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A Regional Waste Management Strategy and Action Plan for Zone 6 in Maldives

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Abbreviations

ADB	Asian Development Bank
BC	Black carbon
CCET	IGES Centre Collaborating with UNEP on Environmental Technologies
EPA	Environmental Protection Agency
EPPA	Environmental Protection and Preservation Act
EU	European Union
GDP	Gross Development Product
GHG	Green House Gas
HDI	Human Development Index
IETC	International Environmental Technology Centre
IGES	Institute for Global Environmental Strategies
IWMC	Island Waste Management Centres
MCC	Male City Council
MDGs	Millennium Development Goals
ME	Ministry of Environment
MEMP	Maldives Environment Management Project
MOEJ	Ministry of Environment Japan
MOT	Ministry of Tourism
MT	Metric Tonnes
MVR	Maldives Rufiyaa
NGOs	Non-Governmental Organisations
NIMBY	Not In My Back Yard
POPs	Persistent Organic Pollutants
PPP	Public-Private Partnership
RWMF	Regional Waste Management Facility
SDGs	Sustainable Development Goals
SLCPs	Sort Lived Climate Pollutants
UNDP	United Nations Development Programme
UNEP-IETC	United Nations Environmental Programme International Environmental Technology Centre
WAMCO	Waste Management Corporation
3R	Reduce, Reuse and Recycle

Foreword

The economic and social welfare of the Maldives' population largely depends on maintaining a high level of environmental integrity. Sound environmental management is fundamental to the sustainability of both the tourism and fisheries industry. The importance of a resilient environment for the future well-being of the country is recognised by the Government and is highly prioritized when formulating policies and strategies for national development.

The environment is being placed under constant pressure from a growing population, changing lifestyles and improvements in living standards. As such, waste is being generated in ever growing volumes. Thus, without adequate treatment and disposal provisions for waste, the risk of a polluted is becoming ever greater. The Government recognises that without a national policy framework and implementation strategy for waste management, the potential for improving environmental outcomes in this sector will be limited. Hence, in order to develop a comprehensive national solid waste management policy and plan of action, the Ministry of Environment has taken steps towards formulating a regional waste management strategy.

The main principle followed in formulating a regional waste management strategy is One-size Does Not Fit for All. Therefore, region-specific strategies will be formulated for other regions/zones of the country. Each zone will have a regional strategy compatible to the needs of the islands in that respective region. In this manner, regional waste management strategies will lead to a national waste management policy.

The waste management system for Huvadhoo Atoll will be developed in line with this regional waste management strategy.

On behalf of the Government of the Maldives, I thank all stakeholders involved in the formulation of this strategy and I am confident that the continued support of all stakeholders in the successful realization of the Regional Waste Strategy of Huvadhoo Atoll.

Dr. Hussain Rasheed Hassan
Minister of Environment

Acknowledgement

Regional waste management strategy and action plan for zone 6 is the first published Regional waste management strategy and action plan developed in the Maldives. This document is formulated by Ministry of Environment in collaboration with IGES Centre Collaborating with UNEP on Environmental Technologies (CCET). We would like to thank the CCET team for working alongside the ME team during the Regional stakeholder workshop and Island level stakeholder workshops to identify the issues that need to be addressed at a regional level. ME would like to extend our appreciation towards UN Environment - International Environmental Technology Centre (IETC) for funding this project and their support in formulation of the Regional waste management strategy and action plan for zone 6.

The authors would like to thank former Minister of Environment and Energy, His excellency Thoriq Ibrahim and former Deputy Minister of Environment and Energy, Mr. Ali Amir for their continuous support through the planning process and formulation of the Regional waste management strategy and action plan for zone 6.

A special thanks to His Excellency Dr. Hussain Rasheed Hassan, Minister of Environment for his commitment towards establishing an efficient waste management system in the country.

Executive Summary

Maldives has had to face a growing challenge in managing its solid waste and associated environmental, economic and social issues. This situation is even worse in small islands due to the size of the island communities, insufficient infrastructure and waste transportation difficulties, absence of sufficient budget and appropriate cost recovery system, lack of institutional capacity, weak regulation, limited opportunities for private sector involvement in service delivery, lack of public awareness and participation. As a result, most of the waste generated on the islands are disposed onto the island foreshore or burnt at low combustion temperatures.

Considering these issues, the Ministry of Environment (ME) in partnership with the IGES Centre Collaborating with UNEP on Environmental Technologies (CCET) in collaboration with United Nations Environment Programme - International Environmental Technology Centre (IETC) and with the financial support from the Ministry of Environment Japan (MOEJ) has developed a Regional Waste Management Strategy and Action Plan for zone 6, including Huvadhoo Atoll and its 18 island councils in consultation with the respective island councils, civil society organisations and other stakeholders. It aims to build capacity for sustainable waste management and promote the development of conducive implementation framework and strategic actions at regional and island levels moving from conventional linear thinking and practice on waste management (collect, transport and disposal) to sustainable waste management based on waste hierarchy and the 3Rs (reduce, reuse and recycle). It also aimed at addressing key issues, needs and challenges in implementing the National Waste Management Policy at regional and island levels whilst raising awareness amongst key stakeholders, including island councils and citizen groups towards achieving a resource efficient and zero waste society.

The Regional Waste Management Strategy and Action Plan identifies some priority strategies and practical actions to be achieved during next five year (2019-2023) period, including (i) at the island level to maximise public awareness, waste separation, proper collection, composting and temporary storage of recyclables and residuals; and (ii) at the regional level to improve appropriate technologies and infrastructure, sustainable financial system, institutional building and private sector involvement.

1. Introduction

1.1. Background

The Republic of Maldives (Maldives), one of the small-island developing countries, faces a growing challenge in managing its solid waste and environmental pollution from sewage and other effluents emanating from residential, tourism and other sources. In recent years, there has been a significant increase in the amount of waste generation coupled with rising population, changing consumption patterns, and a growing tourism industry. This situation is even worse in small island communities due to the small size of the island communities, insufficient infrastructure and waste transportation difficulties, absence of sufficient budget and appropriate cost recovery system, lack of institutional capacity, weak regulation and limited opportunities for private sector involvement in service delivery.

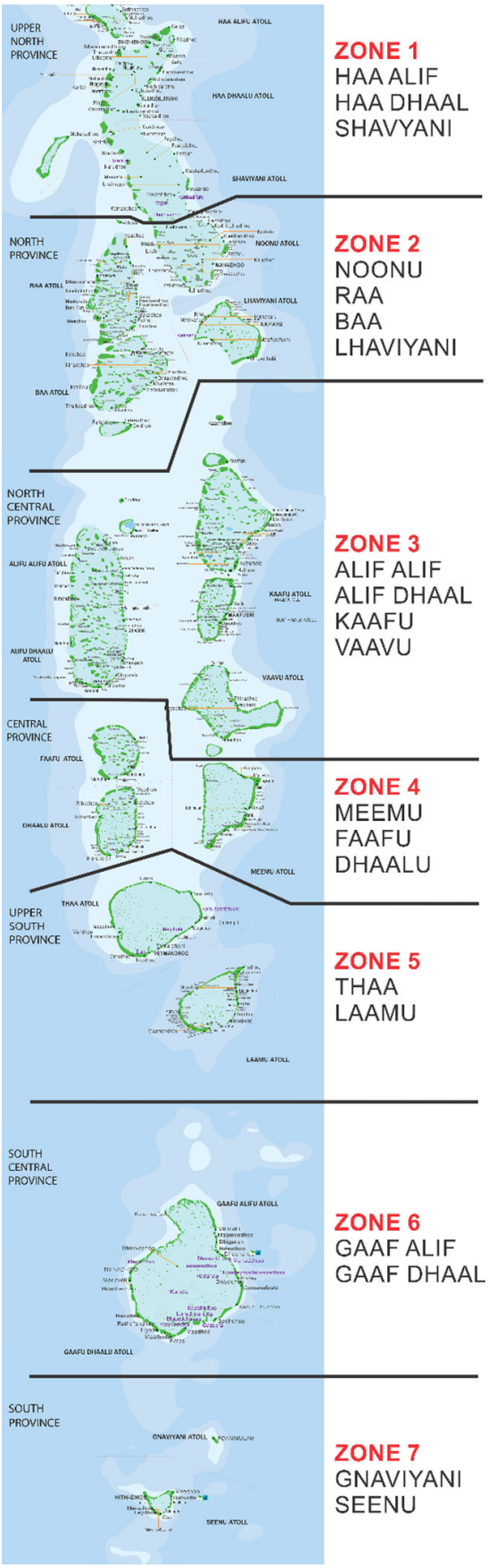
As a result, most of the waste generated on the islands is disposed onto the island foreshore or burnt at low combustion temperatures. Uncontrolled waste disposal and floating debris at tourist resorts is the most visible threat to the country's reputation as a pristine high-end tourist destination. This uncontrolled disposal of solid waste, including foreshore dumping and open burning, currently accounts for 15% of the greenhouse gas (GHG) emissions in Maldives[1]. Ocean dumping of waste can lead to the degradation of coral reefs. Improper waste disposal into coastal vegetation is a major contributor to the degradation of the vegetation belt. Ad hoc disposal of waste on inhabited islands increases the risk of vector-borne diseases by creating vector-breeding sites[2]. The establishment of a sustainable waste management system is therefore important to not only reduce the impact of environmental pollution, climate change and improve community health but also promote resource efficiency, economic benefits and sustainable lifestyles. Proper solid waste management will also help the country to achieve its target of carbon neutrality by 2020 and to achieve the government's commitment on the Sustainable Development Goals (SDGs) by 2030[3].

In light of these circumstances, the Ministry of Environment (ME) formulated the National Waste Management Policy in 2007 with the assistance of the United Nations Development Programme (UNDP). In addition, the Waste Management Regulation (Regulation No: 2013/R-58) in 2013 was formulated and the SaafuRaajje Initiative was initiated aiming to accelerate the implementation of the National Waste Management Policy. The Environmental Protection and Preservation Act of Maldives (Law 4/93) in 1993 and the Environmental Impact Assessment Report Completion Regulation in 2012 (2012/R-27) also provide some guidance on proper waste management. Further, a new governance structure was set up in 2010 under the Decentralization Act giving more powers to local councils mandated to handle waste management responsibilities. Following the 2004 tsunami, ME with financial assistance from both bilateral and multilateral donors was actively involved in establishing Regional Waste Management Facilities and Integrated Waste Management Centres (IWMCs) in some of the island councils in the country.

However, mandated responsibilities failed to be implemented because of several challenges at the regional and island levels. These challenges include inadequate infrastructure, institutional capacity, a lack of clear roles and responsibilities, absence of leadership and coordination mechanisms, lack of public awareness and willingness to pay, as well as limited financial resources within the island councils and their administrative atolls. Considering these issues, ME began collaborating with the IGES Centre Collaborating with UNEP on Environmental Technologies (CCET) to actively work on waste management initiatives in collaboration with United Nations Environment Programme International Environmental Technology Centre (IETC) and with the financial support from the Ministry of Environment Japan (MOEJ) and develop a Regional Waste Management Strategy and Action Plan for zone 6 (see Figure 1), including Huvadhoo Atoll and its 18 island councils. This Plan aims to build capacity for sustainable waste management and promote the development of conducive implementation framework and strategic actions at regional and island levels moving from conventional linear thinking and practice on waste management (collect, transport and disposal) to sustainable waste management based on waste hierarchy and the 3Rs (reduce, reuse and recycle).

This Regional Waste Management Strategy and Action Plan also aimed at addressing key issues, needs and challenges in implementing the National Waste Management Policy at regional and island levels whilst raising awareness amongst key stakeholders, including island councils and citizen groups towards achieving a resource efficient and zero waste society. It respects the holistic nature of waste management,

Figure 1: A Map of the Waste Management Zones



which needs to address waste in all its forms (solid waste, liquid waste/wastewater, and gaseous emissions) and address all components of integrated waste management covering waste separation, collection, reduction through 3Rs, intermediate treatment and disposal. Thus, the strategy identifies some priority actions: (i) at the island level to maximise public awareness, prevention, waste separation, proper collection, composting and temporary storage of recyclables and residuals; and (ii) at the regional level to improve appropriate technologies and infrastructure, sustainable financial system, institutional building and private sector involvement.

1.2. Preparation of the Strategy

The Regional Waste Management Strategy and Action Plan for Zone 6 has been developed based on intensive process of quick study, peer-learning, reflection, and consultation with the participation of relevant governmental agencies at national, regional and island councils, and civil society groups during the period of 2017-2018.

At the initial stage, a quick overview of the current situation on solid waste management policies and practices was conducted based on a literature review, technical discussions, and field observations including initial interviews and meetings with the key stakeholders (island council staff and citizens) between January and July 2017. These actions helped to understand the current state of waste management systems, especially on the islands of Huvadhoo Atoll, as well as identifying major gaps to be addressed when introducing a sustainable waste management system (economically affordable, environmentally effective and socially acceptable).

After that, a two-day regional consultation and training workshop was conducted on 18-20 July 2017 in GA Villigilli with the participation of about 80 participants representing all regional and island councils in zone 6, and relevant staff of the ME and Waste Management Cooperation (WAMCO). The workshop included presentations, group discussions and a plenary session on the current waste management practices, key challenges and identification of practical goals, targets, objectives and actions to overcome those challenges moving towards sustainable and a zero waste society. Participants also identified workable and acceptable strategies and actions for the regional and island councils in the model project area. The consultation included the national government and regional stakeholders as well as the island communities. ME also advised all participating islands to start developing their own island waste management strategies and action plans. During this period, ME in collaboration with Island Councils also conducted community consultations on their waste management related issues and willingness to participate in holistic waste management.

ME followed this up by organising another four-day field visit to all the islands in zone 6 and conducted some training and focus group discussions with the relevant staff of island councils, representatives from other government agencies, community groups (Women Groups), NGOs and citizens on 23-27 February 2018 to review the progress in developing and getting approval for the island waste management plans, improvement in waste management system and infrastructure, as well as discuss any further suggestions to consider in the final version of the Regional Waste Management Strategy and Action Plan.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2. Situation Analysis

2.1. Geography

The Republic of Maldives (Maldives) is located in the Indian Ocean (Southern part of the country) and the Arabian Sea (Northern part of the country), between the southwest of Sri Lanka and India. The country lies about 860 kilometre (km) on a north-south axis and 120 km on an east-west axis. It is an archipelago comprised of 1,192 small islands grouped into 26 administrative atolls[4] spread over 90,000 square kilometres (sq. km) as shown in Figure 2.

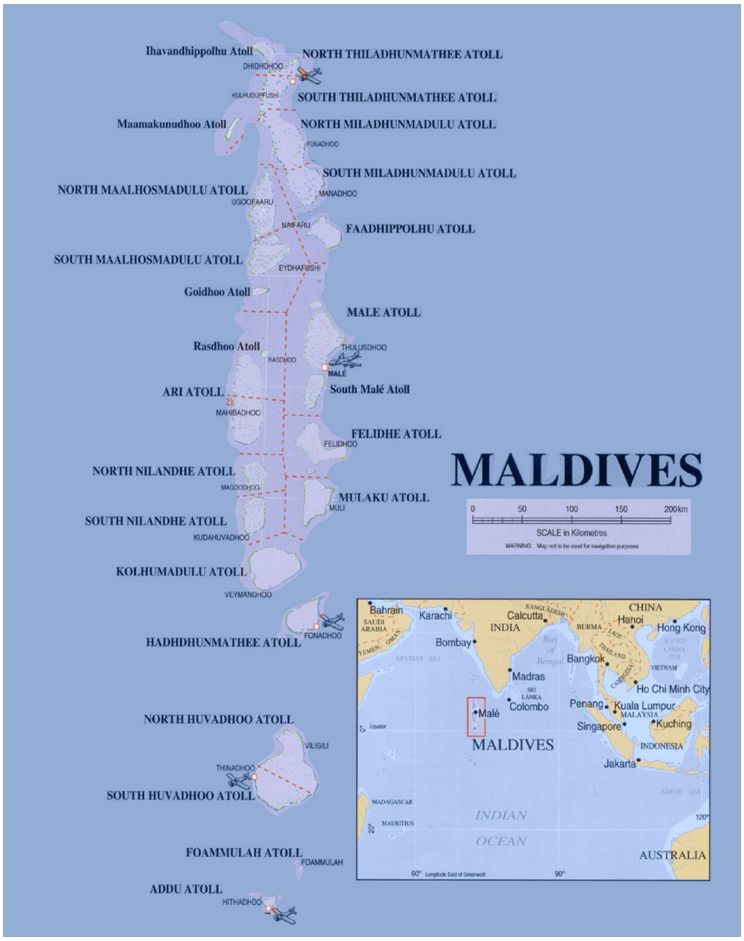


Figure 2: Location of Maldives in South Asia

The total reef area of Maldives is about 4,513 sq. km making it the seventh largest reef system in the world[5]. Over 80% of the land area of Maldives accounts for about 1% of the country's territory and most of its islands are low-lying land areas with an average height above sea level of 1.8 meters (m). As a result, Maldives is extremely vulnerable to rising sea level and faces the real possibility that the majority of its land area will be underwater by the end of this century[6]. The estimations show that given mid-level scenarios for global

warming emissions, Maldives is projected to experience a sea level rise of about 1.5 feet (half a meter) and is set to lose some 77% of its land area by 2100 . However, if sea levels were instead to rise by 3 feet (1 meter), the Maldives could be almost completely inundated by about 2085[6]. This will compound underlying trends of increasing coastal erosion and pressure on scarce land resources, and increase physical vulnerability of island populations, infrastructure and livelihood assets.

Maldives has a tropical monsoon climate. The southwest monsoon (the wet-season) extends from May to November, while the northeast monsoon (dry-season) extends from January to March. The daily temperatures of the country vary little throughout the year with a mean annual temperature of 28°C. Rainfall in the Maldives varies seasonally with more rainfall during the southwest monsoon, mid-May to November. Variations in rainfall exist from north to south of the country, with the north being drier compared to the south[5].

2.2. Population

According to Maldives Population and Housing Census Report 2014 , the country's total population was about 407,660 in 2014. Out of this, the residential population in the Maldives was about 402,071, including 338,434 Maldivian residents and 63,637 foreigners[4]. The Census report also identified that 5,589 Maldivians were living abroad as shown below in Table 1.

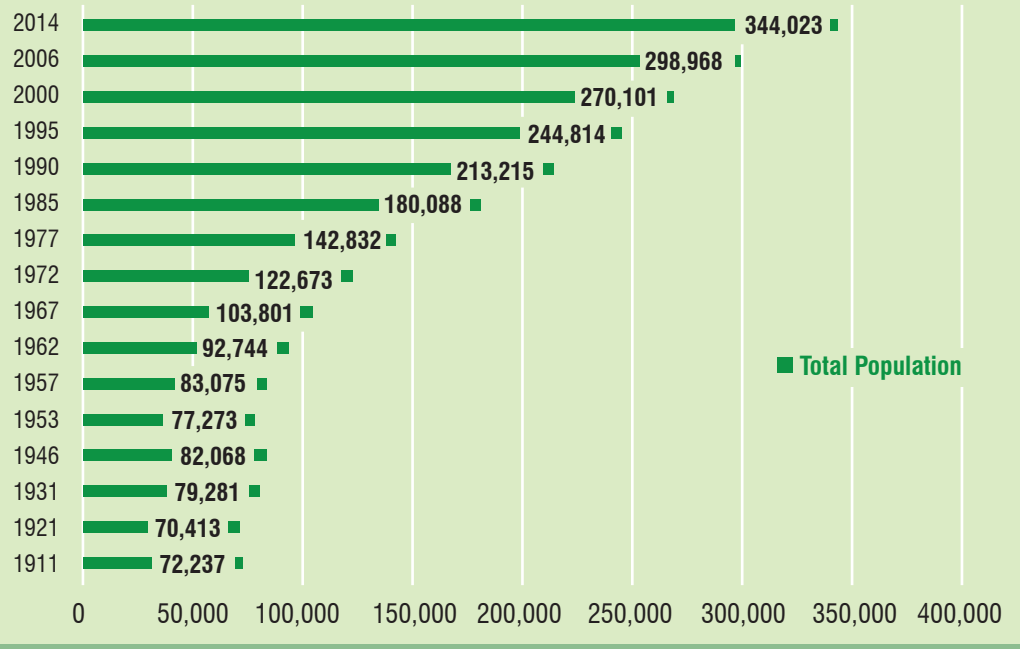
Table 1: Total population in census 2014

Population	Total	Male	Female
Total population	407,660	230,453	177,207
Residential population	402,071	227,749	174,322
Maldivian residents	338,434	171,962	166,472
Foreign residents	63,637	55,787	7,850
Maldivians living abroad	5,589	2,704	2,885

Source: National Bureau of Statistics (2014)

Since the first census in 1911, Maldives population has continued to grow at a steady rate increasing over fourfold during the past century. As shown in Figure 3, the first half of the century experienced a sluggish growth, while from the 1970s onwards the population has increased at a rapid pace. Even though the population continues to increase, the population growth rate has been on the decline during the last two decades. During the last century, the growth rate peaked at 3.43% between 1985 and 1990, and has been on the decline since then. The average annual growth rate between 2006 and 2014 is 1.65%, which is almost the same as the growth rate between 2000 and 2006.

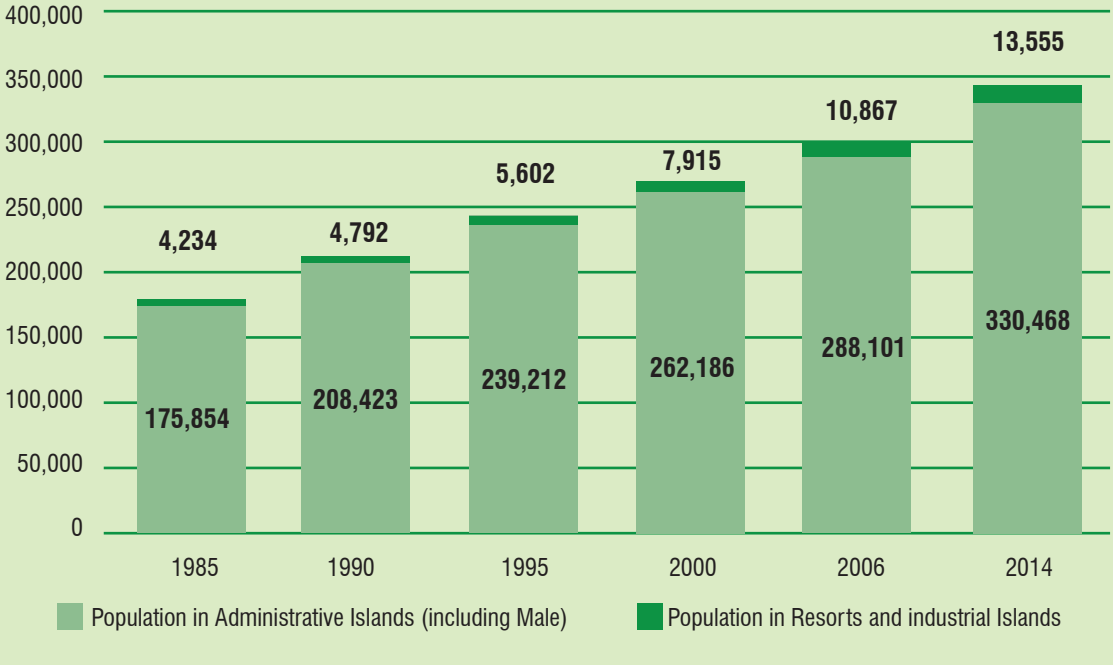
Figure 3 : Total Population during 1911-2014.



Source: National Bureau of Statistics (2014)

The population is distributed within the country among administrative and non-administrative (resorts and industrial) islands. Census 2014 enumerated population from 188 inhabited (administrative) islands, 109 resorts and 128 industrial and other islands. Figure 4 gives a picture of population distribution by these major categories and a quick glimpse of the total picture as close to 96% of the population lives in administrative islands.

Figure 4: Total Population by Administrative and Non-administrative Islands, 1985-2014

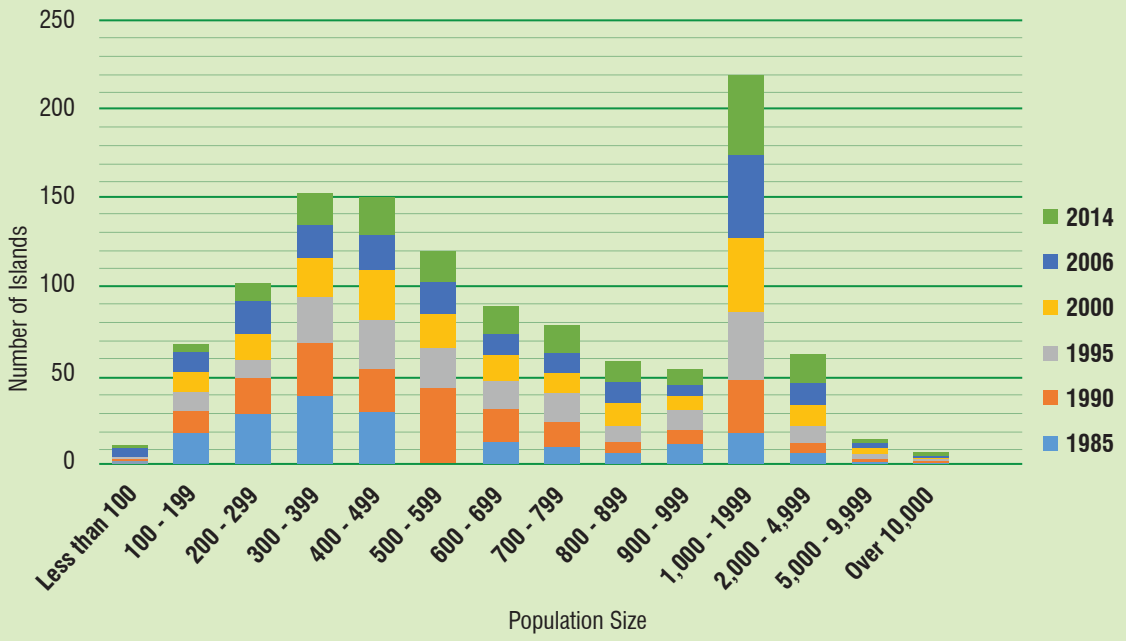


Source: National Bureau of Statistics (2014)

The Maldives population is administratively distributed across 26 atolls consisting of small islands. Even though there is no official categorisation of urban and rural population, the capital city, Malé, is widely referred to as the urban centre and the remainder of the atolls recognised as rural areas. According to the census of 2014, about 38% of the entire population lives in Malé city. Malés population has increased rapidly over the past decades and has exceeded 100,000, making it one of the most densely populated cities in the world which is estimated at about 65,201 per sq. km.[7] The development of tourism within the Malé atoll, rapidly expanding government and private sector, and establishment of major health and educational facilities in Malé, have resulted for a significant disparities between Malé and the other atolls. This uncontrolled population growth in Malé has resulted in increasing environmental pollution, including poor air quality, deterioration of water quality, increased waste generation and pressure on energy use.

According to Figure 5, the number of administrative islands has significantly reduced over the years and there are 188 administrative islands (including Malé) in 2014 as compared to 202 islands in 1985, mainly due to relocation of the population after the 2004 Asian Tsunami. Further, it was also revealed that the majority of the islands in Maldives still have a population of less than 1,000 people. Islands with a population of 300-399 people have gradually decreased over the years. The category of population size class of 100-199 people has also decreased from 17 islands in 1985 to 5 islands in 2014. In 2014, 123 islands had a population of less than 1,000, which accounts for 65% of the administrative islands. One important highlight of the graph is the population category of over 10,000, which remained the same over the years until 2014, with this category including only the capital city, Malé. In 2014, Hithadhoo reached 10,398, surpassing the benchmark of 10,000 apart from Malé for the first time.

Figure 5: Number of Administrative Islands by Population Size, 1985-2014.



Source: National Bureau of Statistics (2014)

2.3. Economy

Maldives witnessed a rapid economic growth, driven largely by a vibrant tourism industry, with support from fisheries and the service sector. The Gross Domestic Product (GDP) of Maldives in current prices reached USD 3.59 billion in 2017 with an annual growth rate of 6.9% when compared to previous year. The GDP annual growth rate in Maldives averaged 6.21% from 1997 until 2017, reaching an all-time high of 19.6% in 2006 and a record low of -8.7% in 2005[8] . Tourism, the highest contributor, accounts for more than 30% of GDP and over 60% of foreign currency earnings . About 80 islands have tourist resorts and tourist arrivals exceeded a million per year with a hotel room occupancy rate of 80% rate from 2013 to 2015[5] (see Table 2).

However, fisheries and agriculture are the country's largest employer and the main source of income for rural communities. The fisheries sector contributed 1.3% to GDP with tuna varieties contributing the dominant catch. Meanwhile, the agriculture sector contributed 1.6% to annual GDP in 2014[5] . The government controls a large part of the economy and 90% of its revenue comes from tourism and trade tariffs[8] . Other important sectors include communication, transport, construction, real estate and government administration.

Table 2: Forecast of Tourism Capacity, 2012-2015

	2012	2013	2014	2015
Tourist arrivals (1,000)	975	1,057	1,144	1,237
Growth in arrivals	4.7%	8.5%	8.1%	8.2%
Bed capacity	24,512	24,995	26,700	27,322
Bed nights (1,000)	8,867	9,093	9,716	9,942
Occupancy rate	77.8%	84.2%	81.9%	82.4%

Source: Ministry of Tourism (2015)

In its advancement as a middle-income country, Maldives made significant progress in meeting the Millennium Development Goals (MDGs), and has been recognised as one of the MDG Plus countries in South Asia. Maldives has seen substantial progress in eradicating extreme poverty and hunger, achieving universal primary education, reducing child mortality, improving maternal health and combating HIV/AIDS, malaria and other diseases, demonstrating its strong commitments to the social sectors, particularly health and education. Progress has however, been slower in remote islands when compared to others, due to large distances from, the nearest economic centres .

Furthermore, infrastructure development policies emphasising climate change resilience have been implemented in recent years, including development of safer, environmentally-resilient islands, greater commitment to renewable energy sources, and policies and strategies targeting integrated water resources management and resilient sewerage systems. In addition, efforts have also been made domestically and

internationally to combat climate change, including the formulation of a national framework policy on climate change and strengthening international partnerships with the aim of combatting climate change globally. Given that the Maldives' economy and social well-being is inextricably linked to its natural environment, particularly its marine environment and resources, the sustainable management of these resources have been a key priority of the government[9] . This places the Maldives on good standing to work towards the SDGs and the Paris Climate Agreement.

Table 3: Maldives HGI and component indicators for 2015 relative to selected countries and groups

	HDI value	HDI rank	Life expectancy at birth	Expected years of schooling	Means years of schooling	GNI per capita (PPP USD)
Maldives	0.701	105	77.0	12.7	6.2	10,383
Bhutan	0.607	132	69.9	12.5	3.1	7,081
Sri Lanka	0.766	73	75.0	14.0	10.9	10,789
South Asia	0.621		68.7	11.3	6.2	5,799
High HDI	0.746		75.5	13.8	8.1	13,844

Source: UNDP (2016)

According to the Human Development Report (2016), Maldives' Human Development Index (HDI) value for 2015 is 0.701— which put the country in the high human development category—positioning it at 105 out of 188 countries and territories[10] . This figure is below the average of 0.746 for countries in the high human development group and above the average of 0.621 for countries in South Asia. From South Asia, countries which are close to Maldives in 2015 HDI rank and to some extent in population size are Bhutan and Sri Lanka, which have HDIs ranked 132 and 73 respectively (see Table 3).

3. Current Waste Management in Maldives

3.1. Waste generation

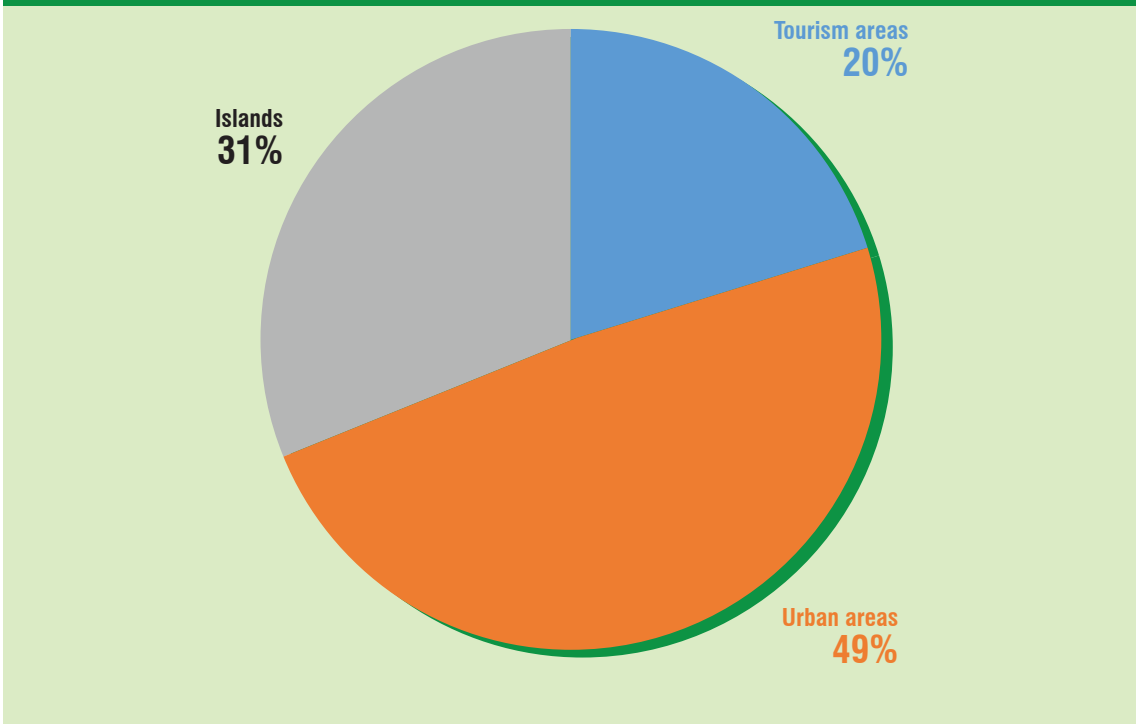
Table 4 estimates the waste generation in urban areas (including Malé), other island communities and tourist resorts in Maldives, based on the per capita waste generation rate and the number of population. According to the World Bank (2017), solid waste is generated at a rate of 1.8 kg per person per day in urban areas (Malé), 0.8 kg per person per day on the other inhabited islands, and 3.5 kg per person per day in resort islands[11] . However, Ministry of Tourism (2015) estimated that 2.8 kg of solid waste per capita per day are produced in urban areas (Malé), with 1.0 kg being generated on the rest of the islands, while in resorts, the figure is 7.2 kg per guest per day[12].

Table 4: Estimated waste generation in Maldives in 2017

Waste generators	Population in 2017 [1]	(1) Per capita waste generation (kg/capita/day) based on World Bank (2017)	(2) Per capita waste generation (kg/capita/day) based on Ministry of Tourism (2015)	Average per capita waste generation (kg/capita/day) [(1) + (2) / 2]	Daily waste generation (tons per day) based on the average per capita
Urban areas	160,475	1.8	2.8	2.3	369
Island communities	261,828	0.8	1.0	0.9	236
Tourist bed capacity	28,1322	3.5	7.2	5.35	150
Total					755

This shows that there is no accurate value on per capita waste generation in the country. Thus, the average per capita waste generation is estimated at a rate of 2.3 kg per day in urban areas, 0.9 kg in other island communities and 5.35 kg in tourist areas, based on the mean values of World Bank (2017) and Ministry of Tourism (MOT), Maldives (2015).

Figure 6: Percentage of waste generated by the urban areas, islands and tourist resorts in 2017.



The current estimations show that approximately 755 tons per day or 275,575 tons per year of solid waste was generated in the Maldives in 2017. Out of this amount, about 20% was generated from the tourism sector while the balance was divided among urban areas (49%) and island communities (31%) as shown in Figure 6.

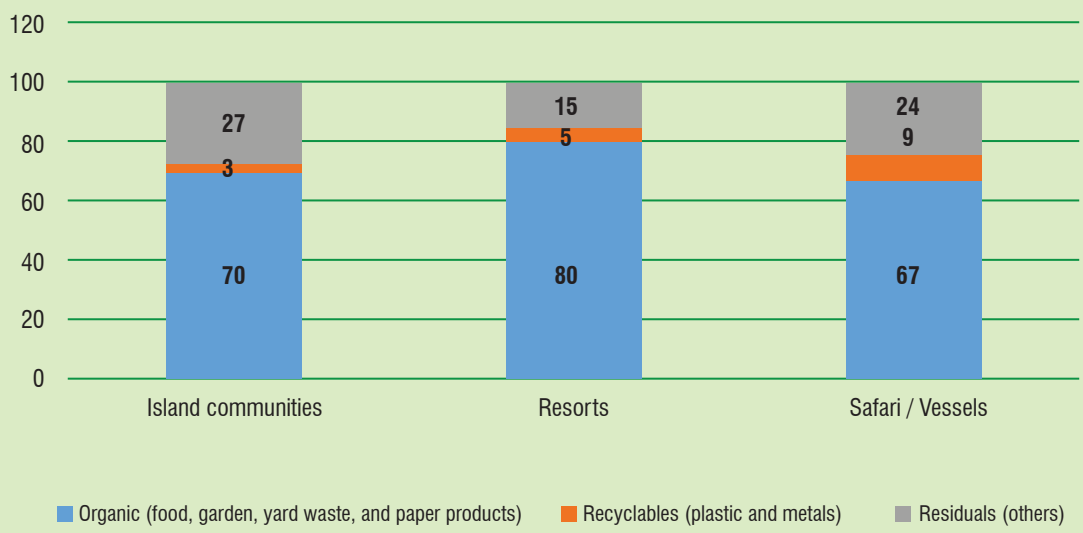
3.2. Waste composition

Figure 7 identifies the composition of the waste, and shows that the organic component contributes the bulk of municipal waste generated from all sources including island communities, resorts and safari vessels (a type of hotel). The organic waste includes food waste and garden/ yard (landscaping). On safari vessels, there is no garden/landscaping waste, therefore food waste is a higher contributor. Preparing fresh food tends to result in more food waste from peels, pits, and other residue. A waste stream with a high organic content also will have a high moisture content and low calorific value that can influence technical considerations in selecting the best-suited treatment options in Maldives.

Recyclables generally include metals, paper and plastics. However, this ratio is low, accounting for only 3% in island communities, 5% in resorts and 9% on safari vessels. The balance of the solid waste is classified as residuals, which includes construction and demolition (C&D) debris, wood, and inorganics such as concrete, glass, miscellaneous discards, such as textiles, leather, rubber, and hazardous waste such as batteries.

According to ME, Maldives do not produce any chemicals. The main pattern of usage of chemicals in the Maldives is in the form of consumption of petroleum products in the energy and transport sector, the agricultural industry, construction, boat building, health sector, domestic use and a variety of other uses in the tourism industry. Chemicals may have a range of adverse ecological and health effects, ranging from degradation of soil, groundwater contamination, marine pollution, to affecting fish and other biota. The high dependence on chemicals and the potential consequences, combined with limited capacity makes effective management of chemicals a key issue in the Maldives. However, due to lack of specific legislation on chemical management, the regulatory mechanism for chemical management remains weak[5].

Figure 7: Waste composition based on island communities, resorts and safari/vessels.



Source: Ministry of Tourism (2015)

3.3. Waste Management Practices

Maldives are a small island country, and the atolls are separated from each other by either a lagoon or by the sea, so 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.

3.3.1. Current waste management practices in Island communities

Malé City

The state-owned Waste Management Corporation (WAMCO) provides waste management services in Malé, (the capital city of Maldives), since December 2016. In addition to providing waste collection service to the residents in Malé, WAMCO is responsible for transferring collected waste from Malé to Thilafushi, and the disposal of waste at Thilafushi landfill area. For effective waste collection, WAMCO divided Malé into 13 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, whereas a monthly of fee of MVR100 (USD6) is charged for the collection of waste from the waste bins kept outside buildings. Garbage collectors use overloaded bicycles to transport waste to boats at the Malé harbour during the evening. The garbage is then transported to the nearby industrial island of Thilafushi for disposal. In addition to Malé, WAMCO provides its service to all households in Villimalé, Hulhumalé, Addu City and Fuvahmulah City. There is also a call and pickup service available (Call 1666) between 14:00 to 22:00 for collection of bulky waste (such as furniture, electronics, etc.). WAMCO will pick up waste any day from Monday to Saturday for MVR 250, using a 350 kg truck per trip, MVR 550 for a 1.5 ton truck per trip, and MVR 950 for a 4-ton truck per trip based on requirements.

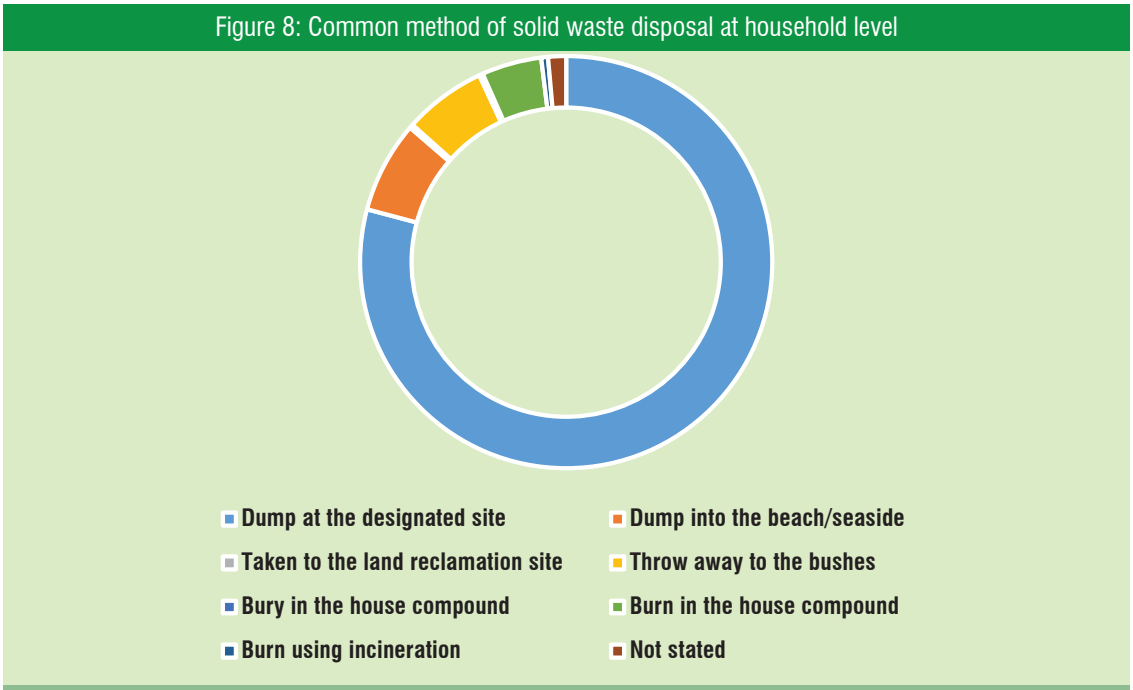
Waste management in other inhabited Islands

The waste management practice in other inhabited islands are inadequate when compared to the urban areas (Malé). On the islands, waste is generally collected by the island councils, community and private operators or carried out by householders themselves and taken to an Island Waste Management Centre (IWMC), or other designated disposal sites. On most of the islands, women of the households carry the waste to the disposal site. However, 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. Figure 8 shows the common methods of waste disposal used at the household level on the atolls. While the most common method of disposal by households is dumping at designated garbage sites (79.13% islands), the next most common methods are dumping at the beach/seaside (7.19%) and throwing into vegetation (7.46%). About 4.7% of households reported burning waste in their backyards. Other methods of waste disposal include taking waste to reclamation sites, burying it in household compounds and burning it using a small incinerator on the islands.

It can be witnessed that development of waste management infrastructure on the islands was not a priority until 2004 when the Indian Ocean tsunami occurred. After the tsunami, the government started a clean-up programme and realised that there was an urgent need to provide infrastructure to those islands. Hence, construction of island waste management centres (IWMC) were first started on tsunami-impacted islands with financial aid from international organisations such as the Association of Australian Red Cross and Canadian Red Cross, UNDP and the EU/World Bank.

Currently, a number of such centres have been constructed on islands but unfortunately, the success rate is low for a number of reasons. Although IWMC have been constructed, there are no organised programmes for waste collection from households to these centres. There are also still no regional waste management facilities (RWMF) to treat the waste. As a result, some IWMCs have reached their full capacity and island residents have stopped bringing waste to the centres. Instead, residents dispose of waste on beaches or in low-lying areas in woody sites. The waste disposed of on the beach is unsightly both for island residents and people on other nearby islands especially tourist resorts. Aside from the aesthetics on the island where the waste is generated, waste thrown on beaches below the high tide line can be entrapped by rising water and float into the sea where it may sink to the sea bottom or onto reefs or wash ashore on tourist resort beaches.

Figure 8: Common method of solid waste disposal at household level



Source: NBS (2016)

Periodically the waste piles may also be burned, creating air emissions such as black carbon (BC), a major component of soot released by the incomplete combustion of fossil fuels and biomass that are short-lived climate pollutants (SLCPs) and remain in the atmosphere from days to weeks. These also have a warming impact on the climate 1,055-2,020 times stronger than CO_2 and make up the majority of PM2.5, air pollutant,

which consists of particles 2.5 micrometres or smaller in diameter (approximately 40 times smaller than a grain of table salt), which is a leading environmental cause of morbidity and premature mortality [13].

Under the Decentralization Act (7/2010), the island councils are mandated to manage household waste collected at the waste management centres or the designated areas. However, a field visit to some of the islands in the Addu and Huvadhu atolls between 8-10 January 2017 and 24-28 February 2018 observed that only a few islands have been reported to segregate waste such as metals, plastic and glass for recycling markets and organic waste for making compost with the active participation of Women's Committee. However, the most commonly used method for households waste disposal are dumping unsegregated waste at sea or on the beach, burying or open burning to reduce the volume of waste. This observation is further confirmed from the results of the State of Environment Survey (2016)[5] . Some of the details of island waste management systems in selected island councils are listed in Annex 1 and summarised below.

Summary of waste management system on Addu and GA Villingili Islands

Municipal Solid Waste Management on Addu Atoll

Addu Island has a population about 10,000 covering Gan. Feydhoo, Gan. Maradhoo, and Gan. Hithadhoo. About 30-40 tonnes of waste is reportedly generated daily. ME is responsible for providing a waste management service. The waste collection service has been subcontracted to the Maldives Road Development Cooperation (MRDC) since 11 June 2015. Before that, Addu City council was responsible for waste collection. There is no waste separation at source despite efforts to introduce separated waste collection, due to lack of cooperation from residents.

The current waste collection service includes door-to-door collection covering 3 days a week for households and 6 days a week for commercial and other institutional premises. For the provision of waste collection service in the area, six trucks are used with three supervisors, six drivers, five guards and 15 workers. The waste collection fees are setup by MRDC, which includes MRV 159 (10.3USD) per month for household and MRV 850 per month for commercial premises.

No proper waste treatment and recycling facilities are available on the island and a plan has been developed by ME to construct a regional waste management facility including an incinerator (40 tons/day), recycling facility, sanitary landfill and vessels for waste transportation among the islands. At present, the collected waste is disposed at an open dumpsite owned by MRDC. Open burning can be seen as method to reduce the volume of waste in the dumpsite.

Municipal Solid Waste Management on GA Villingili Island

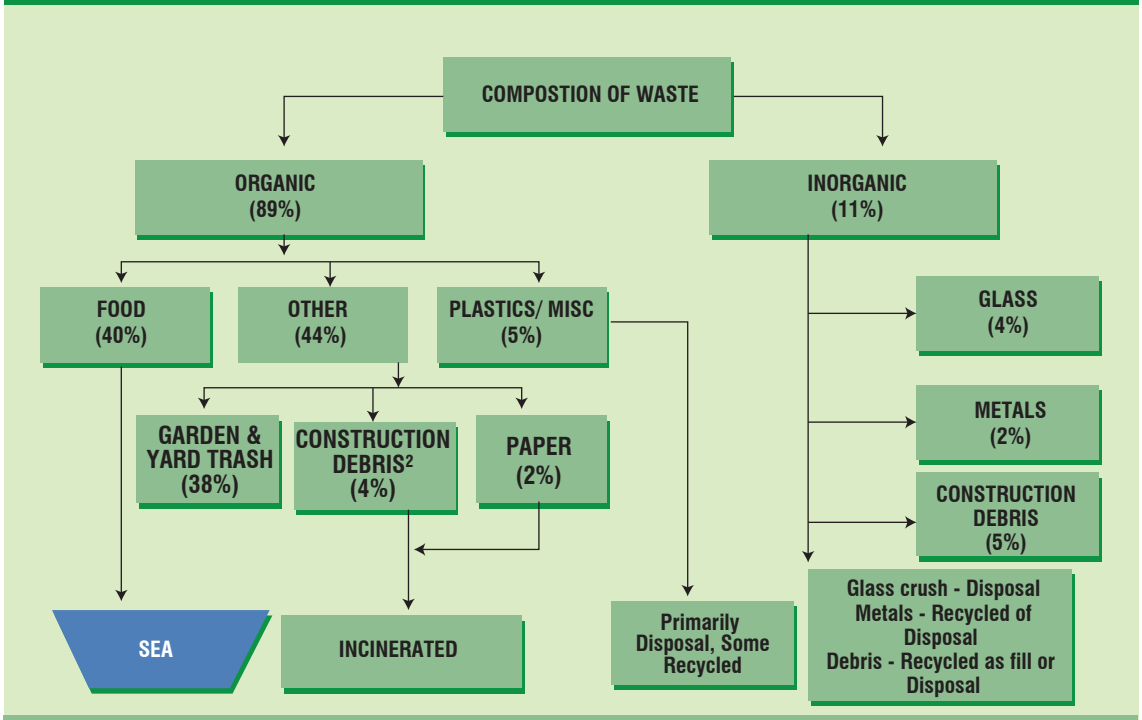
Villingili community on Huvadhu Atoll, has a population of about 437 residents. While there is no accurate data about waste generation on the island, it can be estimated that about 0.5 tons of waste is generated daily assuming a per capita waste generation rate of 1.0 kg per person per day. Residents are required to separate waste into two categories: (1) food waste and (2) others. According to the staff of the island council, more than 80% people separate waste properly thanks to a series of educational and awareness programmes. Door-to-door collection method is used for waste collection from both households (3 days/week) and commercial and other institutions (3 days/week). The island has two trucks for waste collection with two drivers and 11 workers. The island council set a waste collection fee for households (100 MRV/moth) and for commercial premises (250 MRV/month).

The collected food waste is disposed into the sea for fish feeding through a simple screen to avoid leakage of plastics into the sea. Recyclable materials, especially plastic bottles, aluminium cans, iron and others are separated and stored for selling. However, of the island council had difficulties in finding buyers for those recyclable materials, and so collected materials are piled up parallel to the sea, as seen in Figure 5.7. A closed burner was built (500-1,000 kg/day) to burn the dry waste collected, but this is still not in operation due to the failure of getting a electricity supply to the site. Thus, the waste piled on the beach is open burned periodically to reduce the volume of waste. Open burning was reported to be done only when the wind is blowing out to sea; otherwise, smoke from the fire is blown into residential neighbourhoods adjacent to the sea. Additional waste floats beyond the island's reef where it may sink to the sea bottom or onto other nearby reefs. Community officials reported that there have been complaints about floating debris and waste on the reef of nearby dive sites.

Waste management in Tourist Resorts

There are currently 101 tourist resorts in the Maldives. Waste management activities in tourist resorts falls under the jurisdiction of the Ministry of Tourism, Arts and Culture. 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 is separated from other waste and dumped into the ocean. In theory, resort islands may only remove processed recyclable wastes and other non-combustible/ non-putrescible residual wastes for disposal elsewhere. In practice, however, mixed solid wastes from resorts are often loaded onto resort service dhonis (traditional sea vessels) traveling between Malé and the resort, and disposed of at Thilafushi. An unloading fee is charged based on how long the dhoni is berthed at the landfill-unloading platform per hour (m/h).

Figure 9: A typical waste management practices at a resort



Source: Ministry of Tourism

As seen in Figure 9, in most of the resorts, food waste is separated from other waste and dumped into the ocean. Combustible waste components including garden/ yard (landscaping) trash and paper products are incinerated. Combustion under suitable processing systems can reduce waste volume by up to 90%. Nonetheless, although incineration is an effective means to reduce the volume of wastes for disposal, it can generate air emissions, especially at small units such as those used at resorts that have no air pollution control systems. Incineration is a complex technical process that requires well-trained personnel for proper operation. Not only is the risk of high air emissions greater with inadequate operation, but also incomplete combustion will decrease the capacity of volume reduction from incineration. The cost of employing trained operators and maintenance for low throughput incinerators would be expensive for resorts. Furthermore,

combustion of garden/yard waste that may have high moisture content could require a supplemental fuel to have a sufficient heating value for incineration to occur. Since the incinerators at resorts do not operate under ideal conditions, a lesser volume reduction would be expected. The volume of glass waste is required to be reduced using a crusher. There is limited potential for recycling as recyclables only make up a small amount of waste, the dispersed generation of materials presents a logistics obstacle to cost effective consolidation, and the Maldives are geographically distant from end user markets in India.

3.3.2. Waste treatment facilities in Maldives

Originally, the Maldives have three official landfill sites located in three distinct parts of the country—north at Kulhudhufushi, central at Thilafushi and south at Hithadhoo in Addu. However, the north facility is non-operational at present, as it has been developed on an inhabited island. The residents of the island were opposed to receiving waste materials from other islands, resulting in an NIMBY – Not In My Back Yard – situation. According to ME, the waste management facility in the south is also considered as being marginally operational. The Asian Development Bank (ADB) financed the construction of both the north and south landfills and all of them are non-engineered or partly engineered landfills . In addition, the country's first integrated regional waste management facility was established at R. Vandhoo under the Maldives Environment Management Project (MEMP)[5] .

Thilafushi Landfill

Since the early 1970s, 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 is not an engineered waste disposal site and is currently functioning as an open dumpsite. Current operations involve the delivery of waste to the site by boat. It is estimated that two barges of 589 tonnes, operate daily between Malé and Thilafushi landfill. Waste from Malé is loaded onto trucks and taken to Thilafushi. The trucks are uncovered so that some of the waste may be blown off or may slide off the truck. During passage to Thilafushi on a barge, waste may end up in the sea. Waste from resorts and other islands generally are shipped in bulk to Thilafushi. At the treatment and disposal site, there is a jetty dedicated to receiving bulk waste, which was reported to be 10,000 feet in length. Some recycling activities are carried out in Thilafushi by manual segregation for glass, plastics, aluminium, sawdust and lead acid

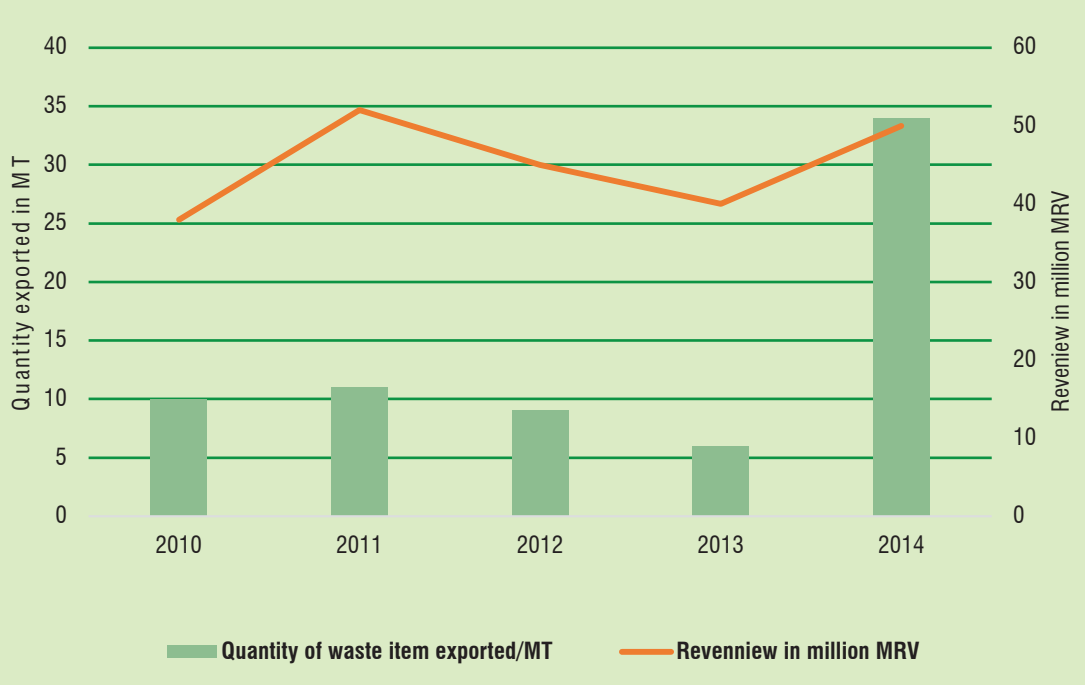
batteries. Waste stockpile at the site is frequently open burned and contributes significantly to air pollution at the Malé region and the nearby islands [14] .

The hazardous waste that is mixed in with the regular municipal waste in the landfill has led to Thilafushi being described by local environmentalists as a "toxic bomb"[15] . Thilafushi lagoon fill, with used batteries, asbestos, lead and other potentially hazardous waste mixed with the municipal solid wastes, is an increasingly serious ecological and health problem in the Maldives. Even though batteries and e-waste are quite a small fraction of municipal waste disposed at the Thilafushi, they are a source of toxic heavy metals such as mercury, lead and cadmium. Chemicals can leach out into water table or sea, posing a danger to the surrounding sea and reefs. Once these toxics chemicals are released, it is very difficult to remove them from the food chain and can end up in the seafood we consume . As a result, the government of Maldives has been working with development agencies to propose a new system to use the waste to produce energy while at the same time to reduce the volume of waste for disposal.

Recycling

Recycling is not common in the Maldives, particularly due to lack of sufficient financial and technical capacity on the islands. The term recycling from a Maldivian perspective is collection and segregation of recyclables and processing them for export. However, considerable recycling activity is carried out in Thilafushi, where manual segregation of recyclable waste takes place. Foreign workers are mostly involved

Figure 10: Quantity and value of recycle materials are exported, 2010-2014



Source: Maldives Custom Service, (2015)

in sorting recyclable wastes manually. Among other recyclable materials, PET and scrap metals are also predominantly found. Most resorts compress the metal and plastic waste, which is then either transported to the disposal site or recycled. Scavenging rights over all waste received to Thilafushi have been issued to a private company, who periodically crush and export the stockpiled recyclable materials. Statistics from Maldives Customs Service shows that approximately 7,277MT of waste material worth over 50 million MVR was exported in 2014 alone (Figure 10). The waste items exported in 2014 included waste oil, parings and scrap of plastics, waste paper, waste and scrap of steel, copper scraps, wastes and scraps of aluminium and battery waste.

4. Development in the Waste Management Sector in The Maldives

4.1. Waste Management Policy and Legislatives

The Ministry of Environment (ME) and the Environment Protection Agency (EPA) are two leading agencies at the national level. Both of them have responsibility in planning, implementing, monitoring and regulating waste management in the country. ME is responsible for the development of a legal framework, developing projects, conducting research, providing capacity building and provision of necessary infrastructure and equipment to island councils. EPA is responsible in approving waste management plans, providing permits for waste companies including waste transport companies and monitoring operation of these entities. In addition, some other agencies such as the Ministry of Health, Ministry of Tourism and Ministry of Foreign Affairs are also involved in waste management in Maldives. Recognising the urgent importance to adopt a sustainable, integrated approach for waste management practices in the country, substantial efforts are being made to introduce some policy and legislative instruments relating to waste management.

The law governing the protection of the environment is the Environmental Protection and Preservation Act (EPPA) of 1993 (Act No 4/93). This sets out the principles for sustaining and extending the benefits of the environment of the Maldives, including waste management. EPPA confers powers on ME to issue regulations and formulate policies for environmental protection and preservation. Section 7 – waste disposal, oil and poisonous substances and Section 8 – hazardous/ toxics or nuclear waste specifically address waste management.

In addition, the Government of Maldives with the support of UNDP developed the National Solid Waste Management Policy in 2008 in consultation with the community. It was then revised and adapted in 2015. The policy recognises that a national approach to waste management in the Maldives has been lacking, resulting in inequity in governance and resources in terms of both capacity and infrastructure. There has also been a lack of leadership on waste management in the Maldives as a result of the absence of clearly defined roles and responsibilities for waste management, not just at the national level, but also at regional, atoll and island level. It has also been recognised that there has not been adequate provision given to waste awareness, incentives to encourage positive waste management behaviour or enforcement of punitive measures to dissuade negative waste management behaviour.

In this regard, the vision in the policy identified the necessity to build on initiatives already in place and methodically advance the development and implementation of additional initiatives that will ensure greater equity in access to waste management infrastructure and stronger administrative capacity

across the Maldives. It prioritises initiatives that will reduce the rate at which waste is being produced by encouraging waste reuse, recycling and influencing consumer preferences. It also recognised that community can become aware and actively engaged in good waste management practices by participating in waste awareness programmes and in waste management planning processes at island, atoll, regional and national level.

We will all begin to take responsibility for the waste we produce which may include changing our behaviour in ways that will help reduce waste or by contributing towards the cost of maintaining waste management systems that ensure the wastes we produce are collected, transported and disposed of in an appropriate manner.

The national waste management policy adopts targets for waste reduction, recycling and recovery to ensure progress is made toward achieving its vision. The primary target is to reduce the waste generation by 25% in 2012 based on 2007 figures through promoting a recycling, reuse and influencing consumer preferences. In addition, the secondary targets are set in reaching the primary target, including:

1. Develop a national waste awareness programme and deliver at least five waste awareness campaigns at national, sectoral and community level;
2. Construct island waste management centres and provide equipment that will enable communities to process and manage reusable and recyclable waste materials on all islands with a population greater than 1,000 persons;
3. Ensure 90% of all inhabited islands have developed island waste management plans which will include information on how island communities propose to operate and manage the island waste management centres and equipment to process and manage reusable and recyclable materials they produce;
4. Ensure all atolls and at least 10 government ministries have developed waste management plans that will include information on how they propose to reduce, reuse and recycle the wastes they produce;
5. Ensure 80% of all health care facilities adhere to minimum standards for health care waste management;
6. Develop an income-based approach to national recycling that will encourage greater private sector participation in reclaiming major recyclable components of the household and commercial waste streams; and
7. Establish a framework for Extended Producer Responsibility where manufactures, importers and retailers are required to support return, collection and recovery systems or other product stewardship programmes.

As summarised in Table 5, about 11 policies and 30 strategies are set in the National Waste Management Policy under the following principal objectives: (1) establishing and activating waste management governance; (2) creating waste producers' duties; establishment of waste management infrastructure; (3) activating the waste management system; and (4) influencing consumer choices and waste management practices promoting 3Rs.

Table 5: A summary of key policies and strategies in National Waste Management Policy, 2008

POLICY	STRATEGY
Establishing and activating waste management governance	
1. Establish a governance structure for solid waste management, which will distribute clearly delineated roles, and responsibilities for solid waste management at island, region and national levels will be established	1.1. Establish waste management administrations, delegate powers and mandate functions to administer the waste management systems.
	1.2. Support the development of the capacity of waste administrations, so that they have the capacity to perform their functions under this Policy, through training, the preparation of operational policies and guidelines and by providing, where feasible to do so, financial assistance

Creating waste producers duties	
2. All waste producers have a duty to manage the waste they generate	2.1. Government Agencies will participate in the development of waste management plans that will include information on how they propose to reduce, reuse and recycle waste and/or how they propose to dispose of waste that they produce. These Agencies will set an example to the rest of the Maldives for excellence in the management of the wastes they produce.
	2.2. Individuals and householders will participate in the development of island waste management plans, which will include information on how island communities propose to operate and manage Island Waste Management Centres and equipment, and how they propose to manage the reusable and recyclable wastes materials they produce. Individuals and householders will, as far as possible, contribute to the costs of providing the services used to collect, transport, treat and dispose of the wastes they generate
	2.3. Commercial enterprises will participate in the development of sector based waste management plans, which will include information on how they propose to reduce, reuse and recycle waste materials they produce. Commercial enterprises will pay the full costs of providing the services used to collect, transport, treat and dispose of wastes they generate
	2.4. Product manufactures, importers and retailers will participate in the development of sector-based waste management plans, which will include information on how they propose to reduce, reuse and recycle waste materials that they produce. They will pay the full costs of collect, transport, treat and dispose of wastes they generate. They will also participate in extended producer responsibility programmes to support product return and recovery systems, product steward ship schemes, and minimisation/ phase-out schemes/ packaging that generate waste that cannot effectively be recovered, recycled or reused.

Establishing a waste management infrastructure	
3. Waste will be managed and disposed as close as possible to the place of their generation	3.1. Construct Island Waste Management Centres on all inhabited islands with a population of 1000 or more and ensure, as far as practicable, that the centres are equipped to enable the island communities to reuse and recycle the wastes they produce. For islands with populations of less than 1000, provide equipment and protocols appropriate for the management of the waste volumes produced.
	3.2. Develop and construct Regional Waste Management Facilities. The sites will be selected after consideration of environmental and social impacts. The most appropriate waste storage, processing and/or disposal technology solution will be selected using the Best Practical Environmental Option approach. Regional Waste Management Facilities will include facilities for the management and disposal of special wastes as appropriate
	3.3. Explore the future of existing landfill facilities including arrangements and responsibilities for remediation, closure or upgrade
	3.4. Provide sorting infrastructure and equipment at island and regional level to support the reclamation of recyclable materials from the waste stream and develop a national recycling strategy which will guide the development of a national recycling industry

4. The waste management system will accommodate the specific requirements of special waste	4.1. Producers of hazardous waste, MARPOL waste and WEEE retain primary responsibility for the safe collection, handling and disposal of the waste they generate. The Central Waste Administration will develop a system for the management and disposal of hazardous waste, MARPOL waste and WEEE, assist and facilitate the producers of this type of waste to develop and implement operational policies, guidelines and standard operating procedures, and explore the feasibility of engaging private sector participation in the delivery of waste management services for such waste.
	4.2. Producers of health care and related waste retain primary responsibility for the safe collection, handling and disposal of the waste they generate. The Central Waste Administration will assist and facilitate health care waste producers to develop and implement operational policies, guidelines and standard operating procedures for health care and related wastes, including those waste, which cannot enter into the mainstream waste system.
	4.3. Develop guidelines for the reuse and recycling of construction and building waste.
5. Waste management planning will be based on variable facts and known effective strategies	5.1. Develop a database that generates information about the types and quantities of waste, and provides details of their transport, treatment and final disposal location. Information from the database will be used to monitor progress towards achieving waste reduction targets and to review and set future waste-related targets. Information from the database will be made publicly available.
	5.2. Develop operational policies requiring Islands Waste Administrations, waste transporters, specified waste producers and waste management facilities to supply information to the database. Government agencies, commercial and industrial enterprises, islands and the private sector waste service providers will be encouraged to access the data when developing waste management plans or making decisions about waste management.

Activating the waste management system	
6. The waste management system will beneficially viable	6.1. Establish a user pays system where waste producers will pay for the total cost (including a government contribution) for the services used to collect, transport, treat and dispose of wastes generated. The cost to manage household, municipal, industrial, commercial and institutional waste will be calculated taking into account the true cost of providing the waste services and the capacity of the waste generators to pay.
	6.2. Establish a framework for Extended Producer Responsibility where manufacturers, importers and retailers are required to support product return, collection and recovery systems or other product stewardship programs.
	6.3. Establish a dedicated fund to support waste management initiatives. The fund will enable contributions to be made under extended producer responsibility programmes as well as from import taxes imposed on products and materials which having become waste, cannot be reclaimed or are hazardous.
7. Consolidated legislation will be introduced to support the implementation of the policy	7.1. Review current legislative mandates for waste management in the Maldives and develop consolidated legislation that will support the implementation of the National Solid Waste Management Policy, including facilitating private sector participation, ensuring transparent decision-making, and enabling regulatory enforcement.
	7.2. Review commitments made by the Government of the Republic of Maldives to international conventions, protocols and obligations relating to solid waste management and where required, develop enabling mechanisms so that they have legal force in the Maldives.
8. Private sector participation will be facilitated where it is financially viable for both the government and the private sector	8.1. Identify the types of businesses that the private sector could become involved with and encourage private sector participation in providing waste management services that are necessary and where there is opportunity to create viable and profitable business.
	8.2. Develop and establish the forms of private sector participation to be employed and the procedures and administrative arrangements necessary to implement participation of the private sector in waste management in the Maldives.

Influencing consumer choices and waste management practices	
9. Financial incentives and disincentives will be pursued to support good waste management practices	9.1. The polluter pays principle will be applied as far as practicable as a direct cost on waste producers through the user pays systems and on manufacturers, importers and retailers through the extended producer responsibility initiatives and product stewardship schemes. The polluter pays principle will be introduced in order to encourage waste reduction across all sectors of Maldivian society.
	9.2. Create incentives and disincentives through an import duties system. The dedicated waste management fund will target revenues from import taxes imposed on products and materials which, having become waste, cannot be reclaimed or are hazardous.
10. Goods that are harmful to the environment or cause public nuisance and unacceptable waste activities will be discouraged	10.1. Prohibit imports of non-biodegradable plastic bags and develop a policy to ban further imports of other waste for which there is little or no opportunity to recover or recycle.
	10.2. Prohibit activities such as dumping waste and littering, and introduce a licensing system that prohibits certain activities such as collecting, transporting and disposing of special wastes except under license.
	10.3. Create an inspectorate within the Central Waste Administration to advise and enforce legislative provisions relating to the import of prohibited goods and unacceptable waste activities.

11. The community participation in and awareness about good waste management practices will be maximised	11.1. Develop a National Waste Awareness Programme targeting the community, formal and informal education sectors, the media, commercial and industrial enterprises and Government agencies. The Awareness Programme will include messages about reduce, reuse, recycle good waste management practice, consumer preferences and producer responsibility for any waste produced.
	11.2. Develop and deliver waste awareness and training campaigns that engage and inform the community, formal and informal education sectors, the media, commercial and industrial enterprises and government agencies about the waste management system and good waste management practices for any waste produced.
	11.3. Deliver national campaigns to engage and inform the community and special waste producers about safe handling and good waste management practice for the treatment and disposal of special waste.

Source: ME (2008)

The Waste Management Regulation (No 2013/R-58) of the Maldives was enacted under Article 3 of the EPPA in 2013 and is implemented by the EPP of ME. The regulation focuses on (1) waste management standards – standards for waste collection, transfer, treatment, storage, waste site management, landfills and managing hazardous waste; (2) waste management permits – approval procedures for waste management sites; (3) waste transfer – standards and permits required for waste transport on land and sea, including transboundary movements; (4) reporting – reporting and monitoring requirements and procedures; and (5) enforcement – procedures to implement the regulations and penalties for non-compliance.

Maldives have also adhered to international treaties, declarations and agreements, including the Vienna Convention for the Protection of the Ozone Layer (1985) and the Montreal Protocol on Substances that Deplete the Ozone Layer (1987); Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal: Technical guideline on environmentally sound management of biomedical and healthcare waste (1989); United Nations Framework Convention on Climate Change (1992); Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemical and Pesticides in International Trade (1998); Stockholm Convention on Persistent Organic Pollutions (POPs), Stockholm (2001); and Kyoto Protocol as modified by the Doha Amendment (2012).

As for the Sustainable Development Goals (SDGs) agreed by the UN Assembly in September 2015, waste management is embedded in several SDG goals, including SDG3 – ensure healthy lives and promote wellbeing for all. Target 3.9 by 2030 aims to substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination; SDG6 – ensure availability and sustainable management of water and sanitation for all; and SDG12 – ensure sustainable consumption and production patterns.

Local government authorities also have some regulations, such as Act on Decentralization of the Administrative Divisions of the Maldives (2010) that provides for general waste management by local councils. Waste Management Regulations of island councils provide for basic methods of waste management.

The Ministry of Health with the assistance of the World Health Organisation developed a National Health Care Waste Management Policy and Strategy (2015-2021) aiming to strengthen the legal framework, training of personals, and raising public awareness as essential elements of successful health care waste management in the country. In addition, Health Service Act, Law 29/2015, Public Health Protection Act, law 7/2002, National Infectious Control Guideline in Health Facilities, 2008 and National Standards on Clinical Laboratories, 2013 are also set up to implement effective health care waste management practices.

Parliament enacted Law No. 2/99 (Maldives Tourism Act) that outlines the topics for which regulations were promulgated for the protection and conservation of environment in the tourism industry. The regulation entered into force on 20 July, 2000. Section 5 of the regulation developed in response to the Maldives Tourism Act (Law No. 2/99) addresses the provisions concerning solid waste management for the tourism sector. For example, waste collection bins with lids are to be placed for convenient use on leased tourist properties such as resorts; the components of discarded wastes (food, glass, metals, toxic or hazardous materials) are to be separately collected; waste disposal is to be done in a manner that will have the least impact on the environment; all tourist resorts are to have and use incinerators, compactors and bottle crushers; waste is to be disposed in the designated area or, in the absence of a designated area, disposed in a manner that is least harmful to the environment; food and other biodegradable wastes may be dumped in the sea in the absence of a designated area for waste disposal in a region. Additionally, ocean dumping of biodegradable waste is to be done in the sea outside an atoll.

The dumping is to be done taking into account wind and water currents so that it will not wash ashore on the islands; waste burning is only to be done in an incinerator, which means open burning is prohibited; combustibles such as plastics that may produce noxious emissions are not be burned but rather separately collected and delivered to a designated waste management area; monitoring data on vessels, including the capacity and proper logs on trips made for waste disposal in an island or part of it leased for tourism

purpose, are to be maintained; and tourist vessels such as safari boats are to have a system for waste collection and storage until such waste can be taken to a designated place for waste management.

4.2. Decentralisation of waste management and construction of Island Waste Management Centres (IWMC)

In 2010, a new governance structure for the Maldives was established by law (Decentralization Act) . The Act mandated the island councils to manage waste at the island level. This was a major shift from central planning to respective region and island councils' implementation. The Environment Research Centre change its name to the Environmental Protection Agency (EPA) in 2008, and is now responsible for facilitating and encouraging good practices and enforcing national policies and strategies, and implanting national regulatory framework in waste management and other environmental concerns.

Following the 2004 tsunami, the government constructed 74 Island Waste Management Centres (IWMC) on tsunami-impacted islands with the assistance from Governments of Canada and Australia through the association of Australian Red Cross and Canadian Red Cross (ARC/CRC). The Government of Maldives and UNDP also developed projects under which waste management centres were built on a number of islands. Subsequently, this basic infrastructure for waste management was extended to other inhabited islands and as a result, about 128 IWMCs have been constructed to date with another 10 under construction . The design of these centres is based on the premise that 70% of the household waste produced on the islands is organic and can be adequately treated, reused or disposed of on the island through composting, and that 1% hazardous waste and 3% of household waste that is recyclable can be stored on the island and removed periodically, and that only the remaining 26% of household waste generated will require routine collection and transportation for disposal elsewhere.

4.3. Efforts to reduce imports of plastic bags

The issue of plastic waste is receiving increasing attention in these days due to its negative impacts on the environment, public health and wellbeing. According to the Earth Day Network (2018), approximately 300 million tons of plastic is produced annually and half of this is for single use .The Ellen MacArthur Foundation with McKinsey at the World Economic Forum reported in the Global Plastic Packaging Roadmap (2016) that only 14% of plastic packaging is collected for recycling with just 10% actually recycled. The remaining end-of-life plastic, goes to landfill (40%), incineration (14%), or shockingly, leaks into the environment (32%), where it may take up to 1,000 years to decompose, leaching potentially toxic substances into the soil and water . The impact of terrestrial microplastics pollution in soils, sediments and freshwater could have a long-term negative effect on ecosystems. The report also points out that in excess of 8 million tonnes of plastic enters the oceans each year.

The Maldives is no exception and in fact, the country is one of the highest producers of plastic waste. In light of this, some initiatives are taken by ME in partnership with other stakeholders. For example, a high tariff is charged by the Maldives Customs Services (MCS) on non-biodegradable plastic bags and polyethylene sheets, while zero tariffs are levied on biodegradable plastic bags. The current taxation rates are implemented in order to discourage the import and use of plastic bags which are harmful to the environment. The different tax rates imposed by MCS for the three categories of plastic bags include zero tax rate on biodegradable bags, 15% tax rate on other than biodegradable bags and 400% on non-biodegradable bags. Although biodegradable bags have a high CIF value, due to zero taxation rates the import of biodegradable bags is cheaper. Despite the purchase cost of non-biodegradable bags being lower than the other two types, due to the 400% tax rate levied, this becomes the most expensive option.

4.4. Key Challenges and Barriers to waste management

Solid waste management is recognised as one of the greatest environmental challenges in Maldives. Over recent years, the issue of waste management has increased significantly due to rapid population growth, changing lifestyle and consumption patterns, and rapid growth of the tourism sector.

As a small island nation, the limited availability of land and the dispersion of the islands over a large geographic area are existing natural challenges towards implementing waste management strategies. Within the islands and atolls, there is insufficient funding for waste management infrastructure, equipment and practices. The small size of the inhabited islands, in terms of both land area and population, and the large distance between them, especially when measured in travel times by the common means of transport, the dhoni, create many problems. These include the severe diseconomies of scale that are felt hardest when delivering services and providing their infrastructure. Service delivery too is more costly even at the basic level. Indeed the majority of the inhabited islands lack basic waste management infrastructure, such as engineered disposal sites, not do they have waste processing equipment such as shredders for green waste and crushers for glass and metal items. It is clearly well beyond the resources of the residents to self-finance such facilities, which would cost hundreds of thousands of US dollars.

At present there are only limited waste collection services, treatment and disposal systems available throughout the islands. Households are generally required to carry their waste to the designated disposal sites, which often results in dumping in the beach, ocean or forests, and open burning. Systematic and comprehensive waste collection systems should be enabled to avoid this dumping and burning. While every island situation is different, there should be flexibility about the type of waste collection and transportation methods used to meet the size and needs of the populations on the island.

Today, there is no regional waste management facility in the zone 6 and 7 to accept collected waste from the island waste management centres. As a result, there are some negative impacts for the operation of island waste management centres, even though it was identified that establishment of island waste management centres is one of the most important strategies in improving the waste management system on the islands.

The lack of investment is exacerbated by or is possibly a function of an absence of appropriate cost recovery mechanisms. The key factor is that of affordability, due to a limited resource base within the islands. For the application of service fees to be more broadly applied, it is clear that far more attention must be paid to the issue of public education and awareness raising. In addition, affordability and willingness to pay need to be accurately determined and assessed before the introduction of new service fees.

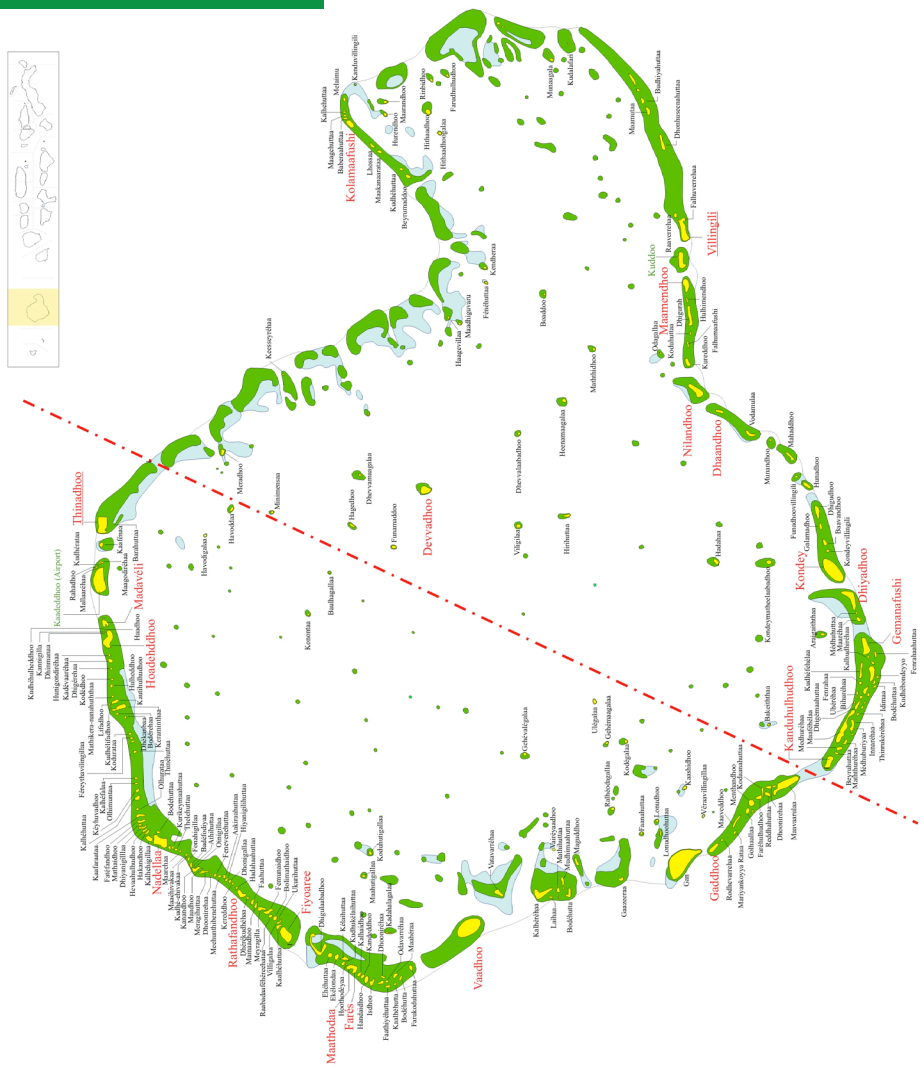
Weak legislative and regulatory framework hinders monitoring and regulatory functions. National, atoll and island institutional capacity to administer and implement sound waste management standards needs to be high for the system to work. The capacity of institutions at all these levels still, however, requires further assessment and development. In particular, inadequate institutional capacity within island councils coupled with a lack of clear roles and responsibilities has resulted in an absence of clear leadership and coordination.

Monitoring and enforcement of waste management services has been observed to be generally weak. Within the island councils, this function is the responsibility of council staff. However, staff have received no formal training and are unclear regarding their rights to impose fines on offenders. Hence, staff prefer to adopt an approach of negotiation and conciliation rather than formally prosecuting offenders.

5. Development of the Regional and Island Waste Management Strategy and Action Plan In Zone 6

In order to address the waste management challenges at the regional and island levels, this regional waste management strategy and action plan for zone 6 has been developed by ME in consultation with the island councils, civil society and other stakeholders with the technical support of CCET and IETC. This will serve as a model for other regions in Maldives. The regional waste management strategy and action plan covers all 18 inhabited island councils from the Southern and Northern Huvadhoo (see Figure 11) and aims to make a transformation from current conventional waste management (waste collection and disposal) practices towards more sustainable waste management practices based on the 3Rs to achieve the goal of a zero waste, zero emission, resource-efficient and sustainable society by 2030. In this new system, waste recognised as resources and sustainable waste management needs to be environmentally effective, economically affordable and socially acceptable.

Figure 11: Location of islands in Huvadhoo atoll



To this end, this regional waste management strategy and action plan identifies a comprehensive list of strategies (see Figure 12) and some practical actions to be achieved during the next five years (2019-2023) that are based on the findings of a quick study, feedback from discussions and consultations with island-level stakeholders, and reflects the stated goals and directives of public authorities with a view towards efficient and effective implementation of waste management linked with the National Waste Management Policy and other national and local regulations.

Figure 12: Proposed strategies for a regional waste management strategy in zone 6

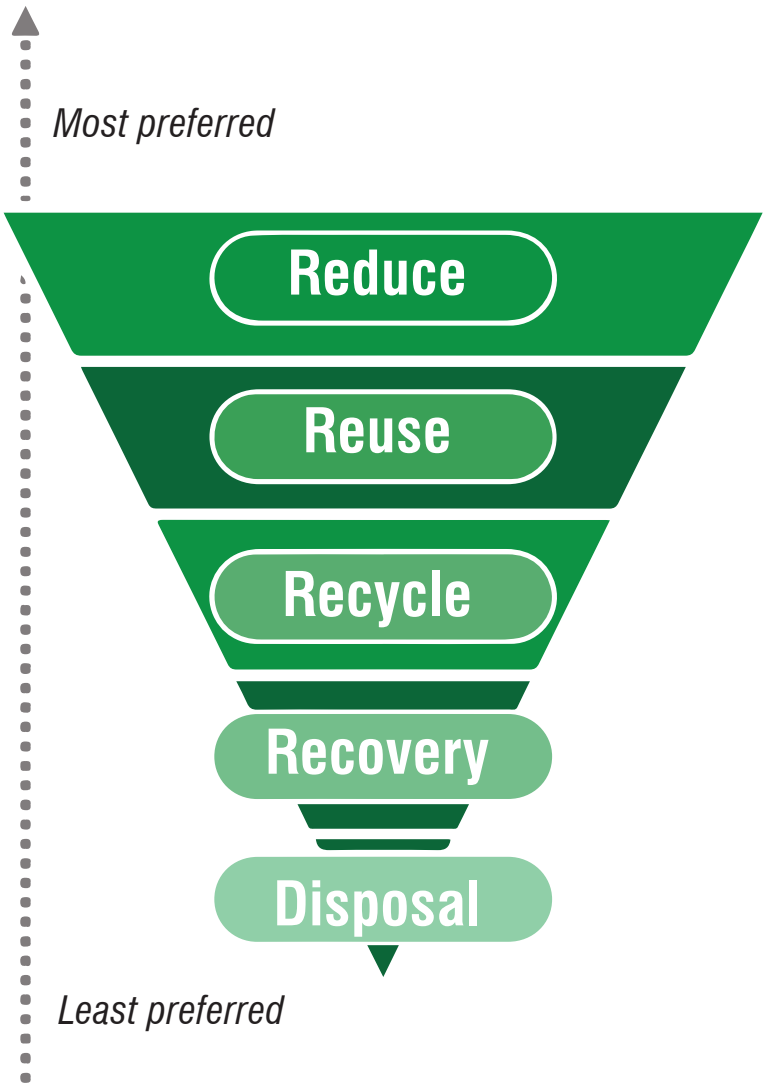
The strategy also ensures that the regional waste management strategy and action plan follows the core environmental principles related to sustainable waste management in the Maldives, including:

- **Zero Waste:** Zero waste refers to waste management and planning approaches, which emphasise waste prevention as opposed to end-of-pipe waste management. It is a whole systems approach that aims for a massive change in the way materials flow through society, resulting in no waste. Zero waste encompasses more than eliminating waste through recycling and reuse: it focuses on restructuring production and distribution systems to reduce waste generation. Zero waste is therefore more of a goal or ideal rather than a hard target. Zero waste provides guiding principles for continually working towards eliminating waste.
- **Integrated Waste Management:** No single approach is capable of solving the mounting waste crisis due to the diversity of waste stream components, disparities in available capital and infrastructure,

and the wide variety of geographical and demographic conditions in the Maldives. Integrated solid waste management requires consideration be given to a number of alternative waste disposal methods and governance structures that, if combined and operated in a complementary manner, can work in a way that best meets local needs.

- **Waste Hierarchy:** Waste hierarchy is a strategic tool, which prioritises actions for waste management. This consists of the 3Rs: Reduce – reducing waste that is generated and which is directed to the landfill (including composting); Reuse – repairing products that can be repaired, or finding alternative uses for waste; and Recycle – returning waste with recoverable value for re-processing (See Figure 13).
- **Environmental Stewardship –** This is the obligation of current generations to maintain environmental quality for present and future generations. Further, it acknowledges the individual responsibility to manage waste to lessen its environmental impact.

Figure 13: Waste Management Hierarchy



- **Consultation Principle:** A principle that conveys the importance of all levels of government consulting and working with people and organisations throughout the development and implementation of waste management strategy and master plan.
- **Shared responsibility:** In this context, zero waste is a shared responsibility and requires partnerships and collaborations between all sectors of government, industry, research institutions, NGO's, and the general community
- **Polluter-pays Principle:** A principle asserting that those responsible for causing pollution or generating solid waste should pay the cost for dealing with the pollution, or managing the solid waste (collection and disposal) in order to maintain ecological health and diversity.
- **Full Cost Pricing:** The environmental effects of production, distribution, consumption and disposal of goods and services should be consistently costed, and charged as closely as possible to the point at which they occur.
- **Proximity Principle:** A principle maintaining that waste should be dealt with as close to the source of generation as possible. This reduces transportation costs, as well as risks of contamination of the environment during transport.

5.1. Strategy 1: Development and implementation of an island level integrated solid waste management systems

Background

The National Solid Waste Management Policy of Maldives identifies the importance of developing island waste management plans, which will include information on how respective islands propose to manage the island waste in a more sustainable manner. It also recommends establishing island waste management centres with adequate equipment to process the collected waste materials within the island. However, a quick review of the progress in zone 6 has identified that most islands are still not fully mandating these targets. Two islands have prepared and received approval from the EPA for their waste management plans and nine islands have already completed the construction of island waste management centres with financial and technical support from ME, out of total 18 islands in the area (Table 6).

Table 6: A summary of the progress in developing island waste management plans and the construction of island waste management centres in zone 6 . (As of December 2018)

Island Council	Island Waste Management Plan	Island Waste Management Centre	Current waste collection system
GA Kodey	Drafting	Not yet	Not available
GD Nadella	Drafting	Construction is complete	Planning stage
GA Nilandhoo	Drafting	Construction is on-going	Planning stage
GD Thinadhoo	Waiting for approval	Construction is on-going	Operational
GA Viligilli	Drafting	Construction is on-going	Operational
GD Vaadhoo	Waiting for approval	Construction is complete	Planning stage
GA Dhevvadhoo	Drafting	Construction is complete	Not available
GD Faresmaathodaa	Plan is being amended	Construction is complete	Operational
GA Dhaandhoo	Drafting	Construction is on-going	Planning stage
GD Hoadedhoo	Approved	Not yet	Planning stage
GA Gemanafushi	Waiting for approval	Construction is complete	Planning stage
GD Fiyori	Drafting	Construction is complete	Planning stage
GA Kolamaafushi	Approved	Construction is on-going	Operational
GD Rathafandhoo	Not yet	Construction is on-going	Not available
GA Kanduhulhudhoo	Approved	Construction is on-going	Not available
GD Gadhdhoo	Drafting	Construction is complete	Planning stage
GA Maamendhoo	Drafting	Construction is complete	Not available
GD Madaveli	Drafting	Construction is complete	Planning stage

The island waste management centres are designed to segregate and store recyclable materials, especially plastic, metal and aluminium/cans, with a specific area for organic waste composting, and an area for storage of hazardous waste and residuals. Discussions between staffs of island councils and community members identified the importance of island waste management centres. However, due to lack of waste separation and efficient waste collection systems, low level of awareness, no established system for transferring waste from island waste management centres to regional waste management facility and lack of resources (finance and equipment) for the sustainable operation of the island waste management centres, most of the island waste management centres are not operational and waste disposal onto the

beach, or waste being discarded in low-lying areas in woody sites or burning are common practices. Thus, this strategy identifies the importance of building the institutional capacity of both island councils and residents to plan and implement an island-level integrated solid waste management system based on the waste hierarchy in order to minimise environmental risks and maximise resource efficiency and co-benefits, including the reduction of GHG emissions and Short Lived Climate Pollutants (SLCPs) from stopping the open disposal and burning of waste.

Key Targets

The following key targets are identified to motivate the participants to work together in improving the situation and monitoring the progress between 2019 and 2023

- All islands will have approved island waste management plans promoting 3Rs by 2020
- All islands will have established effective cost recovery mechanisms by 2020
- All islands will have effectively functioning island waste management centres by 2021
- All islands will have designed waste collection system in operation and stop all open disposal and open burning of waste 2021
- All islands will achieve 25% waste reduction targets by 2023 (based on the volume of 2018 waste generation) in line with waste reduction target of the National Waste Management Policy

Key activities

Based on consultations with island councils, residents and other local stakeholders, including women's groups and NGOs, this strategy identified the following key action areas necessary to achieve the above targets: (i) increase in community participation in source segregation and 3R activities; (ii) implementation of recycling and composting/ biogas programmes at the island waste management centres to reduce the volume of waste to be transferred; and (iii) institutional and financial capacity building of the island councils for planning and effective implementation of island waste management plans based on the 3Rs.

Activity 1.1: Community participation- Increase in community participation in source segregation and 3R activities

Island councils and local groups that participated in the consultation workshops identified the importance of community participation for the success of island waste management systems, and called for strong community participation in the source separation of household solid waste prior to collection and transport to the island waste management centres. Although island councils, women's groups, NGOs and in some cases the national government have taken different initiatives for basic community awareness, virtually no

successful source separation of household waste is taking place on the islands. Usually, waste segregation is limited to combustible and non-combustible waste on the island where waste separation is practiced, and the volume of waste is reduced by open burning due to lack of other disposal options. There is little understanding of what could be done about non-combustible waste. This shows that two factors contributed to waste separation: (i) inadequate community awareness and commitment to participate in island level solid waste management (SWM) and (ii) lack of a waste transfer and disposal system for residual waste from the inhabited islands for ultimate disposal.

In this regard, this activity is designed to address the lack of community commitment to participation in island level SWM. It will also create community awareness on the environment and public health implications of poor SWM on the respective islands and solicit community participation for source segregation of household level solid waste. This will be achieved through:

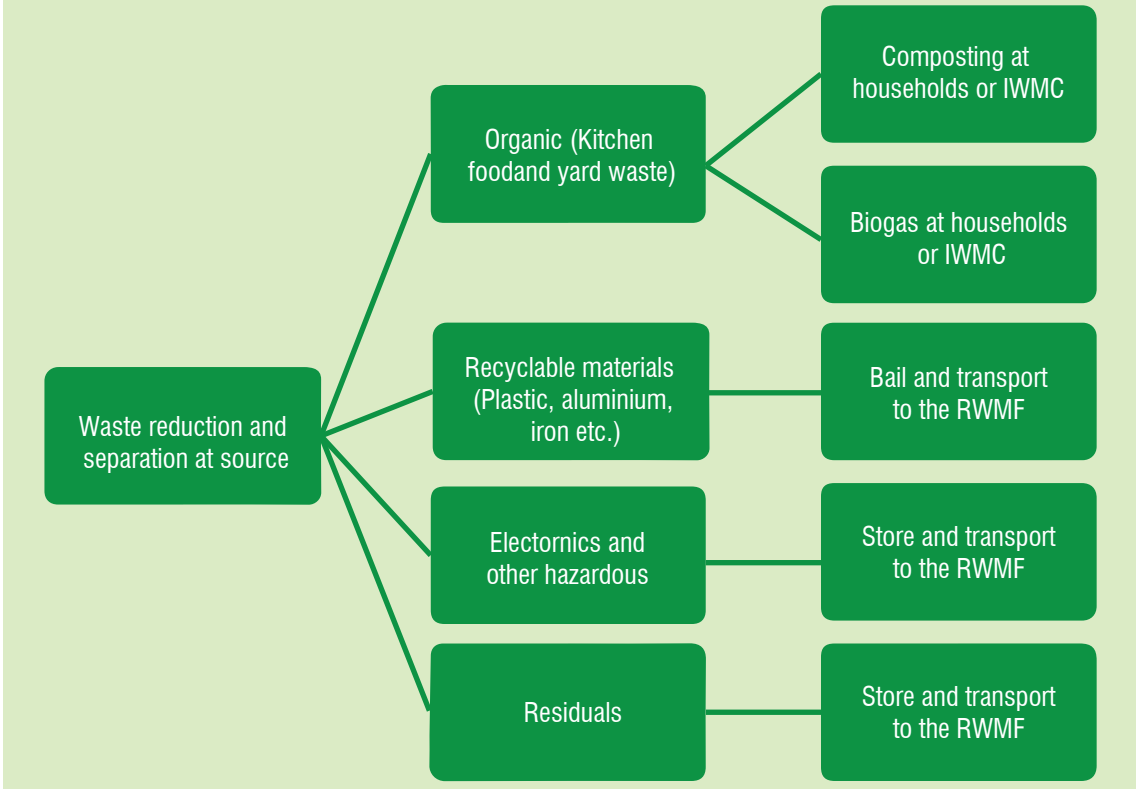
- Developing a suitable waste separation system together with island councils and residents that meets the needs, geographical conditions and capacity of the respective islands.
- Implementing a capacity building programme that involves strengthening community awareness and initiating active community participation in source separation of waste at the household level; conducting a door-to-door awareness programme with the help of NGOs and women leaders; creating awareness through social media; and delivering messages regarding proper waste management via information-sharing and stakeholder meetings.
- Establishing an effective waste collection system based on the geography and capacity of the community. During the discussions, some of the island councils and community members proposed that a door-to-door waste collection service is unnecessary for their small islands where the population is small and houses are concentrated in a small area. In this type of community, the most appropriate way of collecting waste is to educate residents to bring their separated waste to the island waste management centre by themselves rather than having a collection by the island council or contracting a private collector to do this job. However, in the medium-sized and larger islands where island waste management centre are located far from housing, and where residents would find difficulties in walking with their separated waste, the island council or a private contractor should provide a collection service of waste from each household and transport the waste to the island waste management centre. In this situation too, the size and type of collection vehicles can be decided based on the volume of total waste and the distance. It is recommended to use a handcart, tricycle or small tractor for medium-sized islands and collection trucks for larger islands. Huge cost savings and environmental benefits can be gained by using diesel vehicles for waste collection on the islands.

- In addition to introducing proper waste separation and collection systems, new programmes should be introduced in cooperation with local NGOs and women's groups on the islands to promote waste reduction and reuse, such as the use of reusable bags instead of plastic bags, or reduction of single use plastic bottles. It should be remembered that sustainable waste management is not merely waste collection, recycling and proper disposal. The first priority of the 3Rs is waste reduction through sustainable lifestyles.

Activity 1.2: Island Waste Management Centres- Implementation of island-level recycling and composting/ biogas programmes at the IWMCs

Considering the limited land availability within the islands, their economic scale, technical and financial capacity to handle the recycling, intermediate treatment, and final disposal by the island itself, regional waste management facilities are introduced by ME as an alternative. As islands are located far away from each other, ocean transport is the only mode of transport for the transfer of waste from the islands to proposed regional waste management facilities. Since transport costs are prohibitively expensive, it is in the interest of any inhabited island to minimise the waste that would require off-island disposal and this can be achieved by introducing the following actions (see Figure 14):

Figure 14: Waste processing options at island level



- The island waste management centre would receive sorted waste from households and process it accordingly to the waste types.
- Approximately 70% of the solid waste stream is characterised as biodegradable organic matter and could be managed at the island level by introducing composting or biogas methods, thereby minimising the amount of waste that would have to be transported to an off-island waste disposal facility. However, selection of appropriate methods should consider the factors including simple, low-cost and easy-to-handle at the island level.
- Families can undertake composting of kitchen waste at the household level. However, the success of household composting programmes is widely depend on awareness and interest of each family to carry out composting at households. Compost produced from household composting can be used for home gardening if households have sufficient space.
- In addition, island council staff and women's groups can be trained to manage simple windrow or vermi type composting at the island waste management centre. The success of this type of decentralised system mostly depends on knowledge of staff about the technical operations of the composting methods and availability of a means to use the compost products. The product compost from island waste management centres can be sold to farmers on the island or to nearby resorts for a reasonable price.
- Biogas is anaerobic method, which can also be used for treating organic waste at the island level. When compared to the simple windrow compost method, biogas may be slightly more expensive and technically advanced. However, it can generate gas that can be used as an alternative to LP gas for cooking by households. Experience from nearby countries such as Sri Lanka and India has shown that small biogas plants are applicable at the household level connecting both organic waste and drainage.
- The recyclables, hazardous and residual waste would be stored in a protective manner at the island waste management centre until a manageable amount of waste could be gathered and then transferred to the regional waste management facility (RWMF)
- Training and capacity building programmes will be conducted for island council staff, women's groups and residents on the above subjects, including waste separation, composting, biogas and hazardous waste using lectures, practical training and peer-learning. Training manuals and guidelines can also be prepared in a simple and easy manner to understand.

Activity 1.3: Island Councils- Institutional and financial capacity building of the Island Councils for planning and implementing island waste management plans based on 3Rs

The Act on Decentralization of the Administrative Divisions of the Maldives (2010) provides more responsibilities to the island councils to manage waste in their local areas while national/regional waste management is the responsibility of inter-island waste management through regional waste management facilities. However, it was reportedly discussed during the consultations with key stakeholders that lack of institutional capacity, coupled with lack of clear vision, roles and responsibilities, is one of the key barriers preventing sustainable waste management practices at island levels. This activity therefore identified the importance of building institutional and financial capacity of the island councils and their staff to effectively plan and implement island waste management plans based on the 3Rs. It also recommended developing a viable institutional mechanism for cost recovery through the introduction of user fees.

- Develop a waste management committee within the island councils including all key stakeholders such as community representatives/leaders, women's groups, local NGOs, island council staff, council members, representatives from religious, police, educational, and other government institutions, and businesses. This committee would be the leading body to facilitate the development of island waste management strategy, its implementation and review of the progress (at least once every three months)
- The island waste management plan should be developed in consultation with all the key stakeholders and should address all relevant issues. Consultations could be facilitated through pocket meetings, focused group discussions, and larger community meetings. In addition, a baseline study or sample survey could be conducted to understand the amount of waste produced per household per day, composition of waste produced in weight or as a percentage of total waste, and the perceptions of households on waste separation, collection, as well as the willingness and affordability of families to conduct waste collection and disposal. These data should be summarised and utilised during the discussion as practical evidence.
- The island waste management plan is a visionary document of the island council showing its direction in improving the waste management on each respective island over the next three to five years. It should be based on the 3R principles and should cover the key subjects of waste reduction, separation at source, collection, intermediate treatment (composting, biogas), preparation for transport, awareness programme, financing and monitoring. It should also identify the roles of key stakeholders and guide them to undertake their own responsibilities/ tasks to achieve the common goals within the plan.
- The plan should later gain approval from the EPA and be widely disseminated among the residents using island newspapers, community boards and other dissemination campaigns.

- Waste management fees should be set for households and business considering the level of willingness and affordability. In addition, island councils need to set fees for fishing boats and passenger boats for handling their waste.
- It is also important to set both incentives and enforcement methods to motivate all key stakeholders including households to take actions to improve the waste management on the island.

5.2. Strategy 2: Development of Institutional Arrangements and Implementation of a Regional Waste Management Facility

Background

The development of regional waste management facilities as well as island waste management centres is one of key factors for the successful implementation of a waste management system in the region. The National Waste Management Policy also includes the development of regional waste management plans and aim to facilitate the establishment of regional waste management facilities in all seven regions for environmentally-friendly waste treatment and disposal as well as for enabling waste to be managed as close as possible to where it is generated. Currently, there are no regional facilities in zone 6, despite all stakeholders including ME, regional councils, island councils and communities identifying the importance of regional waste management facilities for the successful implementation of island waste management plans and island waste management centres in the region. According to ME, the plan has already approved establishing a regional waste management facility but very few of the island councils and residents in the region are aware of this plan or the concept of a regional waste management facility.

Key Targets

The following key targets are identified as necessary to ensure the progress of this strategic action during the period of 2019-2023

- All islands will have established institutional, technical, and sustainable financing mechanisms for the operation of a regional waste management centre by 2021
- A regional waste management facility is fully operational covering all the islands in zones 6 under public and private partnership by 2022.

Key Activities

This strategy therefore identified the importance establishing a regional waste management facility and its operation through the following activities: (i) development of a viable institutional mechanism which could

include public-private partnership (PPP) for the operation of the regional facility; (ii) development of a cost recovery mechanism for the residual waste transport and treatment system; and (iii) identify appropriate technology and associated equipment for the operation of the regional waste management facility.

Activity 2.1: Institutional mechanism- Development of a viable institutional mechanism which could include public-private partnership (PPP) for the operation of the regional facility

The National Waste Management Policy identified that greater involvement of the private sector in waste management will generate business and employment opportunities. The private sector has the capacity to bring additional and much needed finance to the waste management sector. However, in reality, it can be witnessed very limited involvement of the private sector in waste management sector and this has resulted in not fully realising the opportunities to improve efficiency and achieve cost reduction in waste management. While the island waste management system is the responsibility of island councils in partnership with local stakeholders, the establishment and operation of the regional waste management facility should be introduced through public and private partnership. The following activities need to be considered for well-planned and effective private sector participation:

- The opportunity for the private sector to participate in the provision of waste management services through the establishment of open, transparent and accountable tender processes. Contract monitoring and enforcement mechanisms will be in place to ensure that the private sector delivers services in complete compliance with contract specifications.
- The institutional framework should include a strong legal basis, stating that waste must be disposed of and who is responsible. The general principle is that the polluter pays and respective island councils should be able to engage with NGOs and civil society groups in the development initiatives.
- It may be required to assist with the production and implementation of appropriate tools and documents to facilitate the participation of the private sector. At the same time, it is imperative that regular contract monitoring and enforcement mechanisms are available to ensure that the private sector delivers services in complete compliance with contract specifications. At the initial stage, it can be focused on the following tools: pre-qualification documents; tender documents; tender evaluation matrix; contract documents; and contract monitoring tools and preforms.
- There needs to be communication on the numerous potential advantages of increased participation by the private sector within the provision of waste management services as well as determining the political acceptability of increasing the role and participation of the private sector. On the basis that such initiatives are politically acceptable, representatives of existing and potential private waste management contractors should engage to achieve the following areas: waste collection; waste processing; waste disposal; transporting waste recyclables to national recycling centres; and purchasing of waste recyclables.

- However, to be a successful application of PPP in the waste management sector, the private sector: must show willingness to participate in future waste management initiatives, as well as willingness to pay and carry out affordability surveys within target communities.

Activity 2.2: Sustainable financing- Development of a cost recovery mechanism for the residual waste transport and treatment system;

The lack of investment for waste management is a key issue and this is largely due to lack of appropriate cost recovery mechanisms in the Maldives. Although some island councils have already introduced waste collection fees, the success of these programmes is limited. The findings from group discussions with some island councils and residents identified that willingness to pay and the affordability of households are major factors in designing the user fee system. The community also failed to appreciate that the cost of waste management includes its transport and final disposal, but this could be addressed with strong community awareness. Certainly, the project identifies the polluter-pays-principle that will bear the full cost of collection, transport, intermediate treatment and final disposal. The application of the principle involves establishing a fee collection system that represents the true costs of waste management. With respect to possible funding mechanisms, the following actions are identified:

- Through a series of meetings and consultations with representatives of relevant government departments, agencies and island councils, a firm understanding needs to be developed of the present mechanisms for funding existing waste management infrastructure and operations.
- Building upon the information gained through the completion of the above exercise, a training course should be designed and conducted to raise awareness amongst senior decisionmakers, such as within the Ministry of Finance and Treasury, regarding the pressing need to allocate greater financial resources for the provision of waste management infrastructure, particularly within the atolls and islands. Attention should also be given to the potential consequences of failing to take corrective measures in a timely fashion, such as serious impediments to the continued development of both the tourism and fishing industries, upon which the economy of the Maldives is dependent.
- Detailed cost recovery models must be developed to fund improvements in waste management infrastructure and services. These should include, but not be limited to the following, which have been successfully implemented to meet waste management costs in other developing countries:
    - Increased government funding in conjunction with counterpart community contributions. Due to severe constraints at the local level, community contributions need not be financial in nature, rather the provision of labour and materials is often considered to be appropriate and sufficient;
    - Implementation of a fair and equitable household waste management fee to cover waste collection, treatment and disposal costs having first completed willingness to pay and affordability surveys within selected communities;

- Introducing a disposal fee for all commercial/industrial waste which, with the exception of hotel waste, is presently disposed of free of charge;
- Importation duties and levies on materials which are difficult to dispose of, including plastic packaging and bottles; white goods (cookers, fridges etc.); motor vehicles; vehicle batteries; tyres; oils and lubricants.
- Introducing a deposit/refund system for plastic drink bottles, such as those that soft drinks are sold in.
- Increase income from recyclable materials.

- Mechanisms should be developed, with appropriate approval, to ring-fence funds raised through the implementation of any cost recovery initiatives to ensure they are allocated to waste management activities rather than simply allocated to the Government's Consolidated Fund where it may be allocated to other competing political priorities. One potential approach may be for the establishment of a Waste Management Account within ES, which would be subject to all of the usual government auditing procedures.

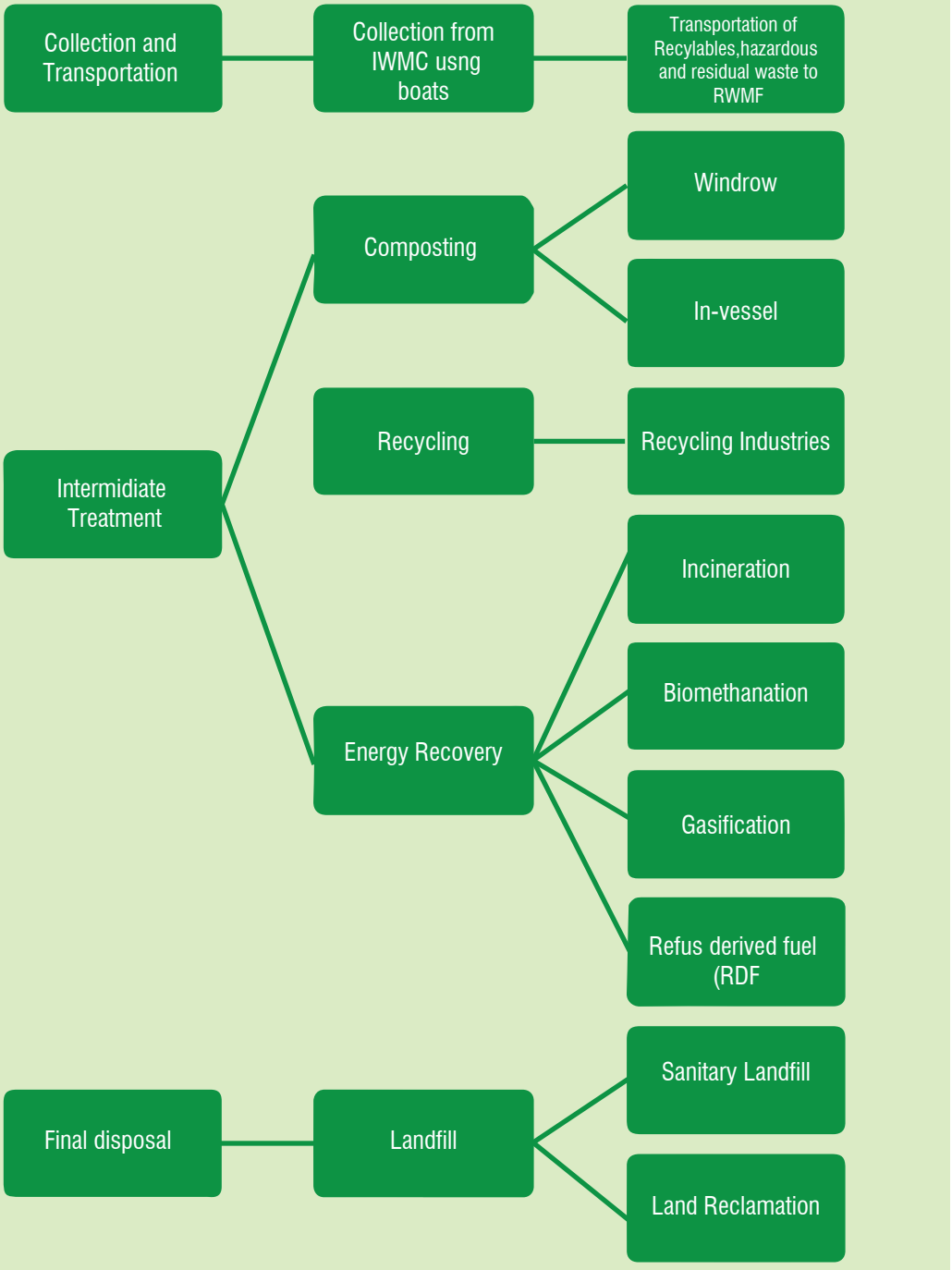
Activity 2.3: Technology- Identify appropriate technology and associated equipment for the transfer of residual waste and treatment

The regional waste management facility should apply the waste management hierarchy by making it possible to segregate waste and minimise the quantities that leave the island for final disposal. The polluter-pays-principle will ensure that this will be financially viable. In the present context, it is recommended that the 3R concept is applied to island waste management centre since reduction, reuse and recycling are most suitable and beneficial for all stakeholders, and this principle could be practiced in the islands. Preference should be made to minimise waste transported to the regional waste management facility because transporting waste by boat is expensive and distances are often substantial. Effective waste segregation and disposal of organic waste on the islands and the planned construction of a regional waste management facility will reduce the waste transport distance and costs. Thus, it is suggested to segregate the waste materials at source, and organic waste to be recycled by composting or use as animal feed, while recyclables, hazardous and residuals would be transferred to the regional waste management facility.

Figure 15 gives a list of potential technology options that can be considered for the regional waste management facility. However, the regional waste management facility would be developed by selecting most appropriate and affordable waste collection and safe disposal technologies. The technology options mapping can be used to facilitate the selection of waste management methods and technologies considering technical, environmental, financial, institutional, policy and social concerns based on the integrated waste management system . According to the ME, incineration technology has a potential as there is a range of controlled incineration types that could be considered depending on what components

of the waste streams are targeted. Incineration also can reduce the volume of waste by approximately 90% and residuals can be either used for landfill or land reclamation as practiced by some cities in Japan and Singapore. However, proper consideration must be given to the cost for initial construction, proper operation and maintenance in long run, as well as to some of its negative environmental impacts due to concentration of toxic components, and ash being considered as a hazardous material. Moreover, selection of technologies should be considered with application of the 3R concept to reduce waste materials at the site of their generation.

Figure 15: A list of potential technology options for regional waste management facility



5.3. Strategy 3: Institutional Strengthening and monitoring

Background

The primary barriers preventing sustainable improvements in the delivery of waste management, not only due to the lack of technology and financial constraints, but also due to the inadequate policy, institutional capacity and monitoring mechanism, lack of clear roles and responsibilities has resulted in an absence of clear leadership and coordination. The National Waste Management Policy of Maldives identified that legislation is necessary to give legal effect to the policy and to provide clarity, consistency and transparency. Participants who joined the consultative workshops consistently requested the need for good legislation and the appropriate institutions to implement it.

In addition, a supportive mechanism is essential at regional and island levels to guide people to achieve the waste management objectives. The task will be to facilitate, mobilise people to discuss, make decisions and take actions on them to achieve the goals. The island council staff have to combine their skills and resources assisting people to bring about improvements in their behaviour. However, it is imperative to enhance the capacity of the council staff to prioritise, plan, implement, and monitor waste management programmes that impact on the lives and environment of the island populations. The capacity of the present island level institutions needs to be strengthened to function as a sustainable organisation. This includes training them in project planning, management, participatory monitoring, as well as evaluation and financial management.

Key Targets

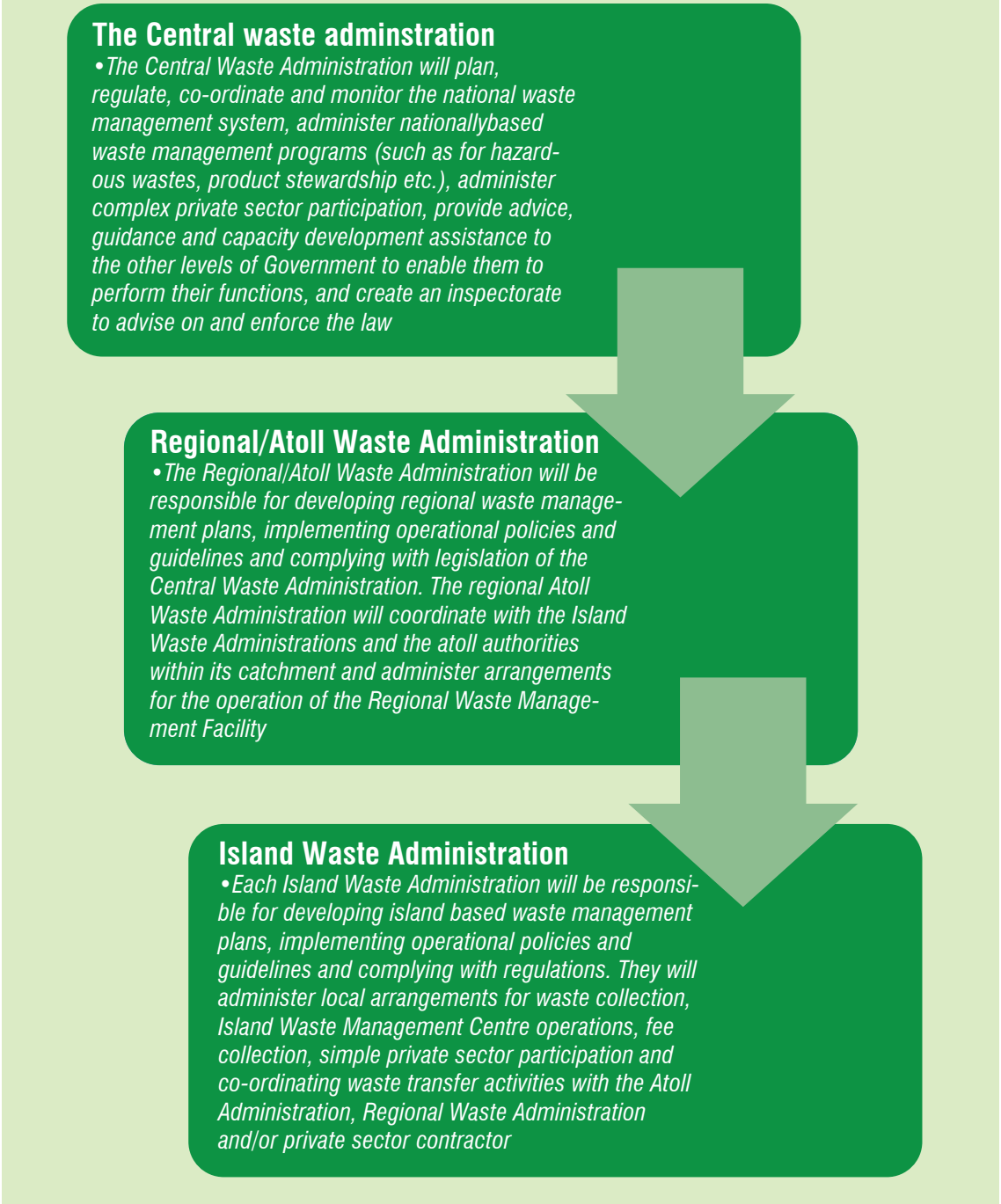
This component aims to achieve the following targets during the period of 2019-2023:

- Establish well-functioning regional waste management coordinating team for zone 6 by 2020
- Establish well-functioning island waste management committees in all the island councils by 2020
- Monitor implementation of this strategy and action plan and update it on an annual basis

Key Activities

This component identified the following activities during the consultation workshops to achieve the above targets:

Figure 16: Establishing and activating waste management governance



- The government of Maldives has taken the initiative through decentralisation of power, roles and responsibilities for waste management, from the national level to closer to the community (island and atoll councils) aiming to maximise opportunities to engage communities in proper management of the waste that they generate. However, island councils identified the importance of establishing a governance structure for waste management which will clearly distribute the responsibilities between national, regional and island levels as shown in Figure 16.
- Identify the importance of establishing an effective coordination mechanism for project implementation and management, including monitoring and reporting of the progress within zone 6 including national, regional and island councils as well as other key stakeholders. ME provides necessary technical, institutional and financial assistance to the island councils and regional facilities through this coordination body and coordination among the participating island councils that will have the primary responsibility for island-level implementation.
- Continuously review legal and policy mandates for waste management at island and regional level and develop consolidated mechanisms that will support the implementation of the National Solid Waste Management Policy, including collaborative planning, transparent decision-making and public, private and community participation.
- Continuously review present practices throughout the national waste management sector, drawing upon information already contained within earlier studies, and clearly define separated institutional roles and responsibilities. One area for particular attention is that of the resort islands to determine whether the existing arrangement, whereby the MOT is solely responsible for policy and regulation is sufficient, particularly in view of the proposed expansion of the sector. Through a series of workshops and consultations, obtain approval of all key stakeholders for the revised national structure.
- Undertake a comprehensive training needs assessment for relevant staff within island councils and other key stakeholder agencies. Based upon the findings of this assessment, design and implement a detailed training programme to satisfy the various stakeholders' roles and responsibilities. Some potential topics can be included are: developing and managing waste management data information systems; undertaking waste characterisation exercises in compliance with international practices and guidelines; undertaking waste audits and inspections (particularly relevant to MOT); engaging in hazardous waste management; ensuring health and safety and carrying out planning and procurement procedures.

Annex

Annex 1: Baseline and Preliminary Actions presented by Island Representatives covering all 18 islands in zone 6 during site visits and consultations workshops (As of December 2018)

1. Ga. Kondey

Main stakeholders: council, women's committee, health, businesses, utility companies,

- Waste collection service is provided: waste is collected on daily basis (organic waste - once a week; bulky waste and garden waste)

The island council plans/wishes to:

- supervise the waste management plan
- raise awareness for 3Rs
- aim for eventual plastic-free policy
- reduce waste generation through promotion of composting and reuse of items
- rent 1 or 2 pick-up trucks for waste collection (1.5 tons pick-up is in use)
- propose waste service fee of 200 Rfs for household; 350-500 Rfs for commercial entities
- conduct awareness raising activities and training programme targeting community leaders
- modify current waste management plan to make it more realistic
- privatise the collection for proper management of vehicles

2. Gdh. Nadallaa

- 3 dustbins have already been distributed to households for source segregation (organic, plastic and others)

The island council plans/wishes to:

- conduct consultation with council, school, business, NGOs, local group (provide clean-up service for public areas)
- promote composting, burn and bury, and source segregation
- introduce waste management fees targeting households. Price setting to be determined.
- promote awareness (leaflet, posters, education materials, monthly events for environmental clubs in local schools and NGOs)
- install dustbins in public areas and shops to prevent littering

3. Ga. Nilandhoo

The island council is currently planning to:

- engage stakeholders (NGOs, council, schools) to waste management planning
- promote 3R activities, composting, sales of recyclable materials, while sending residual waste to regional centres
- initiate waste service fee of 150 Rfs with the eventual increase up to 200Rfs
- maintain waste management equipment under the responsibility of island council
- promote awareness through organizing sessions and posting posters in public areas (in collaboration with environmental clubs for activities on environmental day, 3R day… among others) while enforcing rules via introduction of fines
- promote dissemination of the developed waste management plan to public.
- introduce measures against littering in public areas
- seek cooperation from business

4. Gdh. Thinadhoo

Main Stakeholders: women's committee is the most important stakeholder, clubs, businesses, industrial workers, schools, colleges and universities

Current status:

The island council is responsible for waste collection, and has already developed a waste management plan.

The island council is currently planning to:

- reduce waste generation, promote 3Rs, stop plastic bags in the groceries, promote use of rechargeable batteries, donate plastic bottles to recyclers, reduce informal waste burning
- provide dustbins to all households (closed dustbins) and public areas.
- collect different types of waste on different days (currently all waste types are collected on the same days).
- transport plastic will to Malé for treatment/recycling
- introduce waste service fee at the Island Waste Management Centre: household - 150Rfs, business – 200Rfs, restaurants/cafés - 800 Rfs, industrial sector – to be decided.
- utilise social media for awareness raising, while initiating such activities from schools and grassroots (communities)
- clean public areas twice a day

5. Ga. Villingili

Main stakeholders: Fishermen, government officers, NGOs, women's association

Current status

- The island has a Waste Management Resource Centre and a Waste Management Plan
- Two pick-up trucks operational for household waste collection
- Catch phrase: "My island, clean Villingilli

The island council is currently planning to:

- involve communities in the planning and implementation of future plans
- conduct survey to serve waste management planning
- seek to privatise waste collection service
- find suitable candidates for officers in charge of waste management operation
- seek support from international donors
- invite private sector contribution as a means of CSR

6. Gdh. Vaadhoo

Current status

- The island has a Waste Management Plan, but this requires some revision
- The responsibility over waste management operation is shared with different community clubs and councils
- There is a strong demand for composting
- Construction of a waste management centre is completed and awaiting start of operations

The island council is currently planning to:

- install dustbins to public areas
- promote reuse and repair
- find staffs for waste management centre
- outsource collection of waste collection service fee
- expect support from development partners to construct additional waste management facilities
- consider different financing options (international development institutions, NGOs, etc.)

7. Ga. Dhevvadhoo

Main stakeholders: Island Council, women's association, clubs, construction workers, fishermen

Current status

- Currently the waste collection services are operated using two pick-up vehicles. The full round of all the pick-up points takes a whole day, which makes complete collection of generated waste a challenge.
- Baseline survey was conducted
- 7-8 staffs are currently hired and operational for waste collection service (carts) and the management of the waste management centre

The island council is currently planning to:

- hire around 7-10 staffs to work in WM operation
- place dustbins in common areas and employ waste carts
- promote 3Rs through awareness raising activities (stakeholder meetings to be organised)
- introduce waste management service fee for household (currently under development)
- hire more technical staff

8. Gdh. Faresmaathodaa (Model Island)

Current status

- The island has been successful in introducing composting, and is expected to play a role to disseminate the model to other islands.
- A waste management plan was developed in consultation with island council, businesses, clubs, fishermen and other organisations.
- The island is currently promoting 3Rs, but feels the necessity to create more awareness
- Two (2) pick-up vehicles are in operation to collect kitchen waste every day.
- Gate fee is charged for external groups at the entrance of the waste management centre.

The island council is currently planning to:

- hire more technical staff, and implement educational programmes on waste management
- consider setting tariffs for different waste types and for selling valuable waste
- conclude contracts with all the agencies on the island
- organise awareness raising events to different stakeholders to educate them
- provide dustbins for public areas as well as staff for cleaning operations in the area

9. Ga. Dhaandhoo

Current status

- The island is one of the most populated area in the region
- A consultation session is currently planned inviting, local schools, womens' association, youth clubs, administrative staffs, political personnel

The island council is currently planning to:

- set up a Waste Management Committee within the council – waste audit will be conducted
- conduct a baseline survey
- introduce measures for reduction of plastic bags
- conduct awareness raising activities (every 3 months), using various media such as posters and IT. Measures for communicating waste regulations will also be introduced. Different approaches can be considered for different stakeholders / waste types
- encourage residents to re-use materials. Residuals can be sent to the regional centre

10. Gdh.Hoadehdhoo

- Main stakeholders: Island Council, educational institutions, business sector, farmers, fishermen
- Main agricultural products: mango, papaya, chili, cabbage, cucumbers, water melons, etc
- The island owns a 1-ton pick-up truck.
- Awareness sessions conducted every 3 months

The island council is currently planning to:

- employ composting once the IWMC is completed
- encourage bulk-buy, use of rechargeable batteries and waste reduction at source
- set up billboards to prevent littering

11. Ga. Gemanafushi

Main stakeholders: Island Council, cooperative society, Red Crescent, NGOs (youth groups and women's committee)

- island with one of largest economies

The island council is currently planning to:

- conduct an outreach session on wastes management
- focus on education for effective implementation
- develop and disseminate posters and educational materials for awareness raising
- encourage bulk-buy
- start waste segregation practice from local schools
- conduct a competition for promoting 3Rs targeting households
- give away any recyclable materials
- promote composting and reuse of plastic & glass
- terminate the use of plastic bags by 2018
- outsource waste collection services (fees to be collected from households and businesses)

12. Gdh.Fiyoari

The island council is currently planning to:

- promote composting and recycling of glass and plastic
- reduce plastic bottles and glass
- promote reusable batteries
- outsource waste collection service with fees collection
- work with NGOs for awareness raising (targeting women's committee and youth groups)
- develop and utilise posters and educational materials for awareness raising
- collaborate with NGOs to organise clean-up campaigns

13. Ga. Kolamaafushi

Current Status

- Island Waste Management Plan is developed but will be revised/improved via consultation with other stakeholders. Ga. Kolamaafushi is considered a model island
- Owns one pick-up vehicle and waste collection service is made available every day. Island owns a glass crusher
- WM Committee is established and is operational – decision on service charge was passed with the rate of 400 Rfs

The island council l is currently planning to:

- organise a stakeholders meeting with the communities for improving IWMP
- promote 3Rs and source segregation at household level
- sell recyclable waste such as plastic, metal, aluminium
- increase the number of dustbins and safety equipment for WM workers
- generate financial resources for waste management service: 1) from external funding agencies, 2) service fee from household, and 3) sales of recyclables
- Council will be managing fees
- Organise awareness raising session and disseminate waste management plan

Other remarks

- Pointed out that NGO and communities also have the responsibilities in financing the service
- Council has the responsibilities for cleaning operation after major events

14. Gdh. Rathafandhoo

The island council is currently planning to:

- conduct consultation with all stakeholders
- promote 3Rs, awareness raising activities, source segregation, and composting
- consider development of mechanism for selling compost to farmers
- evaluate two options for waste collection: dustbins (possible direct operation by public sector) or service provision by third party, towards eventual outsourcing of the service
- attract financial aid from donors and NGOs as well as community works
- conduct awareness raising workshops for promoting waste management plan
- develop plan for clean-up campaign for public events such as sports day: teams will be formulated to be in charge of different events
- utilize government buildings as a venue for communicating ISMP
- consider incentive mechanism for promoting waste management

15. Ga. Kanduhulhudhoo

The island council is currently planning to:

- involve stakeholders
- segregate recyclables and promote reuse
- use wheelbarrows and pickup trucks to transport waste
- introduce waste service fees targeting households
- consider approaching funding agencies for financing waste management service
- promote awareness on waste issues
- raise awareness during public events
- enforce existing regulations
- outsource waste collection services

16. Ga. Gaddhoo

Current Status

- IWMC is under development
- equipment is being secured
- waste management plan was developed but plans to improve based on the guideline

The island council is currently planning to:

- conduct consultation with stakeholders (electricity and water companies on site in addition to conventional stakeholders)
- promote composting, source segregation, use resource
- buy a pickup truck
- introduce waste management fee from households
- create awareness amongst island population about the plan
- provide clean environment to visitors to the island
- clean the lawns surrounding houses
- produce posters for education on waste issues
- create a WM committee to oversee the management service

17. Ga. Maamendhoo

- **Main stakeholders:** Administrative staff, council members, women's associatione

The island council is currently planning to:

- organise stakeholder meetings
- establish a waste management committee to supervise the WM service, on behalf of island council and other stakeholders
- divert burnable waste to waste management centre
- conduct awareness raising events targeting different stakeholders: door-to-door awareness raising campaign, workshops, and seminars, targeting business owners and NGOs
- recruit public ambassador for communicating waste management plan ("waste management officers")
- involve women's committee as a major stakeholder

18. Gd. Madaveli

The island council is currently planning to:

- conduct stakeholder consultation (waste service fee can be discussed)
- promote 3R
- ensure that the IWMC is top quality (sustainable)
- utilise social media for information dissemination and outreach
- distribute three dustbins for each household
- sell recyclables once/month to generate income for waste management service
- develop awareness raising materials

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