REVIEW REPORT

On

Water and Waste Accounts

Zameela Ahmed – Local Consultant/2018

Table of Contents

List of acronyms

CBO – Community based Organization
EPA - Environmental Protection Agency
GEF – Global Environment Facility
HPA - Health Protection Agency
IWRM – Integrated Water Resource Management
LGA - Local Government Authority
MEA - Maldives Energy Authority
MEE – Ministry of Environment and Energy
MFDA – Maldives Food and Drug Authority
MHI - Ministry of Housing and Infrastructure
MMS - Maldives Meterological Services
MOE - Ministry of Education
MOFA - Ministry of Fisheries and Agriculture
MOH - Ministry of Health
MWSC – Male' Water and Sewerage Company
NBS - National Bureau of Statistics
NDMC - National Disaster Management Center
NGO – Non-Governmental Organization
NHL – National Health Laboratory
NWSP – National Water and Sewerage Policy
RO – Reverse Osmosis
RWH – Rainwater Harvesting
SIDS – Small Island Development States
STELCO – State Electric Company
UNDP – United Nations Development Program
UNEP – United Nations Environment Program
UNICEF – United Nations International Children's Emergency Fund
UNOPS – United Nations Office for Project Support
Watsan – Water and Sanitation
WDC – Women's Development Committee
WHO – World Health Organization
WSP – Water Safety Plan

1. Purpose

At the national level, environment statistics is comparatively a weak area with limited data available. Data are available for some of the environmental issues, but they are dispersed among many different sources and are not routinely compiled.

Given the environment statistics a priority on the implementation of Sustainable Development Goals at national level, a working group under the National Statistical Coordinating committee has been established to strengthen the environmental data at national and sub national level. In 2017, the working group with technical support from ESCAP conducted an initial assessment on key environmental issues/indicators for the compilation of environmental statistics in a standardized manner with regard to the concepts, methods and classifications in accordance with the System of Environmental-Economic Accounting (SEEA). The assessment identified that there is a strong interest among the experts from stakeholder agencies for the objective of creating a nationally coherent compilation mechanism to improve the use and quality of environmental data collections. Additionally, establishment of a dedicated environment statistics unit would help to establish
the commitment of resources that is needed to help build long-term capacity within the government for regular production of the core environment statistics via a coordinated and coherent approach and mechanism.

The key recommendation by the national stakeholders workshop was first to identify the data compilation priorities as a foundation towards developing a national mechanism for compilation of environment statistics. Accordingly, the areas identified by the MEE was waste and water as the initial priority areas for the Maldives and test accounts for waste, mapping of potential data holders for water accounts, and a short term workplan were also produced.

However, with the limited capacity at the MEE and the National Bureau of Statistics (NBS) and the level of understanding on environmental issues/indicators, specific guidance and commitment of a local expert is required to work with this group by building on the initial work in 2017 with an aim to compile and publish pilot SEEA waste and water accounts.

The key task of this consultancy is to support the compilation of environment indicators based on System of Economic and Environmental Accounting (SEEA) to strengthen the environment statistics. Further, conduct an assessment on the current data availability and guide the working group on environment statistics to implement the short term workplan on the development of waste and water accounts, which includes;

- Review the available data through all sources and obtain data available on waste and water
- Develop and implement a national detailed classification of waste, based on aggregates provided by SEEA
- Draft waste and water account for review by the working group and ESCAP

2. Background

2.1. Country Overview

The Republic of the Maldives is an island nation in the Indian Ocean, composed of 1,192 islands in 26 geographic atolls, spread over roughly 90,000 square km (35,000 square miles), making it one of the world's most dispersed countries. The population of 407,660 (2014, NBS) inhabits 188 administrative islands.

Tourism and fisheries represent key economic sectors and together constitutes up to 35 percent of GDP, more than two-thirds of export earnings, and employment for some 18 percent of the domestic labor force. Other sectors such as distribution and trade, construction and transportation are closely linked to the performance of the tourism sector (DNP, 2010).

2.2. Fresh Water Resources

In Maldives the availability of the fresh water stocks is governed by the seasonal rainfall. The annual average rainfall is 2,218 mm over the southern atolls, 1,966mm over the central atolls and 1,799mm over the northern atolls over the period 1978 to 2012 (MEE, 2016). The main natural fresh water resources available are in the form of rain-fed shallow groundwater lenses, small fresh water or brackish water ponds in few islands, and rainwater (MEE, 2017).

Majority of the island populations rely on intermittent collection of rainwater for drinking and cooking (MEE, 2016)[1]. Results from household surveys conducted in 12 islands in Laamu Atoll, show that the primary source of water for drinking and cooking at the household level is rainwater via individual household roof-water systems. This is believed to adequately reflect the situation in most islands of the country (UNDP, 2015)

Fresh groundwater occurs as a lens-shaped body surrounded by saltwater derived from the sea, forming the main freshwater source for the island communities. In all islands (except Male' City), groundwater is widely used for personal hygiene, bathing, washing and for all other general water needs. Groundwater is also the main source of water used in many of the economic activities including agriculture.

Fishing and agriculture are the most important economic activities in almost all the inhabited islands. Both sectors are dominant water users and the demands have continuously increased over the years. In some islands, economic development activities such as the local guest house business industry (privately run small guesthouses) are becoming more widespread. In such cases there is increasing competition and demand for water.

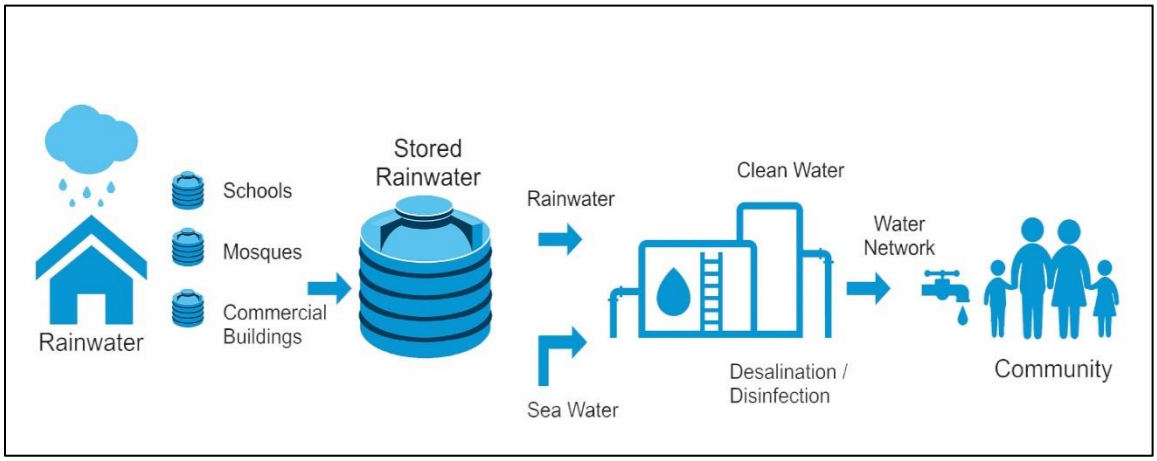
2.3. Centralized Water supply network systems

As reported in the NWSP (MEE, 2017) 23 islands in the Maldives, including Male' City had access to water supply network systems with metered house connections, increasing the access to piped-water supply to

[1] National Water and Sewerage Policy states that 23 islands (out of 188) has been provided with water supply network systems. The remaining 165 islands rely on rainwater for potable water needs.

41% of the population[2]. The water supply systems established in most of the islands are based on the "integrated water resources management model" (IWRM model) adopted by the Government.

Diagram 1: IWRM[3] model to provide water supply



A critical component of the water supply services development is to ensure financial and environmental sustainability. The Government has adopted the Integrated Water Resource Management model (IWRM-water supply) that integrates specific components into the design of the system to make it more environmentally and financially viable to ensure long-term sustainability. One of the components integrated into the IWRM-water supply model is to blend-in rainwater with desalinated water to reduce the cost. It also integrates renewable energy components to reduce the cost of energy production to operate the facility.

All the tourist resorts use desalinated water systems as the main water supply. The Ministry of Tourism administers the regulations specifically directed at service provisions in the resorts. According to the regulations, it is mandatory for the tourist resorts to establish desalination water supply systems and sewerage network systems to secure their hotel/ resort operating licenses.

2.4. Sewerage

Many of the island communities in Maldives do not have access to centralized or island-wide sewerage network systems. Communities without the services of a centralized sewerage system rely on individual septic systems. These systems have been proven to be unsuccessful due to contamination of groundwater and soil because of disposal of untreated wastewater into the ground.

Installation of centralized sewerage systems in the islands began in 1992, with simplified sewerage systems know as small-bore sewerage systems. These systems rely on collecting the effluent flowing from onsite household sewage collection tanks and piping this affluent to be disposed of untreated by near-shore marine outfalls (MEE, 2016).

[2] Figures reported for 2016.

[3] This concept refers to the approach adopted in the Maldives of integrating environment friendly and cost effective components/ and or technology to provide safe water via a water supply network system.

The Government has improved its efforts in providing improved sewerage facilities in the last few years that has resulted in, 48% of the population having access to centralized sewerage network systems (49 islands)[4]. Wastewater treatment is being carried out to some extent in few islands, however, wastewater is not being used for any purpose.

2.5. Water supply and sewerage services provision

The Government, through the Ministry of Environment and Energy establishes Water supply and sewerage network systems in islands selected under specific criteria determined by concerned authorities. The systems are handed over to the state utility companies once completed. Male' Water and Sewerage Company, The State Electric Company (STELCO) and FENAKA Private Limited are state utility companies that are mandated by the Government to provide water supply and sewerage services in islands where they have island-wide water supply and sewerage network systems. (List of islands provided in Annex 3)

It is expected that the Island Councils will establish procedures to moderate the use of water from the public rainwater harvesting systems in a sustainable and viable manner. Proper management of the water resources, and fair prioritizing and pricing of the drinking water supply will not only alleviate some of the serious health risks that occur during low rainfall periods but will also help island councils to properly fund the maintenance, repair and replacement of equipment and infrastructure.

3. Water Management Challenges in the Maldives

3.1. Water Resources and Sewerage Governance and Management

The National Water and Sewerage Policy (NWSP) provides a basis for Integrated Water Resources Management. The endorsement of the Water ACT is already in an advanced stage and nearing adoption. The subsequent implementation of the NWSP through the legal framework of the Water Act is a high priority of the Government.

There is a need to improve and strengthen holistic approaches to water resource management, co-ordination and collective decision-making. For instance, there are duplications and gaps in responsibilities in areas such as water quality monitoring and water resources management. A formal coordination body or a mechanism does not exist at present. The NWSP stipulates formation of a National Coordination Committee to strengthen the existing governance structure and coordination of water management responsibilities.

3.2. Water Shortage

[4] Figures reported for 2016 (MEE, 2017)

Due to the poor state of groundwater, rainwater, desalinated water and bottled water are the most important alternative sources of potable water used in the administrative islands. The lack of land for water storage is a major hindrance to achieve water security. Storage capacity in Male' is only sufficient for 24 hours and the unavailability of land does not allow for storage expansion (MEE, 2016). The situation is other islands are slightly different, as the water supply systems established in the islands provide 7 days of storage capacity.

The rainwater harvesting capacity and per capita water storage is low in some islands resulting in some island communities facing water shortages during the dry season. The government receives requests from approximately 80 islands across the country for water shipments over the recent years. The government has made plans to address this issue by increasing the water production and storage capacity of targeted islands across the country.

The mandate to establish emergency protocols to address water shortages has been transferred from the National Disaster Management Center (NDMC) to the Ministry of Environment and Energy (MEE) during early 2016. MEE has developed water supply schemes to establish a sustainable source of water supply in the vulnerable islands. Community rainwater harvesting capacity of 27 island communities have been increased under this scheme[5]. Similar projects are being carried out in 65 more islands. Additionally, some targeted islands will be provided with reverse osmosis plants and storage tanks under the same scheme.

4.3. Financial Sustainability and Cost Recovery

Financial sustainability and cost recovery of the water supply and sewerage systems remain as a major challenge. Financial sustainability of the utilities through tariff revenue is a key focus activity under this segment. Even though community consultations and willingness to pay studies have demonstrated that the communities are willing to use the services and to pay for the water supply, the consumption of water from the water supply network systems in the islands (except Male') are significantly low. Therefore, government subsidies are required even for operating costs for the systems in the islands.

4.4. Use of Groundwater

There are no regulations on groundwater abstraction and use even though it is one of the key fresh water resources in Maldives. The quality of groundwater in most of the inhabited islands has deteriorated significantly over the past two decades. Easy accessibility and growing demand by the communities coupled with the absence of any control measures have led to excessive groundwater pumping even in islands with modest population densities. In addition, anthropogenic activities such as household wastewater disposal and the application of various pesticides and fertilizers used in agriculture have led to contamination of groundwater (Rasheed, 2005).

4.5. Water Quality and Environmental Sustainability

[5] Figures for 2016

Results from surveys and community consultations show that communities are reliant on rainwater that is at risk from contamination (MEE, 2015; and UNDP, 2016). As reported by MEE, rainwater is affected by atmospheric pollution that occurs in the Indian sub-continent and is considered a threat to Maldives where more than 50% of the population depends on roof top harvested rainwater (MEE, 2016). The only way to determine whether the water is potable is to have the water tested for micro-bacterial and chemical contamination. Results from a survey carried out in Laamu Atoll show that where water sampling and analysis has been done, and the results reported back to community groups, there is evidence that it had a marked effect on the behavior of households with regards to their use of the water, and their general willingness to address any potential issues with it (UNDP, 2016).

At present, only few islands have access to locally established water quality testing facilities and equipment. A mechanism that provides accessibility to testing on a regular basis is needed to ensure that the quality of water is checked and proper measures taken to ensure the safety of the water resources used by the communities.

5. Waste Management

The issue of waste management has become one of the most pressing environmental issue facing the Maldives over the past couple of decades (MEE 2016). With a unique geography dispersing the population of the country into tiny remote pockets, limited technical and financial capacity of locals to address the issue, absence of effective and cost-efficient waste management models suited for small islands, limited enforcement, improvements in the quality of life leading to changing consumption patterns and poor awareness among the general public on the issue, waste management has been identified as a great development challenge facing the Maldives that requires immediate attention (MEE 2016).

Solid waste output has increased significantly in the Maldives, particularly driven by population growth, changing consumption patterns, barriers in transportation and rapid growth of the tourism sector. The per capita waste generation is estimated at 1.7kg, 0.8kg and 3.5kg in Male', atolls and resorts respectively.

The 2014 Population and Household Census recorded a total population of 338,434 people in the country, with 38% of the population residing in the Greater Male' Area. Inevitably, Male' region is responsible for a significant proportion of the waste generated in the country. According to some reports, the amount of waste generated in Male' has increased by 155% over the past decade (MEE 2016).

Waste from the Male' region and most resorts are transported to Thilafushi Island, where they are stockpiled. The most common method of waste disposal is open burning, leading to pollution and generating conditions harmful to public health. The Maldives government recognizes the importance of improving the existing methods of waste management. (MEE, 2017)

6. Waste Management Service Provision

Improving solid waste management is a top priority of the government and is included in the Manifesto of the Progressive Party of Maldives (2013- 2017) (de facto national development plan). The Government has formed the Waste Management Corporation (WAMCO) to operate waste management related facilities and to provide waste management services in the country. At present WAMCO provides waste

collection, disposal and management services in Male', Villimale', Hulhumale', Gulheefalhu, Addu City and Fuvahmulah City. WAMCO is also in charge of the Regional Waste Management facility in the North Region. Once the facility is fully operational, waste from administrative islands and resorts in Noonu, Raa, Baa and Lhaviyani Atolls will be transported to this facility and managed by WAMCO.

7. Water and Waste Information Management

Environment data collection and reporting is ad hoc and inadequate in the Maldives. Within a decentralized national statistical system, the National Bureau of Statistics (NBS) is mandated as the core body for the with data collection, analysis and compilation at the national level, while sectoral agencies are mandated for the data collection, analysis and compilation of the relevant sectoral data where MEE and related agencies collects and compiles environment related data. A robust mechanism to collect and collate data could only achieved with the support of stakeholders, including Government Institutions and the service providers (Utility Companies).

Stakeholder agencies under the MEE highlight the need to establish a robust electronic data base that includes statistics on water and waste issues. The utility companies collect and log data for their own use. Data is only shared with Government authorities upon request. A common consensus amongst the service providers is that it is crucial to identify or agree on a common set of indicators or data requirements that is consistent.

A data assessment study conducted in Laamu Atoll shows that data collation and analysis is not a common activity that is conducted on a regular basis at the island or atoll level. Data is collected and compiled at different frequencies for various data sets in response to requests by the government authorities and institutions, but not on an ongoing basis. The data collected does not include statistics on water, sanitation and waste management (UNDP, 2015). It will be crucial to develop a mechanism and a process to engage Island Councils in data collection in islands where utility companies do not operate. This would be quite challenging for water supply and waste management as the work need to be carried out manually.

In this context, it is important to establish a structured data collection system and to report on a regular manner. To this end the establishment of a centralized, comprehensive national water and waste database with clear maintenance and access rules is crucial.

7. Data Availability on Waste and Water

7.1 Water

Key Data requirement/availability for compilation of Water accounts

	Data/Indicator	**Status**	**Data Collection methodology/ frequency**	**Agency**	**limitations**	**Proxy indicator/ Comments**
Fresh Water Abstraction and Use						
1	Surface Water abstracted - Rainwater used	Available	Admin form/ annual	Stelco, MWSC and Fenaka	Data received for water systems managed by stelco, MWSC and Fenaka	
2	Water abstracted by water supply industry	Not Available				
3	Desalinated Water	Available	Admin form/ annual	Stelco	Data received from Stelco only. MWSC and Fenaka did not maintain this record	Fenaka reported that they could calculate using "pump operation duration"
4	Water used for Manufacturing	Available	Admin form/ annual	Stelco	Data received from Stelco only. MWSC and Fenaka did not maintain this record	
Water Supply Industry						
3	Gross water supplied by water supply industry	Available	Admin form/ annual	Stelco and MWSC	Fenaka did not maintain this record	
4	Losses during transport	Not Available				
5	Water supplied to households	Available	Monthly, bills	Stelco, MWSC and Fenaka		

6	Water supplied to business & industrial	Available		Stelco	Data received from Stelco only. MWSC and Fenaka did not maintain this record	At present, this is included under "commercial" by MWSC and Fenaka.
7	Water supplied to agriculture, forestry & fishing	Not available		MoFA		At present, this is included under "commercial"
8	Water supplied for manufacturing	Not available				At present, this is included under "commercial"
9	Water supplied to Electricity Industry	Not available			Stelco shared for 1 island	At present, this is included under "commercial"
10	Other Economic Activities	Not available		MoT		For resorts
11	Water provided for harbor	Available		Stelco	MWSC and fenaka did not share this information	
12	Commercial	Available	Monthly/ bills	Stelco, MWSC and Fenaka		Includes government institutions, businesses, commercial activities etc.
Total population supplied by water supply industry						
13	Population served by water supply	Available				NBS – census data
Wastewater generation and treatment						
14	Wastewater generated (from water supply)	Available		MWSC	Fenaka did not supply this information	Outfall meters not installed

7.2 Waste

Key Data requirement/availability for compilation of Waste accounts

Generation of Solid Waste

	Data/Indicator	**Status**	**Data Collection method/ frequency**	**Agency**	**limitations**	**Proxy indicator/ Comments**
1	Chemical and Health care waste	Not available		WAMCO/ MNDF	Quantities not recorded	Wamco collects health care waste, but quantity not recorded. MNDF collects chemical waste
2	Radioactive waste	Not available		WAMCO	Not collected separately	
3	Metallic waste	Not available		WAMCO/ secure bag	Not recorded	
4	Non-metallic recyclables	Not available		Parley/ bottling companies / WAMCO	Not recorded by WAMCO	
5	Discarded vehicles and equipment	Not available		WAMCO	Information not available at WAMCO	
6	Animal and vegetal waste	Not available		WAMCO	Not collected separately	
7	Mixed residential and commercial waste	Available	Monthly records/ only for Male' and Hulhumale	WAMCO		Island Councils manage waste in islands not managed by WAMCO
8	Mineral wastes and soil	Not available		WAMCO		Soil is reused for construction
9	Combustion waste	Not available		WAMCO	Not recorded	
10	Card board	Available	Annual records	WAMCO/ Bottling Company	Not recorded by WAMCO	Minimal data available only from bottling company
11	Other wastes	Not available		WAMCO	Not recorded	Solid waste from sewerage systems/ septic tanks

8. Notes on draft data sets received from Utility Companies and Recommendations

a. Draft Data Sheets

Draft Spreadsheets were developed based on the test account sheets shared with the consultant. The data sets were selected based on the feedback gained by the stakeholder consultation meeting with MEE, Stelco, MWSC, Fenaka and WAMCO.

After the consultation meetings draft spreadsheets were shared with the utility companies for data collection.

b. Draft data sets received

Some of the data received were inconsistent and incomplete. For instance, it was observed that data for some islands show that the total amount of water produced and water distributed did not tally. This was observed as an error and emails were sent to the utility companies to check and to modify the figures.

The data sheet provided by Stelco included figures for water supplied to harbors. This was not a category we initially asked for, however, if all other utility companies could provide this data separately it could be added to the spreadsheet. Water collected from harbors could represent a portion of the amount of water used in fishing.

None of the data sheets provide figures for “losses”. Methodology on how to calculate this figure could be discussed further with the utilities.

The utilities companies collects and maintains data for consumption or distribution in 2 main categories, i.e., households and commercial. “Commercial” category includes Government Institutions, Schools, Hospitals and other similar service providers in addition to hotels, cafes, restaurants etc. that conducts commercial activities and businesses. The feedback from meetings with the companies is that it would be a challenge to provide data breakdowns to show “industries” etc. specially for islands with larger populations such as Male’ and Hulhumale. Consumption data is linked to the billing system – billed water. This could be a matter that could be further discussed with the utilities to finalize the key sub categories that could added.

Population data is not collected or maintained by the utilities. Therefore, this data could be drawn from the NBS data sets.

The amount of salt water or brackish water discharged from the water supply systems were not provided by the utilities. The importance of collecting this data could be highlighted in meetings with stakeholders including MEE and EPA.

The total volume of salt water extracted for desalination is also included as a new category in the spreadsheet shared with the utilities. Both Stelco and Fenaka confirmed that this is information that they could provide. However, only MWSC provided this data. The importance of collecting this information could also be highlighted with the stakeholders.

None of the utilities provide data for wastewater generation/ or discharge. It was highlighted in the meetings with the utilities that water treatment systems are few and treatment is rarely done. As reported earlier, treated water is not commonly used for any purpose, and it is usually discharged. Therefore, it is expected that minimal information will be available on water treatment. The most promising information on wastewater is the "amount of waste water discharged" as it is common for the sewerage systems to have outflow meters. However, since this information is rarely recorded, or maintained.

Solid waste management data is only limited to the volume of the carrying capacity of the vehicles that WAMCO uses to collect and transport the waste. WAMCO reported that they are planning to have equipment installed in the transfer stations to weigh the waste collected, since their plan is to charge for waste collection against the weight of waste produced. Solid waste categorization for data collection will only be practical once WAMCO installs weighing equipment in their transfer stations.

The data collected for water supply and sewerage from utility companies will only be limited to islands with centralized systems. It will be crucial to determine a mechanism to use and provide training to engage the Island Councils to collect data from islands without centralized systems.

Water and waste data from resorts could be collected with assistance from the Ministry of Tourism. At present, the Ministry of Tourism do not collect or maintain any records on water and waste data.

The use of groundwater for agricultural purposes is another crucial area that should be considered, especially for islands that practice commercial agriculture. At present, Ministry of Fisheries and Agriculture do not collect or maintain any records of this data. Methodology to quantify the amount of water used for agriculture should be identified in consultation with the Ministry of Fisheries and Agriculture.

9. Recommendations from the National Steering Committee

Meeting with the National Steering Committee was held on 5th September 2018. The Committee members commented about the composition of the Committee, highlighting lack of personnel who can provide input for waste data. Committee members advised NBS to invite senior officials from waste departments of both MEE and EPA to join the Committee.

NBS team highlighted the major gap in data collection as unavailability of data from "water users" and industries. Committee members indicated the importance of collecting data from Resorts. The suggestion was to approach through Ministry of Tourism (MoT) and Maldives Association of Tourism Industry (MATI). Initially it would be important to have a briefing meeting with MoT and MATI to seek their support for the activity. Energy department of MEE used this approach and managed to collect information from 25 resorts. Committee members highlighted that the Resorts do not respond well if independent people and other authorities approach them.

Committee members emphasized the need to develop a data collection sheet that would serve as a standardized form for all key data needs by/ and for the key organizations. Although, most members agreed with this comment, some members highlighted that the form should be concise and that it should not overwhelm the stakeholders.

NBS team shared information about the encouraging response received from all utility companies who supported the exercise. Committee members pointed out the importance of using this opportunity to work in harmony with the utilities to establish a positive and organized and systematic approach for data collection.

Some good practices inherent in the organizations highlighted in the meeting were, the regular data logs maintained by the utilities and monthly statistical reports publicized by Maldives Meteorological Service in their website. These are practices that could be developed and utilized to ensure systematic data collection and availability.

Committee members pointed out that it is important to meet with senior most officials, or decision makers from MEE and EPA waste and water departments to seek their advice and to formalize support for this exercise; this would be crucial in determining the key data set that is required, specify classifications for solid waste data and to agree on a collective plan of action.

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Pilot Accounts 2017

Water Supply										Water Use								
2017 (Megalitre)/ month	**Commercial**	**Water supply**	**Sewerage**	**Households**	**Govt**	**Imports**	**Environmental Flows**	**Total Supply**		**Commercial**	**Water supply**	**Sewerage**	**Households**	**Govt**	**Exports**	**Environmental Flows**	**Total Use**	**Annotations**
1. Source of Water																		
Inland Water Resources																		
Surface water							0	0			0						0	Not applicable
Ground water		0					0	0			0						0	Not applicable
Soil water		0					0	0			0						0	In local context this is called ground water. Ground water is used for all uses except for drinking and cooking
Total		0					0	0		0	0	0					0	
Other water sources																		
Precipitation		5,554					0	0									0	Rainwater is combined with desalinated water and distributed via water network systems in .. islands. Rainwater from public rainwater systems and household rainwater systems are used widely in .. Islands for drinking and cooking.
Sea water	36,748	2,365,137					0	0									0	seawater is extracted for desalination / and use or distribution via water network systems and as bottled water.
Total	36,748	2,370,691					0	0		0	0	0					0	
Total abstracted water	**36,748**	**2,370,691**						2,407,439		0		0					0	
Produced Water																		
Desalinated Water	**17,709**	**738,686**						756,395										Desalinated water produced for use and distribution
Total		**744,240**						744,240										
2. Abstracted / Produced Water																		
For distribution/distributed water	2,146,163	828,166		5,985,610	99,837			828,166										Amount of water distributed, using water network systems and bottled water.
For own use	2,939	3,170						6,109									0	Used by the water supply companies, for their own use
3. Wastewater and resuse water																		
Wastewater	49	30,823					30,872	0										Wastewater produced
Wastewater to treatment	15				0		15	0										wastewater treated
Own treatment	0						0	0									0	own treatement
Reused water produced								0										
For distribution								0									0	Re-used water produced for distribution
For own use	0							0									0	Re-used water produced for own use
Total	64	30,823			0		30,887	0		0	0	0	0	0	0		0	
4. Return flows of water																		
To inland water resources																		
Surface water								0										not applicable
Ground water								0										not applicable
Soil water								0										not applicable
Total	0		0	0	0			0								0	0	
To other sources								0								0	0	sewage water/ dark water
Total return flows	0	0		0	0			0								0	0	
of which: Losses in distribution		0						0										losses in distribution
5. Evaporation, transpiration, water incorporated into products																		
Evaporation								0								0	0	evaporation
Transpiration								0								0	0	transpiration
Water Incorporated into products								0										Water used to produce products
TOTAL			**0**	**0**		**0**	**0**	**3,241,714**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	

Pilot Accounts 2017

Table 3.9 Solid waste account (tonnes)

Physical use table for solid waste	Intermediate consumption of solid waste										Final consumption	Rest of the world			
	Waste collection, treatment and disposal industry														
		Incineration													
	Landfill	Total	Of which: incineration to generate energy	Recycling and reuse	Other treatment	Other industries	Hospitals	Resorts	Construction	Trade	Households	Exported solid waste (customs)	Flows to the environment	Total use	Annotations
Collection and disposal of solid waste residuals															
Chemical and health care waste															waste from healthcare facilities
Radioactive waste												170000			Scrap of primary cells, batteries
Metallic waste												10831425			aluminium, copper, steel, alloy, cast iron
Non-metallic recyclables	94,262.00											4825970			Paper, paper board, plastics
Discarded equipment and vehicles															equipment and vehicles
Animal and vegetal wastes															animal and vegetables
Mixed residential and commercial wastes	25,933.00														mixed waste from households, commercial and institutions
Mineral wastes and soil															mineral waste and soil
Combustion wastes															construction waste
Other wastes	293.00											219600			waste oil, furniture, household items
Use of solid waste products															
Chemical and health care waste															waste from healthcare facilities
Radioactive waste															Scrap of primary cells, batteries
Metallic waste															aluminium, copper, steel, alloy, cast iron
Non-metallic recyclables															Paper, paper board, plastics
Discarded equipment and vehicles															equipment and vehicles
Animal and vegetal wastes															animal and vegetables
Mixed residential and commercial wastes															mixed waste from households, commercial and institutions
Mineral wastes and soil															mineral waste and soil
Combustion wastes															construction waste
Other wastes															waste oil, furniture, household items

Annex 1- Core Functions of Authorities in Water and Sewerage Management

Ministry of Environment and Energy

The Environment Protection and Preservation Act 4/93 sets out the mandate for the government authorities to preserve, protect and safeguard the environment of Maldives. The directive for the Ministry of Environment and Energy (MEE) is to formulate policies and regulations for environmental protection and preservation of areas except those allocated to other government authorities.

The Ministry of Environment and Energy's core functions related to water and sewerage sector include:

- Formulate policies, regulations and standards needed for the implementation of legislation related to environment, climate change, energy, water, sanitation, sewerage, and meteorology.
- Protect the environment of the Maldives, and develop strategic action plans, action plans to promote the sustainable development and implementation of all aspects of energy, water and sewerage, and meteorology.
- Develop concepts of projects related to the water, sanitation and sewerage and acquire funds to the projects through collaboration with the related institutions; plan and manage all aspects of those projects.
- Develop monitoring guidelines and regulate projects related to environment, climate change, energy, water, sewerage, meteorology and infrastructure.
- Advocate and manage related to the mitigation of the effects of climate change to the Maldives and other small island developing states, at regional and international level.
- Prepare tender and bid documents required for developing water supply and sewerage infrastructure.
- Facilitate contractors and consultants in getting necessary approvals for sewerage and water supply development.
- Prepare project proposals and budget estimates and prepare sector budgets annually.
- Approval of appropriate concepts and technologies for water and sewerage projects.
- Strengthen capacity building of service providers.
- Implement public water supply and sewerage infrastructure projects.

At present, MEE is composed of six technical departments, namely Climate Change; Environment; Water and Sanitation; Coastal Zone Management; Waste Management and Pollution Control; and Energy department.

Environment Protection Agency

The Environmental Protection Agency (EPA) is a legal regulatory entity, working under the supervision of a governing body under the Ministry of Environment and Energy. EPA was formed when the Environmental Research Center and Maldives Water & Sanitation Authority were merged by a presidential decree on December 18, 2008. The EPA's Governing Board is a statutory body, established under the Environment Protection Act, with expertise in environment protection, industry, environmental science,

regional issues, environmental law and local government. EPA's core functions related to the water and sewerage sector include:

- Formulate and enforce water supply and sewerage system design criteria and design specifications.
- Formulate and enforce national wastewater disposal guidelines, sea-water desalination plant regulation, borehole guidelines and dewatering regulation.
- Provide approvals for water supply and sewerage system designs and EIA's.
- Enforce and implement water supply and sewerage tariffs, fees, fines and penalties.
- Enforce licensing and registration of water supply and sewerage systems.
- Carry out water quality tests on public water supplies for compliance monitoring.
- Regulate the utilities in the water and sewerage sector.

Maldives Meteorological Service

The mandate of the Maldives Meteorological service is to provide accurate, timely and reliable meteorological information to minimize the impact of weather and climate events on life and property while supporting sustainable socio-economic development of the Maldives.

The Ministry of Finance and Treasury

The core functions related to the water and sewerage sector include:

a. Provide financial support to the sector to help in achieving sector development goals and targets.
b. Facilitate programs to secure external financing for sector development and coordinate with external agencies.
c. Facilitate resource mobilization,
d. Facilitate and support in coordinating foreign aid.
e. Facilitate project tendering and bid process.

The **Ministry of Housing and Infrastructure (MHI)** oversees and regulates large-scale infrastructure adaptation projects such as the construction of sea walls and built environments. MHI's core functions related to water and sewerage sector includes;

a. Facilitate in providing land-use plans for islands and provide approval of land required for water supply and sewerage facilities.

The **Ministry of Fisheries and Agriculture (MoFA)** is mandated to manage, conserve and develop the marine resources in the Maldivian waters. It is further mandated to manage the land-based ecosystems and to develop agriculture in the Maldives. As such the Ministry of Fisheries and Agriculture plays a key role in policy, planning and implementation of projects related to the fisheries and agriculture sector. MoFA's core functions related to water and sewerage sector includes;

a. Promote water conservation and efficient irrigation practices.
b. Promote awareness on water resources protection from agro-chemical pollution.

The **Ministry of Health (MoH)** focuses on addressing environmental health issues including assessment and control of environmental factors that can potentially affect health. Within this mandate, their target is preventing diseases and creating health-supportive environments. The *Health Protection Agency (HPA)* operates under the Ministry of Health with a mission to ensure health safety. MoH's core functions related to water and sewerage sector includes;

a. Facilitate and promote good sanitation practices.

The **National Health Laboratory (NHL)** operating under the **Maldives Food and Drug Authority (MFDA)** has the main mandate to carryout assessments regarding safety and hygiene verification of food and pharmaceuticals and quality control assessments including water quality testing. NHL operates under the Health Protection Agency (HPA) and NHL is divided into two main sections namely, Chemistry and Microbiology laboratories. HPA's core functions related to water and sewerage sector includes

a) Ensure safety of water source and its suitability for human consumption and free from micro-organisms.
b) Carry out random water quality test on the public water systems.
c) Develop Water Safety Plan (WSP) and guidelines.
d) Monitoring and evaluation of WSP implementation.

Other agencies with a role in the implementation of related activities include;

The **Maldives Energy Authority's** core functions related to water and sewerage sector include

a) Facilitate the promotion of renewable energy in water and sewerage infrastructure.
b) Approval of electrical components in water supply and sewerage designs.
c) Approval and registration of power generations systems of water and sewerage facilities.

The **Ministry of Tourism's** core functions related to water and sewerage sector is to ensure compliance of the tourism establishments and tourist resorts with the desalination regulations, wastewater disposal guidelines and dewatering regulations.

Local Government Authority

The type of decentralization envisaged by the Decentralization Act is that the island communities are making decisions in a democratic and accountable manner. It implies that such enablement will lead to an improvement in living standards through social, economic and cultural development that comes from people being empowered and by having services delivered by institutions that are close to them. (UNICEF, 2013)

At present the Local Government Authority plays an administrative oversight role over the Councils. They also provide training to Councils in community based planning; community based monitoring, project cycle management, finance and account management. It is anticipated that the capacity building programs will lead to empowerment and the councils taking greater responsibility for managing their own planning, thus reducing the need for central government to play a role in this regard.

Councils

The Constitution decrees the Councils to provide democratic and accountable governance; to foster the social and economic well-being and development of the community; and to establish safe, healthy and ecologically diverse environment. It also requires Island and City Councils to provide and maintain basic public services such as water, electricity, and sewerage systems; maintain cleanliness of the island and its beauty and to build and maintain roads. The Constitution entitles Councils to raise revenues and receive a budget allocation from central government to carry out these functions. The combined revenue sources should enable the Councils to fulfill their mandates (UNICEF, 2013).

Island Councils' core functions related to water and sewerage sector includes;

a) Identification and approval of land for the provision of water supply and sewerage services in the islands.
b) Provide required support to MEE, monitor contractors and consultants in carrying out the work in accordance with the schedules during implementation.
e) Oversee that the facilities including infrastructure and equipment are protected from vandalism.
f) Develop the public rainwater harvesting systems in association with MEE to ensure that the rainwater stocks last throughout the dry period
g) Maintain public rainwater harvesting systems and make arrangements to provide the water to the public as and when there is a need.

To plan and implement related activities, the Councils shall act under the sponsorship, guidance and support of the government authorities. Councils form an important link between the central national authorities (ministries, departments and the like) and the communities that are impacted by activities such as water and sewerage services development. The local councils could garner support from various groups, institutions including the private sector to develop, implement and strengthen activities in the local context.