%), composting (7%) and 6% by incineration.

4.3.1 Waste management in Tourism sector

There are currently 145 (MoT 2019) tourist resorts, 521 Guest Houses, 153 Safari Vessels and 12 Hotels in the Maldives. Waste generated in tourist resorts comprises of discarded food waste and Residual waste including construction and demolition debris (organics such as wood and paper and inorganics such as concrete), glass, discards such as textiles, leather, rubber, and waste such as batteries. The tourism regulation "Regulation on Disposal of Garbage" requires all tourist resorts to burn their combustible wastes (including plastic bags) in on-site incinerators, and to crush cans and bottles. In most of the resorts, food waste (Kitchen waste) is separated from other waste and dumped into the open ocean 4-8km away from the resort (Jameel 2010). Combustion under suitable process systems can reduce waste volume up to 90%, but incinerators of such capacity are a limitation at the resorts. Inorganics such as glass waste is crushed to reduce its volume and transported to RWMC such as Thilafushi and R.Vandhoo. Many resorts use this crushed glass as a construction material. Waste composition and management in a typical tourist resort is shown in Figure 2 (MoT 2015)

Waste generated in guest houses and hotels in inhabited islands are considered as MSW treated within the solid waste management system on the islands. Waste generated in Safari (tourist) Vessels are kept in the boat until it is reached to an inhabited island where waste is unloaded and transported into waste management facility on the island (MoT 2015)

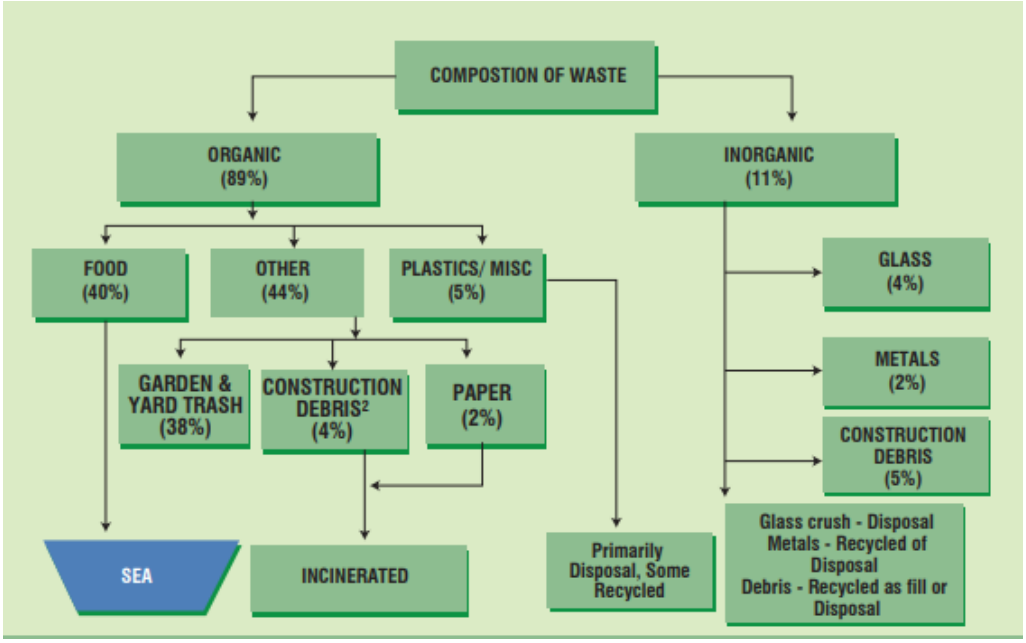

Figure 4 A typical waste management practice in a tourist resort. Source (MoT 2015)

4.4 Waste management practices in island selected for waste Audit.

Existing waste management practices in islands selected for waste audit in this assignment. The status is updated through personnel communication with respective councils. As the islands vary in size of population, economic activities, and physical size, it is possible to get a general understanding of the situation of the waste management in islands of the Maldives.

Table 10 Status of waste management in the islands selected for sampling in the assignment

Zone	Atoll/ Island	Updated status of current waste disposal practice
Zone 1	Ha,Kelaa	Currently waste is disposed at an old waste disposal site that has been built after the 2004 Indian Ocean tsunami, construction of new IWMC work is going-on and it will be completed within a month. Management of waste disposal site is out-sourced through an open bidding process. No, Door-door waste collection is provided now. Therefore, unauthorized waste dumping into various parts of the island exists to some extent. Council is planning to start providing waste collection services on the island, Process of procuring second pickup required for providing waste collection service is going on pending approval from LGA, which is required under the new Local Council Act. The council is making all arrangements to start providing door-door waste collection service to the island with the commencement of new IWMC in the island. According to the council they will provide Door to door service four days a week and will ask households to segregate waste from the source, so they will have collection of different type of waste on different days of the week. Open burning is practiced to reduce the volume of waste. Unburnable waste is piled in the site and the council has no means of transporting waste piles to the RWMC
Zone 1	Ha, Ihavandhoo	There is a designated waste disposal site, dumpster, no IWMC, waste transportation service was provided by FENAKA earlier for a nominal fee of 30 MVR (no they longer provide the service because it is not in their mandate) Most of the people now dispose their waste to the designated area but some still throw garbage into various parts of the island. If the council finds them doing so, they will be brought to the council and warned. There are some individuals and groups providing waster transfer service to dumpster on regular basis 3-4 time a week. The dumpster is very difficult to manage because they don't have equipment such excavator to gather all the waste and keep in the

		designated area, at the moment they are borrowing the excavator used in the ongoing harbor construction work by Maldives Transport and Contracting Cooperation. Two workers are employed by the council in the designated waste disposal area. Council is planning to start waste transportation and collection system; they are in the process of procuring a pickup for waste management on the island. Open burning of waste is only in the waste disposal site. Unburnable waste is piled in the site and the council has no means of transporting waste piles to the RWMC
Zone 2	N.Velidhoo	Velidhoo is a highly populated island with very limited area. Waste disposal area was initially developed with the assistance from the Government and the disposal area in Velidhoo has been changing recently, initially it was on the eastern side of the island residential areas are as close as 100m from the dumpster. Some people occasionally put the waste dumpster on fire by some people and when burned the whole island is filled with smell foul smell, insect's rodent etc. Waste disposal area was shifted to Western side to avoid the situation but the same situation continued the waste disposal site is located on the North Eastern end of the island. Management of waste on the new disposal site has already started in November 2020. The island has a waste collection and segregations system where food waste is collected on daily basis and other waste such garden waste and glass and cans etc are collected twice a week. Waste Collection operation is outsourced to a local company. Collection fee is for household is 150/m. Waste disposal site is fenced and locked with lockers for various types of waste, eg nappies, can bottles. The council has an agreement with WIMCO to transfer unburnable waste to Vandhoo RWMC on monthly basis. However, WAMCO transports waste once every four or five months. According council over 250 bags of Solid waste was transported to Vandhoo RWMC in the last time by WAMCO.
Zone 3	K. Maafushi	There is a designated waste disposal area, Construction work for IWMC is going on, 4 tons capacity waste incinerator will be installed in the center. At present council is doing the doors-to-door waste collection free of charge. Waste ins not segregated; open burning is used to reduce the waste volume. Non-burnable waste is piled at the waste disposal site pending transportation to Thilafushi waste Management center. Once the IWMC is established waste collection

		service will be provided by the island council for a nominal fee of 100MVR for households and charge for the tourist guest house will be based on the number of rooms. At present Maafushi has 40 guesthouses over 2000 tourist beds
Zone 3	Aa. Thoddoo	IWMC of Thoddoo completely burned in an incident last year. At Present there is no waste management Center on the island. However the burned site is still used for disposal of waste. Waste collection, transfer and disposal site is out sourced to a company. Daily collection and transfer operation is conducted by the company for a charge of 100/household /month. Waste is segregated. This is an agricultural island, garden waste and green waste is usually burned at disposal site, agricultural fields also at the back yard of houses. Waste is also buried in large house with a back yard. The council is hoping that the burned waste management centre will be reconstructed soon, however there is no plan at the moment.
Zone 3	Adh. Maamigili	Waste Management Center of the island is located on the North Eastern end of the island at the inner edge of the breakwater. The center was established about 1 years ago, the center was designed to send their unburnable (tins, cans bottles metal etc) to a regional waste management facility. As per the council so far waste transportation to another island has not been carried out therefore the existing facility is now over its capacity and large amount of waste is at the edge of the premises. There are no formal /contracted waste collectors on the island. Youth groups are providing waste collection services for a nominal fee for those who request. Few years back waste from couple of resorts transported their unburnable waste to Maamigili for a nominal fee. But that acitivity did not last very long. The council is hoping to privatize the waste collection and management of WMC on the island pending approval from the LGA. Council has procured a Pickup truck to use for waste collection and has new employment opportunities in waste section to be established by the council.
Zone 5	Veymandoo	There is an existing IWMC in the island, rarely people use the site for disposal of waste. Construction waste is usually disposed on the island beach or vegetation. But most of the people carry the organic waste particularly food and kitchen waste to the disposal site but some still throw food waste into the beach. The council has no means to

		manage the waste on the island. Waste is burned only in the waste disposal site, waste burying and burring at the back of the house is not practiced on the island.
Zone 5	L.Gamu	Gamu is the largest island in the Maldives. The island used to have three waste disposal sites, one in each district. Now the Council has developed a waste disposal and management area. The area is fenced and waste segregation beds are created. Under LeCRED funding the council has obtained equipment for waste management including plastic shredders, bottle crusher, and can pressure and an incinerator. These equipments will be used in the waste Management Center. The Council has started waste door-to-door household collection in April 2020 for a nominal fee of 150/household/month. They have also provided 3 bins to each household to segregate waste from the sources into three categories; food waste, garden waste; plastic and metal cans etc. the council is hoping to make compost from waste, but the process has not started yet. Two pickups are procured to provide collection and transportation services. At present there are 18 employees in the waste management section in the council.
Zone 7	Gn. Fuvahmulah city	Waste collection and disposal service is provided by WAMCO twice a week from households and charges 100MVR monthly. Collection service for shops and café and other commercial establishments are provided on daily basis. Waste is not segregated at household level. Some degree of waste segregation process takes place at IWMC also composing takes place in the IWMC.
Zone 7	Hithadhoo, Addu city	Waste management by WAMCO (waste household collection, transportation and disposal) Plastic, metal, electronic, glass, paper, tires, organic waste, food waste (Food waste is given to people with animals. Food waste also get discomposed at Hulhumeedhoo as well). Green waste is left to decompose. Metal: Sometimes metal waste is sold to people who come to buy metal. They take it to Hithadhoo bandharu (last time copper was sold at 2rf/kg). Plastics: Parley takes transparent and not shredded plastic (PET). Plastic is sent in 20 jumbo bags, 2-3 times a month. Parley has taken about 4 times. Other materials are not taken Development of RWMC for zone 6 and 7 is proposed at near the existing waste dumpsite of Hithadhoo called Ruhjehera Estimated average quantity per day (whole of Addu City): 97.27 tons

5 Status of data collection and data management

5.1 Institutional arrangements for Data collection and management

Very limited literature exists on data collection and data management in waste sector in the Maldives. Most focuses on waste management issue rather than data collection. In General environment data in the Maldives is collected and reported in ad hoc basis (NBS 2018). There is no systematic data collection process, procedures and standards especially in waste sector. Saafu Raajje Waste management Policy strategy 7 addresses establishment of waste related statistical data and collection, management and dissemination of information system at national and island level. The current government policy on waste is to promote waste as a valuable resource for income generation (GOM 2019). Actions identified under waste management through evidence based policies strategy 1.5 includes: (1.5a) Conduct and Develop a national database and establish methods for information collection, collation, access and dissemination to ensure its comprehensiveness and public availability comprehensive waste audits across all islands to identify volume of different waste streams and to formulate reduction targets, (1.5b) Develop a national database and establish methods for information collection, collation, access and dissemination to ensure its comprehensiveness and public availability. MoEn has been identified as the lead implementing agency for these activities. MoEn was asked to provide information on activities that has been carried out to implement the Actions in the SAP. Other implementing agencies identified include Local Councils, EPA, HPA, Resorts, Industries, waste service providers NBS and NDC.

5.2 Existing institutional arrangements for data Collection

NBS has the mandate for statistical data collection, analysis and compilation at the national level. NBS has been providing data on waste management practices and waste transported to Thilafushi island in censuses and other statistical reports. MoEn as the responsible ministry for waste policy formulation and implementation is mandated for the waste related data collection, analysis and compilation. Stakeholders including Government Institutions and the service providers (Utility Companies) resort, Island and Atoll Councils, private service provider involvement and support is needed to establish a robust and reliable mechanism to collect and collate waste data. Maldives Customs Services provide data on the exports and imports, and it can be used to identify information export of recyclable items.

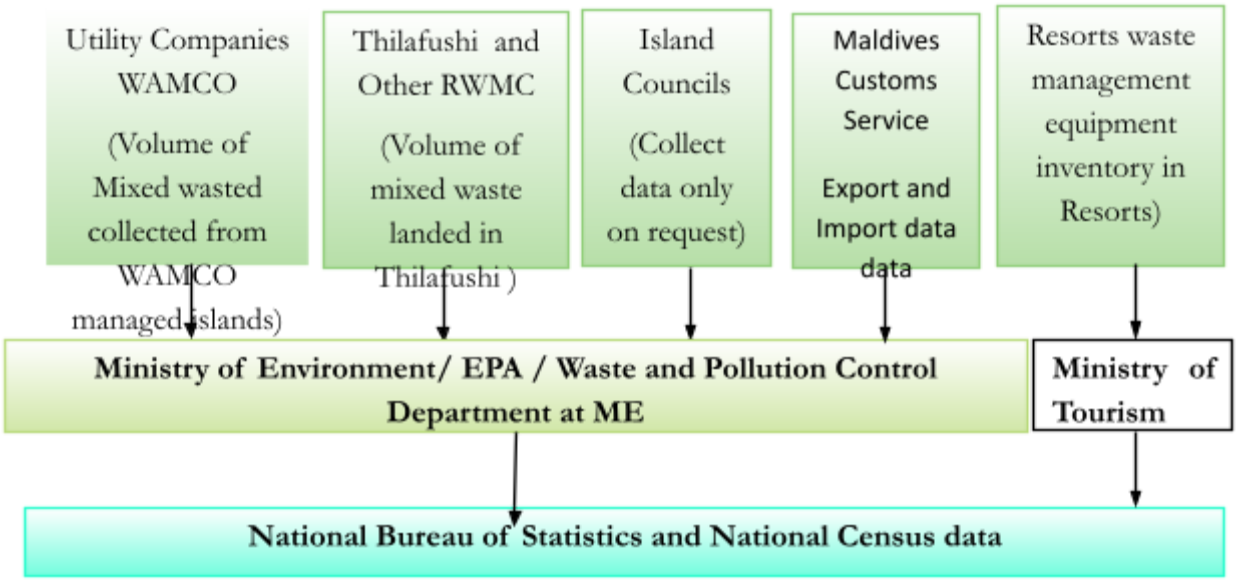

Figure 5 Existing data flows, interrelations and hierarchy between stakeholders in waste related data management

5.3 Data Collection and Sharing

Private and public service providers and utility companies collect and log data for their own use. Data is shared with Government authorities only upon request. Data collation and analysis is not a common and not conducted on regular basis at the island or atoll level. Data is collected and compiled at different frequencies for various data sets in response to requests by the Government authorities and institutions, or in relation to a project or study activity but not on an ongoing basis. It is necessary that the Government Agencies and various stakeholders establish standard set of indicators or data requirements that is consistent. The best option would be to develop a mechanism and a process to engage Island Councils in data collection in islands where IWMC are operational or yet to become operational. The established data collection process needs to structured systematic and must have a regular reporting procedure.

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