

Appendix 5-2
Training Material of Guideline on Operation
and Management of Sanitary Landfill

Training on Sanitary Landfill Operation and Management

JICA Expert Team
November 2022

1. Outline of Sanitary Landfill Management

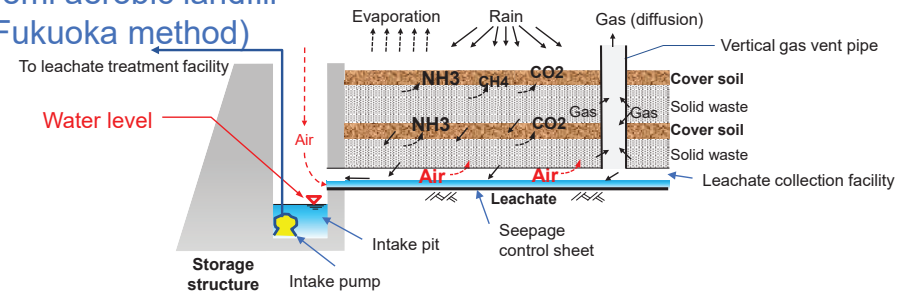
1.1 What is Landfill

- Types of Landfill
 - Municipal (non-hazardous) solid waste
 - Hazardous waste
- Roles of a sanitary landfill for municipal solid waste
 - Final receiving facility for all waste
 - Preventing waste from runoff to the surrounding areas.
 - Stabilizing and detoxicating waste.

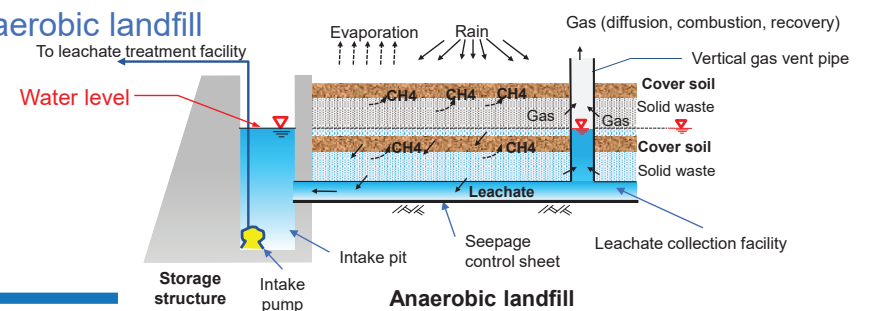


1.2 Landfilling Structure

Semi aerobic landfill (Fukuoka method)

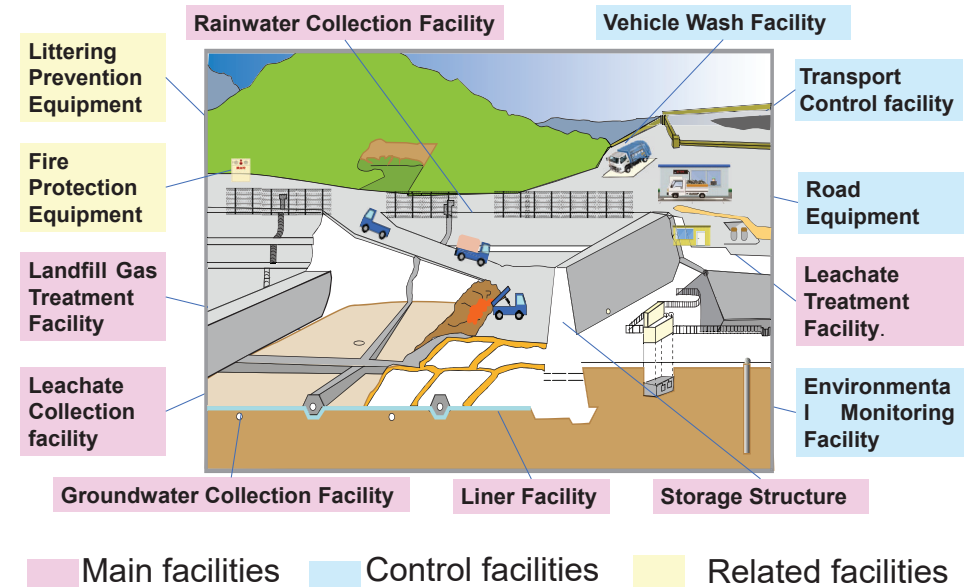


Anaerobic landfill



2.1 Functions and Facilities of Landfills

2.1 Facilities in Sanitary Landfill



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2.1 Relationship between Facilities and Functions

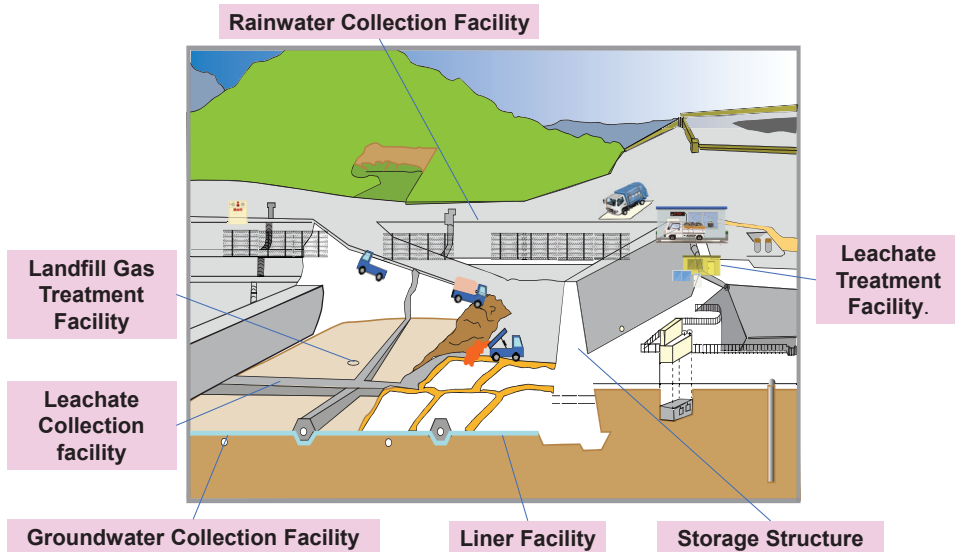
Facilities	Functions	Storage and treatment functions	Environmental Conservation Functions		
			Ground water Pollution Prevention	Prevention of Pollution of Public Waters	Others (air pollution, environment preservation, etc.)
Main Facilities	1.Storage structures	⊙		○	
	2.Groundwater collection and drainage facilities		○		
	3.Water interceptor	○	⊙		
	4.Rainwater catchment and drainage facilities			○	
	5.Leachate collection and drainage facilities	○	⊙	⊙	
	6.Leachate treatment facilities	○	⊙	⊙	
	7.Landfill gas treatment facilities	○			○
Control Facilities	1.Carry-in management facilities	⊙			⊙
	2.Environmental monitoring facilities		⊙	⊙	⊙
	3.Administration Building	○			
	4.Controlled road	○		○	○
	5.Others (car wash facilities)				○
Related Facilities	1.Anti-scattering equipment	○			
	2.Fire protection equipment				○

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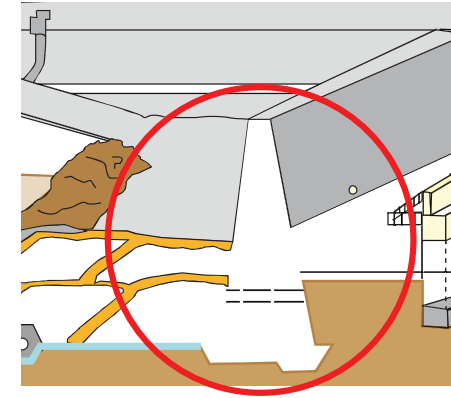
2. Functions and Facilities of Landfills

2.2 Functions and Facilities of Landfills -Main Facilities

2.2 What is the Main Facility?

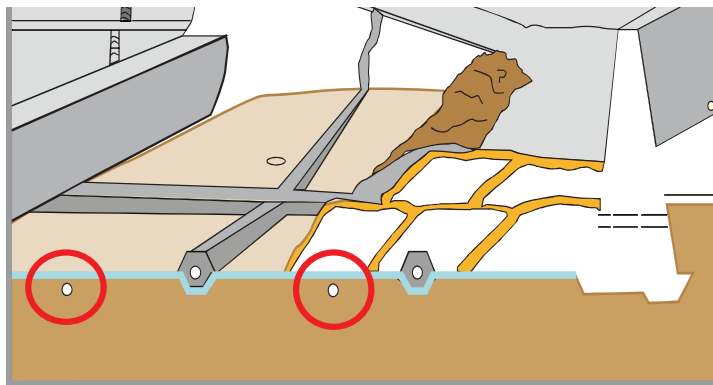


2.2.1 Storage Structure



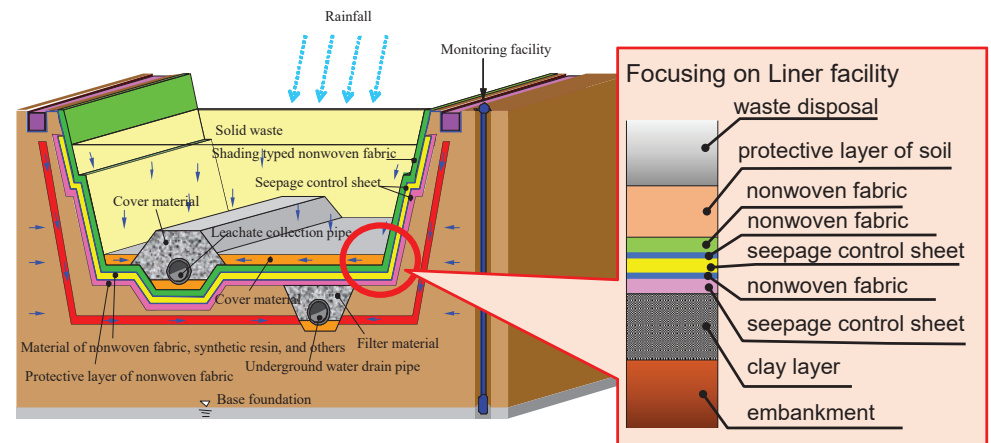
The facility for retaining solid wastes safely to prevent the effluence of solid waste and leachate outside.

2.2.2 Groundwater Collection and Drainage Facilities



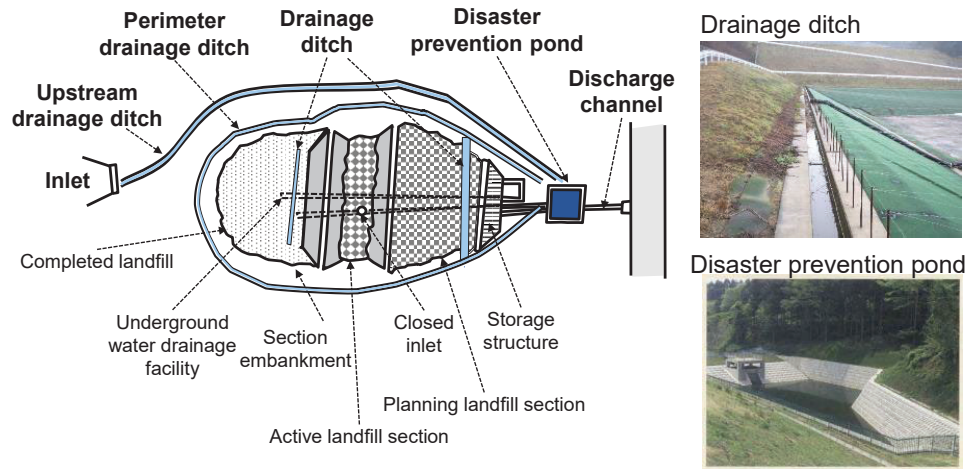
The facility for collecting and discharging underground water efficiently to prevent underground water from affecting the effects of seepage control work.

2.2.3 Liner Facility



The facility for cutting off the effluence of leachate outside the landfill to prevent environmental pollution of the peripheral area.

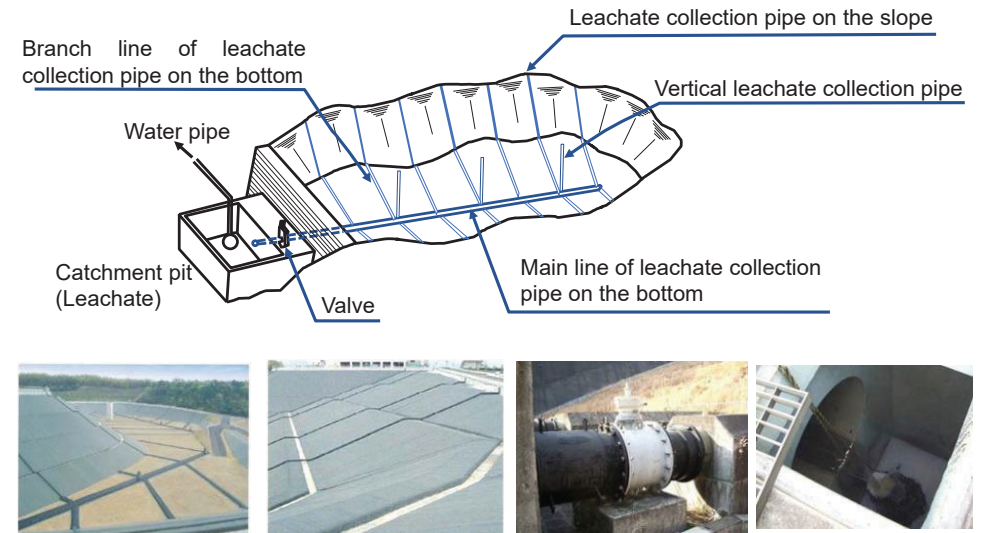
2.2.4 Rainwater Collection Facility



The facility for preventing rainwater from flowing into the landfill site, and to reduce the amount of leachate.

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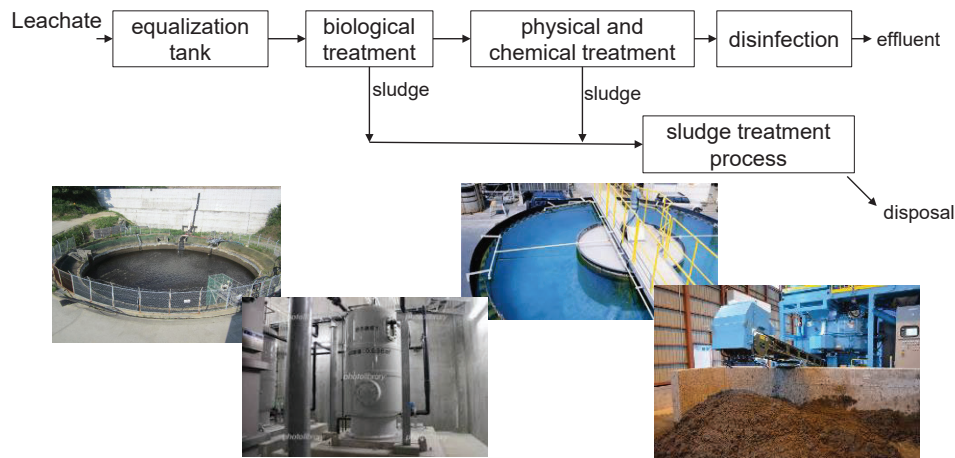
2.2.5 Leachate Collection Facilities



The facility for the collection and discharge of leachate, and intaking the fresh air into the landfill in Fukuoka method.

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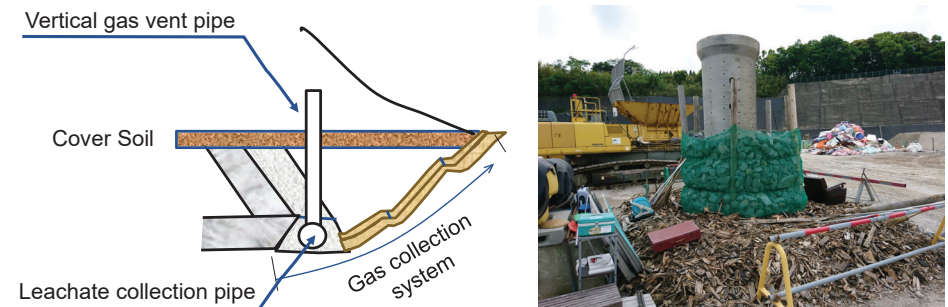
2.2.6 Leachate Treatment Facility



The facility for treating leachate to meet the designed effluent quality standard, and preventing leachate from contamination of a public water body and underground water.

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2.2.7 Landfill Gas Treatment Facilities



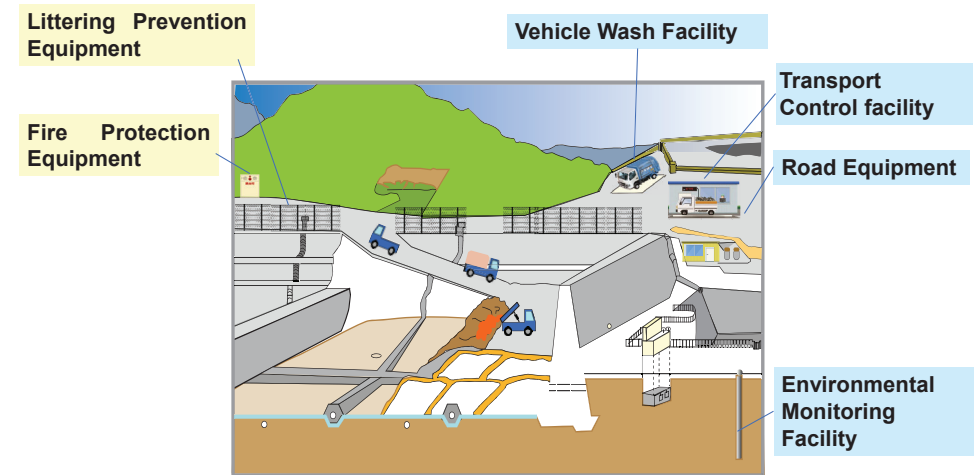
The vent for the emission of the landfill gas and the admission of the fresh air.

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2. Functions and Facilities of Landfills

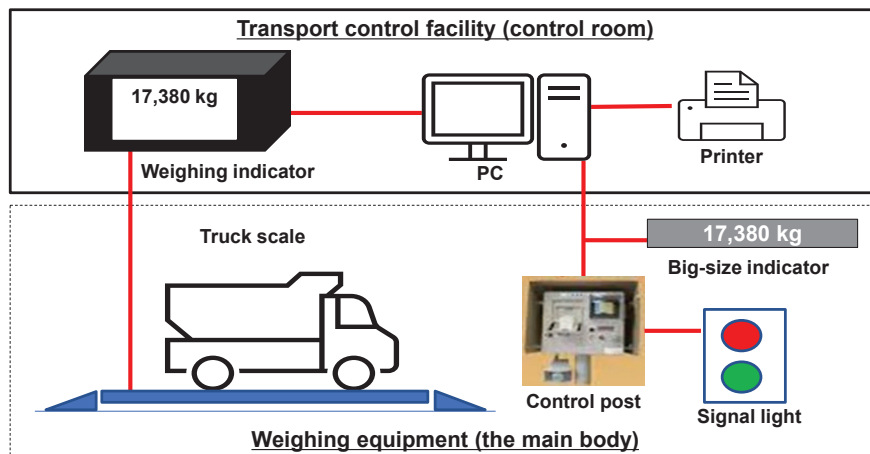
2.3 Control Facilities 2.4 Related Facilities

2.3 What are Control Facilities and Related Facilities?



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2.3.1 Transport Control Facilities



The facility for weighing, tallying, and recording transported solid waste.

2.3.2 Environmental Monitoring Facilities



The facility is for the equipment management to monitor the environmental factors, ex. a thermometer, pH meter, conductivity meter, and a water level meter of groundwater well.

2.3.3 Control Building



This facility is for the comprehensive management of a series of operations at the landfill site.

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2.3.4 Road Equipment



The road on the landfill site used for daily operation and maintenance.

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2.3.5 Vehicle Wash Facility



The facility is for washing the vehicles exiting the landfill site and preventing environmental pollution of the surrounding areas.

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2.4 What is the Related Facility?

• 2.4.1 Littering Prevention Equipment

The equipment is for preventing solid waste scattering of solid waste from the disposed site.



• 2.4.2 Fire Protection Equipment

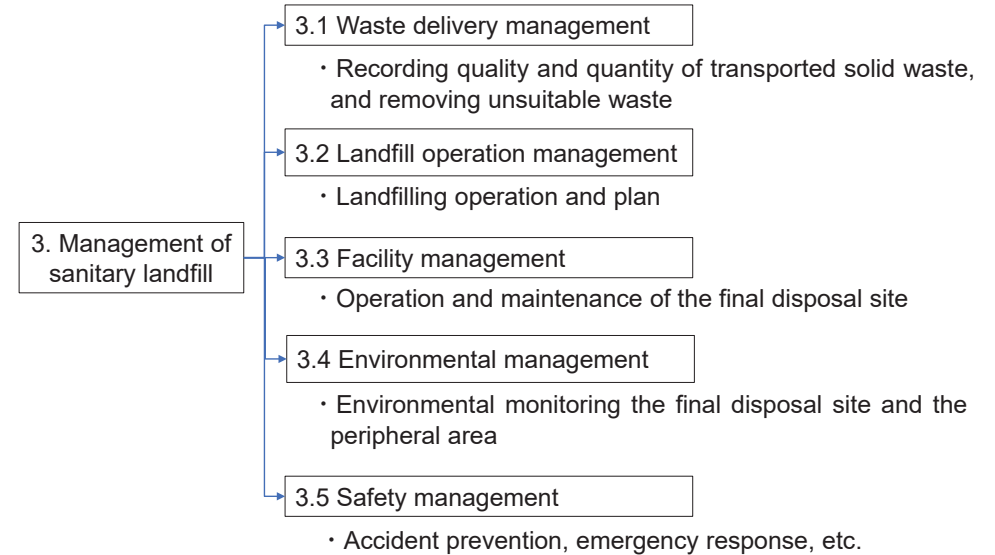


The equipment for fire extinction when the fire occurs and for preventing the fire from spreading to the surrounding area.

3. Management of Sanitary Landfill

3. What is Sanitary Landfill Management?

The followings are necessary for sanitary landfill management



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3.1.1 What is Waste Delivery Management?

Objective

- **Implementation of planned waste management operations:**
Implement waste management operations in a planned manner by monitoring and managing waste volumes.
- **Prevention of environmental pollution:**
such as pollution of public waters and groundwater by leachate, scattering, and spilling of waste, bad odor, and inhabitation of sanitary vermin and animals.
- **Maintenance of facilities:**
such as storage structures, impervious structures, etc.
- **Facilitation of landfill operations:**
such as spreading and compaction waste materials and soil cover construction.

3. Management of Sanitary Landfill

3.1 Waste Delivery Management

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1) Types of Transported Waste

The following wastes are assumed to be accepted:

- Household waste
- Business waste
- Hazardous waste that has been rendered harmless and can be disposed of in a non-hazardous waste landfill

2) Waste Acceptance Criteria

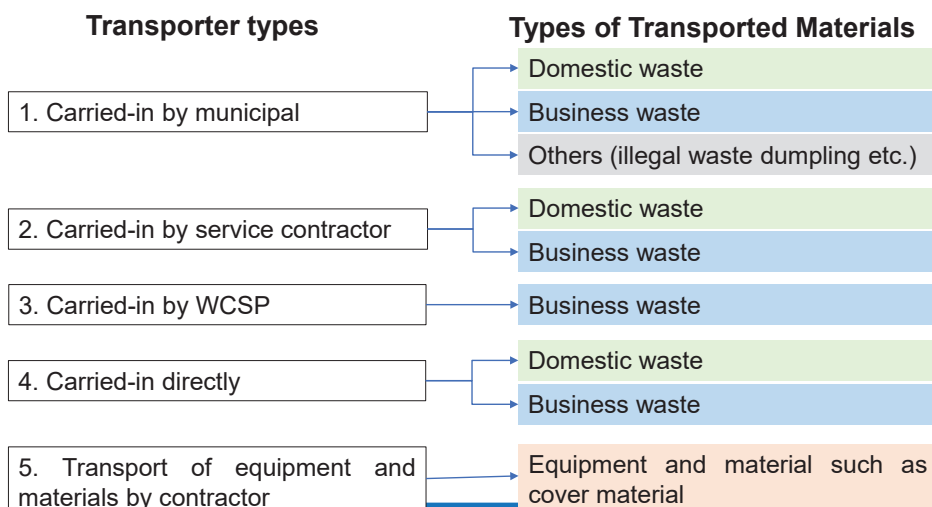
The following waste should be unaccepted in the landfill.

classification	exemplification
(1) Industrial waste	Cinders, sludge, wood waste, construction waste, waste plastic, rubber waste, mineral scraps, soot and dust, waste oil, waste acid, etc.
(2) Toxic and noxious substances	Parts using PCBs included in the following Scrapped air conditioners, TVs, microwave ovens Items that are contaminated with pesticides, deleterious chemicals, or other toxic substances Items for which landfill disposal is prohibited by the law
(3) Fire and flammable materials	Cinders, leftover burnt materials that catch fire. High-temperature items Explosives, paints, gas cylinders, solvents, etc.
(4) Items that emit a significant odor or sewage	Urine, decomposed animal and vegetable residues, etc.
(5) Difficult-to-dispose-of materials	Fire extinguishers, batteries, tires, automobiles, motorcycles, large agricultural machinery, pianos, septic tanks, pruned trees over 50 cm in length
(6) Infectious waste	Waste containing or potentially containing infectious pathogens, such as gauze and needles with blood on them from medical institutions, etc.

3.1.2 Transporter types to Landfill Site

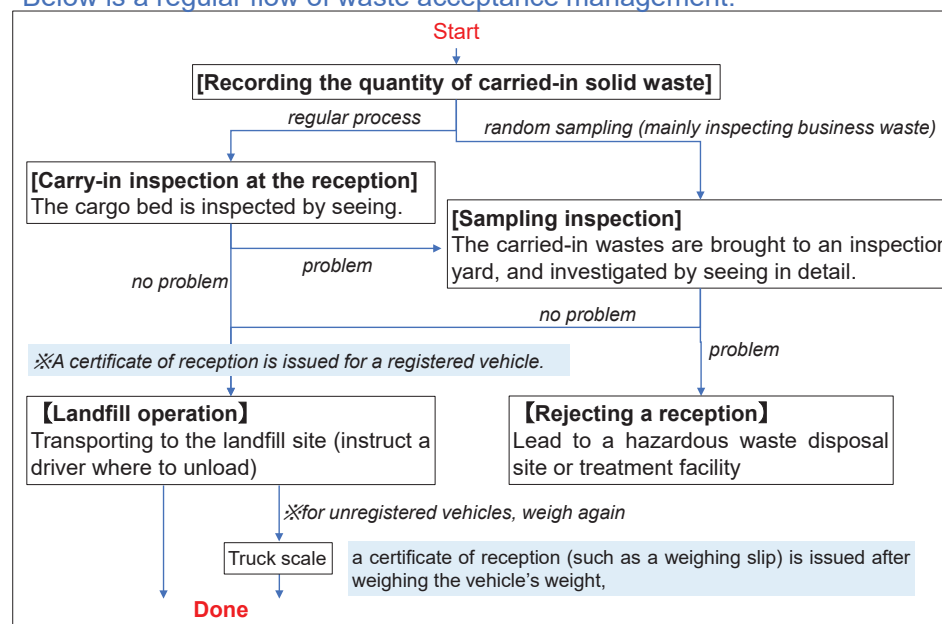
Carrying-in types are shown below.

The acceptance method should be decided for each type.

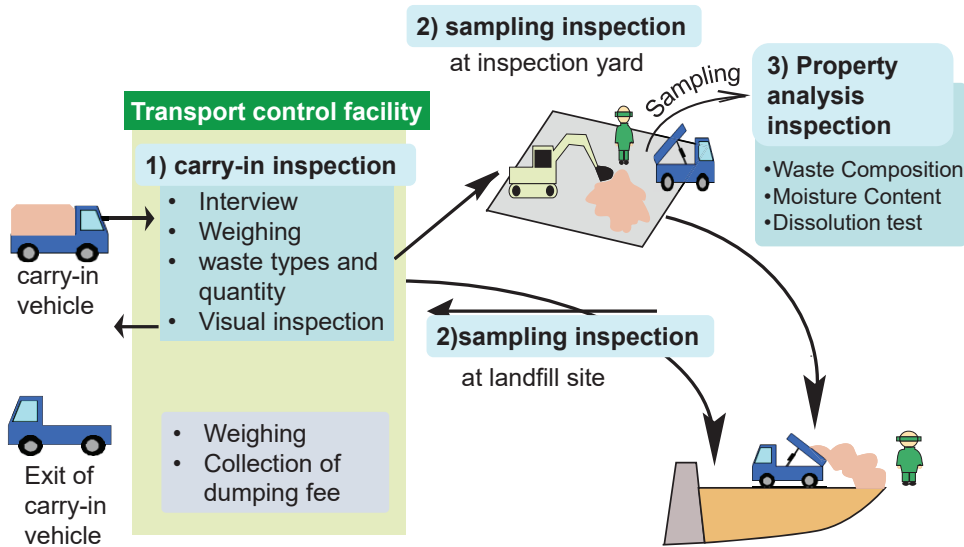


3.1.3 Acceptance Management Flow

Below is a regular flow of waste acceptance management.



3.1.4 Acceptance Test



3.1.5 Transport Control Items

The waste accepted to the landfill should be managed in the following items.

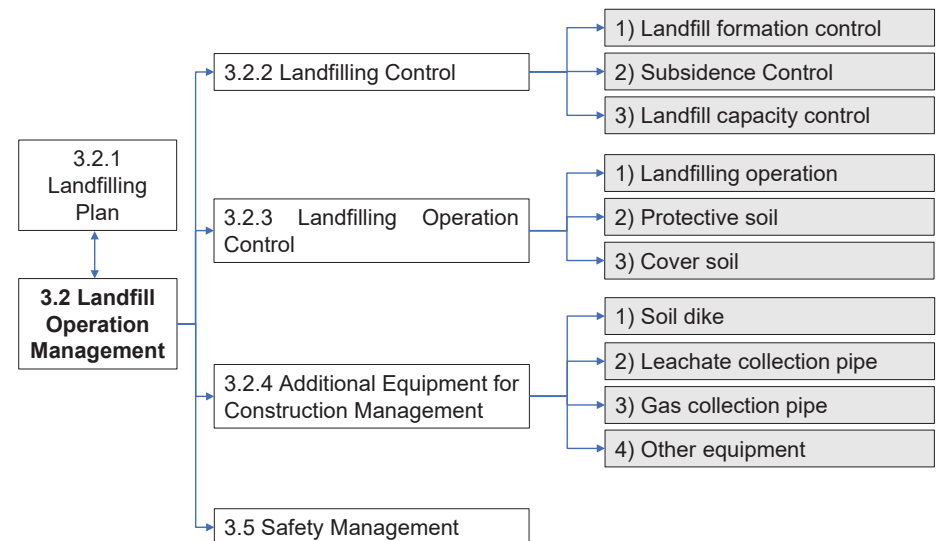
1. Types and properties of waste
2. Amount of waste, Transporter type, etc.
3. Amount and material of cover soil

Date & Time	Vehicle No.	Transporter type	Waste type	Source of waste generated	Region	Loading weight	Vehicle weight	Amount of waste	Remarks

3. Management of Sanitary Landfill

3.2 Landfill Operation Management

3.2 What is Landfill Operation Management?



3.2.1 Landfilling Plan

Objective

A reclamation plan is important to determine the remaining capacity of the landfill site and to predict the timing of the construction of the slope-raising embankment.

The followings should be considered for the landfilling plan

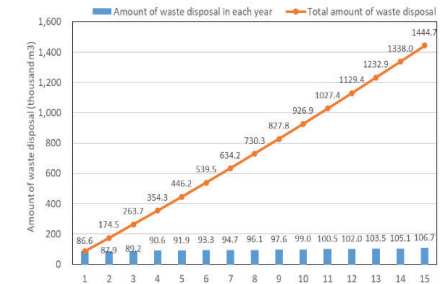
- 1) Yearly Landfilling Plan
- 2) Periodic Landfilling Plan
- 3) Consistency with Leachate Treatment Plan
- 4) Landfilling Method
- 5) Landfilling Equipment

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3.2.1 Landfilling Plan

1) Yearly Landfilling Plan

- A reclamation capacity and an annual reclamation plan of the landfill site should be periodically verified and revised concerning the implementation of the plan.
- A table comparing the predicted and actual landfill delivery by waste material should be prepared.
- The plan should be reviewed when the actual data deviates from the predictions

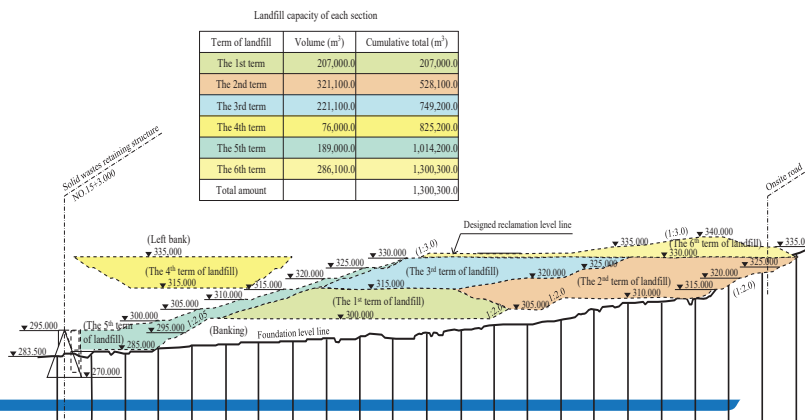


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3.2.1 Landfilling Plan

2) Periodic Landfilling Plan

The landfilling period of a landfill site is usually 15 years, which is a long period, so the landfill plan should be prepared in periods



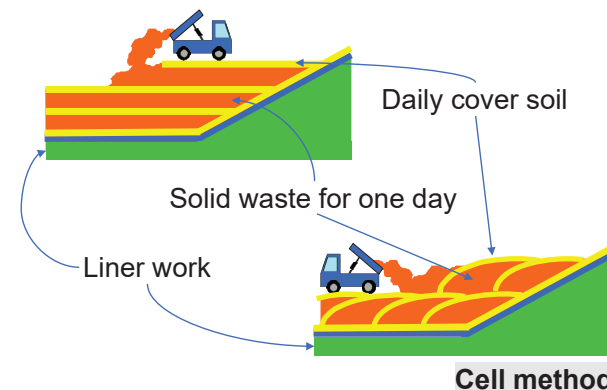
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3.2.1 Landfilling Plan

4) Landfilling Method

There are two kinds of landfilling methods.

Sandwich method



The cell method is better in terms of environmental and safety management.

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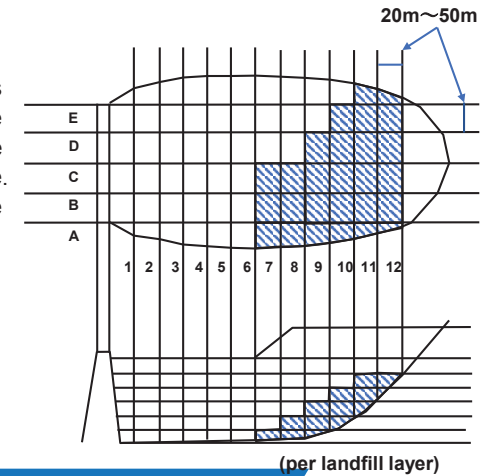
5) Landfilling Equipment

Type	Waste		Protective soil and cover			Transport	Movement
	Leveling	Surface compaction	Excavation	Leveling	Surface compaction		
Bulldozer	⊙	○	△	⊙	○	×	○
Tractor shovel	○	○	⊙	○	○	○	○
Compactor (Blade)	⊙	⊙	×	○	⊙	×	×
Compactor (Bucket)	○	⊙	△	△	⊙	○	×
Hydraulic power shovel	×	×	⊙	△	×	×	×
Wheel Loader	○	×	△	○	×	○	⊙

3.2.2 Landfilling Control

1,2) Landfill formation and Subsidence Control

- Purpose
 - Ensure consistency between plans and actual results of landfill reclamation shape.
- Measuring method
 - Set up measurement stakes based on the several reference piles installed beforehand at the location unaffected by subsidence.
 - Measure a distance and angle using a transit and tape measure.
- Frequency
 - Once or twice a month

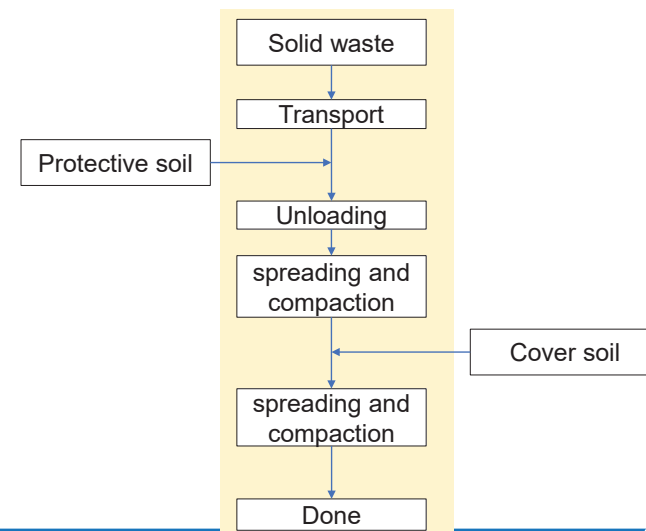


3) Landfill Capacity Management

- Actual Landfilled Volume
 - Calculated from the landfilling control results.
 - *Calculated by the amount of carried-in waste if it is difficult to do the landfill reclamation control.
 - The results are compared with the annual landfilling plan and used as basic data for reviewing the landfill plan in the future.
- Calculation of Landfill Capacity
 - “Landfill Capacity (m³) “
 - = “Total landfill capacity” – “Actual landfilled volume”
- Frequency
 - Once a month

3.2.3 Landfilling Operation Management

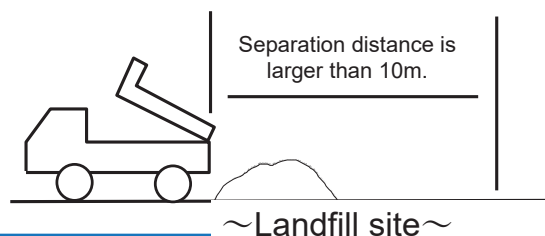
Below is the flow of landfilling operation



1) Landfilling Operation

In unloading from transport vehicles, below are cautions

- Covered and compacted to prevent flat tires on the hauling vehicle
- Keep carrying-in vehicles out of the landfill area to avoid contact with heavy landfill equipment.
- Keep a certain distance from the bottom of the slope at which the waste is unloaded.



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1) Landfilling Operation

In spreading and compaction work, below are the cautions.

- Spread over a whole area as wide as possible.
- Decide the daily landfill area and thickness
- The thickness of compacted waste is 30 to 50 cm
- Compact in 5 to 6 round trips
- The speed of a compactor is low, the first gear.
- After the completion of compacting all the layers in a day, start the second layer.
- No humans and vehicles during spreading and compaction.
- Take care near a sloped area and a gas treatment pipe.
- Take care of the sheets of the liner facility on the first layer.
- In the slope area, spread, and compact in an upward direction.

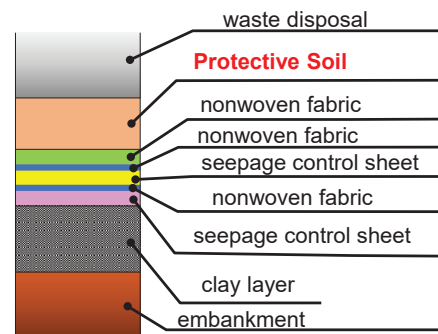
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2) Construction of Protective Soil

Protective soil is important to protect the sheet of the liner facility

Protective soil shall be constructed according to the following

- Securing Protective Soil
- Putting in slope protection soil
- Putting in bottom protective soil
- Measures against sheet shrinkage



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3) Construction of Soil Cover

- Purpose
 - Leachate volume control
 - Prevention of spattering and runoff
 - Prevention of stench dispersion
 - Fire prevention
 - Vector control
 - Closure of landfill termination parcels



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3) Construction of Soil Cover

There are three types of soil cover.

Type	Purpose	Frequency
Daily Soil Cover	<ul style="list-style-type: none"> Prevent scattering of landfill waste and drainage of rainwater. 	Every day
Intermediate Soil Cover	<ul style="list-style-type: none"> Pathway for the vehicles Drainage of rainwater in the landfill areas 	each height in 2.0 to 3.0 m
Final Soil Cover	<ul style="list-style-type: none"> Use the landfill site, which is completed landfilling works, as another site. 	After completing all landfilling works.

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3. Management of Sanitary Landfill

Facility Management

Additional equipment should be constructed according to the progress of landfilling

- Main Additional Equipment
 - Soil dike
 - Leachate collection pipes
 - Extension of the vertical gas venting system



Prepare a list of additional equipment to be installed during reclamation to ensure that it is installed, and that the reclamation staff is made aware of it.

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3.3 What is Facilities Management?

- Prevention of impacts on the surrounding environment
- Prevention of accidents due to abnormalities
- Proper implementation of waste delivery, landfill operations, and leachate treatment
- Ensure proper and economical operation of facilities
- Prevention of damages to facilities due to landfill operations, etc.
- Health care of staff and workers

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Contents of Facility Management

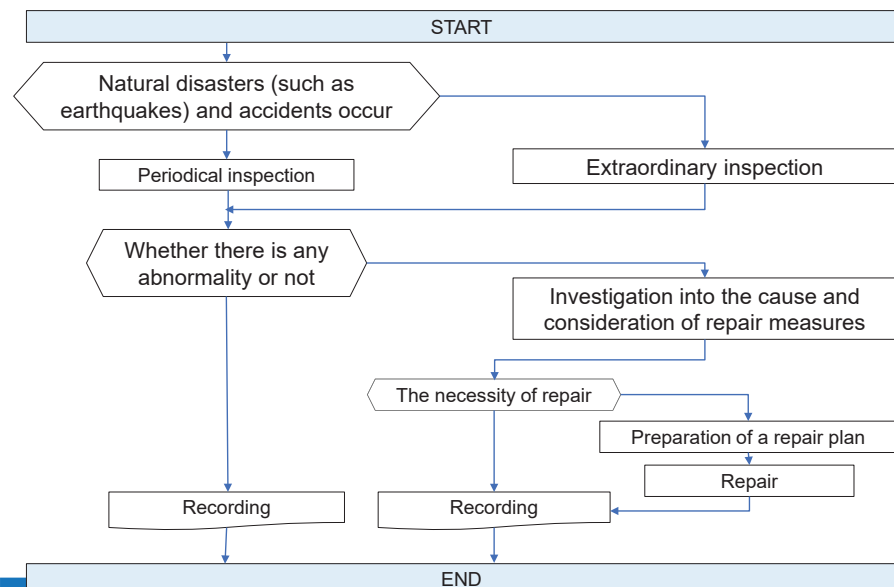
- **Inspection** : Inspections of facilities for damage or defects, or for the progress of damage, with a plan for the next period, frequency, and items to be inspected. Various methods are available, including visual and photographic inspections, physical inspections using measuring instruments, and scientific analysis.
- **Repair** : Repair or update a facility to restore damage to the facility.
- **Damage Prevention**: Prevention of damage to facilities caused by landfill equipment during landfill operations
- **Cleaning**: Cleaning and dredging of stormwater collection and drainage facilities

Inspection Types

There are three types of inspections for the facility management.

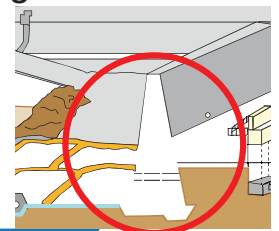
Inspection	Frequency	Contents
Daily Inspection	Periodically (daily, weekly, yearly) - The frequency is decided in each facility	The main objective is to detect damage as early as possible.
Detailed inspection	In case that facility damages are found by the daily inspection, and it is difficult to judge doing repairment.	Using suitable test equipment for each facility
Abnormality Inspection	It shall be conducted after disasters such as earthquake, heave rain, and cyclone.	Do check same items with the daily and detailed inspections.

Procedure of the Abnormality Inspection



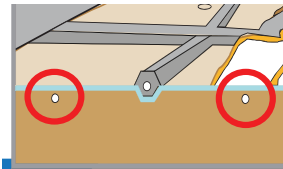
3.3.2 Storage Structure

- **Main method of maintenance**
 - Visual check about cracks, leakage and so on, every day.
- **Adverse effect without the maintenance**
 - landfill collapse
 - water pollution into the surrounding river.



3.3.3 Groundwater Collection Facilities

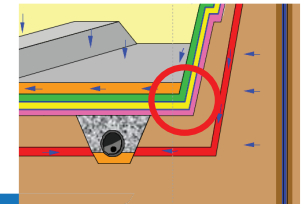
- **Main method of maintenance**
 - Visual check, measure of water quantity and water quality test
- **Adverse effect without the maintenance**
 - Groundwater damages the liner facility by pumping pressure, and the landfill do a collapse or slide.
- **Remarks**
 - The facility cannot be directly controlled because it is installed below the liner work. The maintenance is conducted by monitoring groundwater quantity and quality.



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3.3.4 Liner Facility

- **Main method of maintenance**
 - Visual check about a hole, crack, and tear and so on.
 - Quantity and quality test of the groundwater
- **Adverse effect without the maintenance**
 - Leachate water is discharged into the groundwater and causes water pollution.

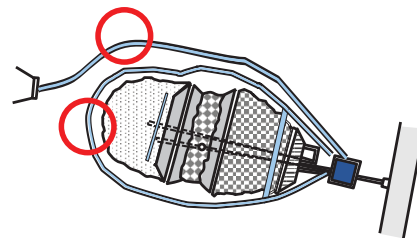


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3.3.5 Rainwater Collection Facilities

1) Rainwater Drainage Canal

- **Main method of maintenance**
 - Do visual check about a crack, damage, leakage, growth of surrounding plants and so on
- **Adverse effect without the maintenance**
 - Flood
 - Water pollution into the surrounding river and sediment.

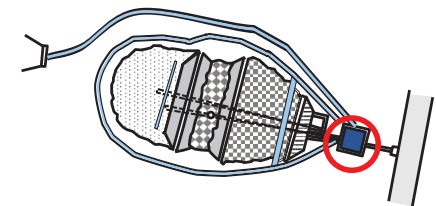


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3.3.5 Rainwater Catchment Facilities

2) Disaster Prevention Pond

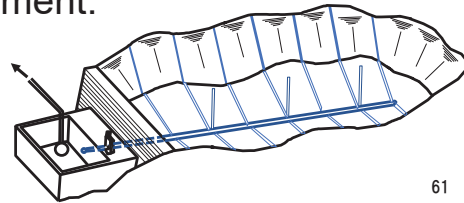
- **Main method of maintenance**
 - Do visual check about a water level, crack, damage, leakage, growth of surrounding plants and so on.
- **Adverse effect without the maintenance**
 - Flood
 - Water pollution into the surrounding river and sediment.



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3.3.6 Leachate Collection Facilities

- Main method of maintenance
 - Measure water level in the landfill
 - Do visual check of leachate quantity, a crack of the landfill and so on.
- Adverse effect without the maintenance
 - Leachate is stored in the landfill.
 - Water pollution into the surrounding river, groundwater and sediment.



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3.3.7 Leachate Treatment Facility (1)

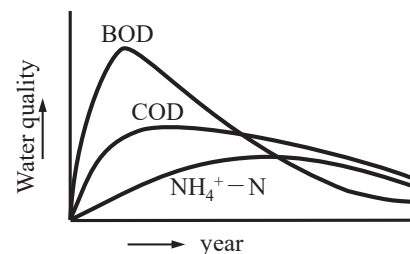
- Main method of maintenance
 - Visual check of cracks and damages of each equipment.
 - Check a treatment plant according to the manual
- Adverse effect without the maintenance
 - Water pollution into the surrounding river, groundwater and sediment.
 - Flood



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3.3.7 Leachate Treatment Facility (2)

- Countermeasure against fluctuating water quality and quantity.
 - The amount of leachate is fluctuating depending on the **dry/wet season** or **the early/middle/end stage of the landfill**.
- Prepare the treatment plan according to the season and the stage



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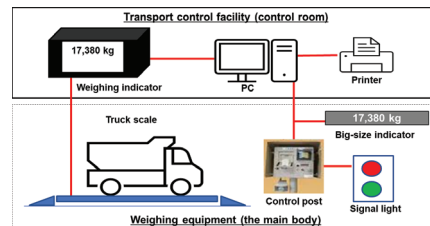
3.3.8 Landfill Gas Treatment Facilities

- Main method of maintenance
 - Clean surrounding the facility and visual check of cracks and damages.
 - Check temperature, amount and property of landfill gas.
- Adverse effect without the maintenance
 - Landfill gas is stored in the landfill, and causes fire accident and health hazard.
 - Delay a landfill stabilization.



3.3.9 Transport Control Facilities

- **Main method of maintenance**
 - Visual check of cracks and damages of each equipment.
 - Check of facility according to the manual
- **Adverse effect without the maintenance**
 - Unable to measure the amount of carried-in waste.
 - Unable to make a landfill plan.



3.3.10 Environmental Monitoring Facilities

- **Main method of maintenance**
 - Operation test of each equipment
- **Adverse effect without the maintenance**
 - Unable to measure any environmental factors.
 - Water pollution into the surrounding environments, rivers, groundwater, and sediments.
 - Air pollution
 - Noise & Vibration



3.3.11 Control Building

- **Main method of maintenance**
 - Visual and operation check of the buildings and the equipment of air-conditioning, lighting, firefighting, and so on.
- **Adverse effect without the maintenance**
 - Unable to manage the whole landfill operation.
 - Health problems of the staff



3.3.12 Road Equipment

- **Main method of maintenance**
 - Visual check of a road crack, and obstructions.
- **Adverse effect without the maintenance**
 - Flat tire
 - Vehicle breakdowns
 - Traffic jam
 - Vehicle accidents



3.3.13 Vehicle Wash Facilities

- **Main method of maintenance**
 - Visual check of cracks and damages.
 - Clean up the facilities
 - Operation check of the washing equipment.
- **Adverse effect without the maintenance**
 - Carrying-out the landfill waste with the vehicle.
 - Flat tire.



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3.3.14 Littering Prevention Equipment

- **Main method of maintenance**
 - Visual check of damages of the fences and pillars.
 - Clean up waste on the fences.
- **Adverse effect without the maintenance**
 - Waste runoff into the surrounding areas and rivers.



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3.3.15 Fire Protection Equipment

- **Main method of maintenance**
 - Visual check of water level in the firewater tank, and of a crack of the pipes.
 - Operation check of the supply water pump and fire hydrant.
- **Adverse effect without the maintenance**
 - Unable to start immediately extinguishing fire
 - Fire spread



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3. Management of Sanitary Landfill

3.4 Environments Management

3.4 What is Environments Management?

Landfill activities influence the surrounding environment.

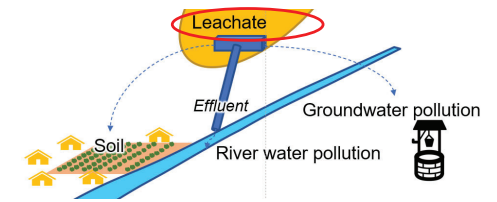


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3.4.1 Leachate Management

Negative influences on;

- River
- Groundwater
- Soil



The measuring point is at the point of discharge from the landfill.

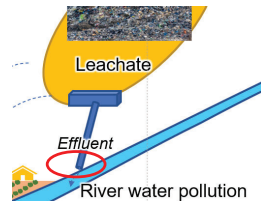
measurement item	Frequency
Precipitation, wind direction and speed	24-hour
Leachate volume	24-hour
Leachate level in landfill	24-hour *automatic measurement 1 time/week *manual measurement
Leachate water quality	described in the guideline

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3.4.2,3 Effluent and Dewatered Sludge Management

3.4.2 Effluent

- Negative influences on rivers and soils
- The measuring point is the discharge point from the landfill site.



measurement term	Frequency
effluent volume	24-hour
effluent water quality (standard parameters are described in the guideline)	described in the guideline

3.4.3 Dewatered Sludge

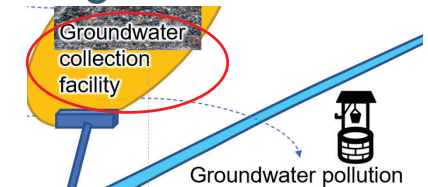
- Negative influences on the disposal site.
- The measuring point is inside the leachate treatment facility.

measurement item	Frequency	remarks
moisture content	4 times/year	Less than 85
dissolution test	1 time/year	described in the guideline

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3.4.4 Groundwater Management

- Negative influences on the surrounding groundwater



measuring point	measuring item	Frequency
Groundwater monitoring wells	Groundwater level	4 times/year
	Groundwater quality	24-hour *automatic 1 time/month *manual
Groundwater collection		
Drainage pits	Cl ⁻ , BOD, COD, SS, Coliform count	1 time/month 1 time / month
	Other parameters (see the guideline)	1 time/year
etc.		
Surrounding wells	Groundwater quality	Cl ⁻ Other parameters (see the guideline)
		as necessary

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3.4.5 Landfill Gas Management

Negative influences on

- Air pollution

The measuring point

- Discharge points of gas collection pipes



measurement item	Frequency	
	at the time of closing	other times
Gas temperature	4 times/year	2 times/year
Amount of landfill gas generated	4 times/year	2 times/year
Landfill gas composition	4 times/year	2 times/year

3.4.12 Summary of Monitoring Plan

Make a summary of the monitoring plan to manage daily.

Classification	Contents	Parameter	Location	Frequency
Landfilling area	Leachate	volume	discharge point from a landfill site	24-hour
		water quality	discharge point from a landfill site	
Surrounding area	River water	pH, BOD, COD, SS, T-N, Ca ²⁺ , CL ⁻ , etc.	surrounding river	1 time/month
		Environmental standard items related to water pollution, etc.	surrounding river	1 time/year
	Odor	following to the regulation	boarder of the landfill site	1 time/year
	Sediment	following to the regulation	surrounding the landfill site	1 time/year
	Noise	Machine operating noise and vibration	housing area surrounding the landfill site	1 time/year



3.4.6~11 Surrounding Environmental Management

Measuring each environmental item outside the landfill site.

Measurement item		Frequency
3.4.6 River water	pH, BOD, COD, SS, T-N, Ca ²⁺ , CL ⁻ , etc.	1 time/month
	Environmental standard items related to water pollution, etc.	1 time/year
3.4.7 Odor	Odor 22 substances (see the guideline)	1 time/year
3.4.8 Sediment	Regulations (see the guideline)	1 time/year
3.4.9 Noise and Vibration	Machine operating noise and vibration	1 time/year
	Road traffic noise and vibration	1 time/year
3.4.10 Air pollution	Dust	1 time/year
3.4.11 Natural Environment	Animal : categorize the species and count the number	1 time/year
	Plant: categorize the species and count the number	1 time/year
	Scenery: record the landscape around the landfill site by photo	1 time/year

3.4.13 Vector Control

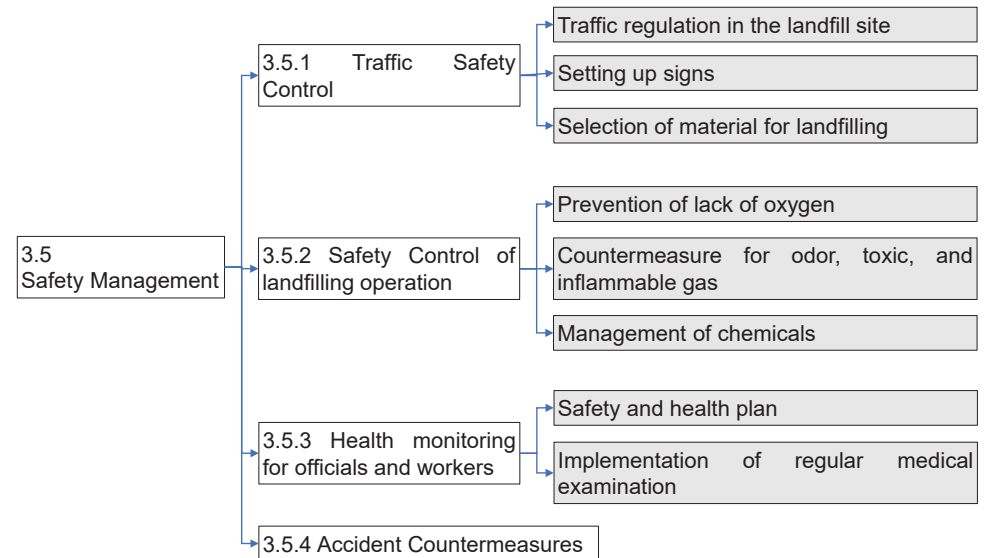
3.4.14 Prevention of Waste Littering

- Vectors in a landfill
 - Crows and other sanitary pests and animals.
- Waste littering
 - Wind
 - Crows and other sanitary pests and animals.
- Countermeasures
 - Covering the soil promptly every day as much as possible.
 - Pesticide

3. Management of Landfill

3.5 Safety Management

3.5 Outline of Safety Management



3.5.1 Traffic Safety Control

- **Traffic rules in the site**
 - Restrictions on roads other than entry/exit routes, designation of one-way streets, and other regulations as necessary to ensure the smooth passage of waste delivery vehicles, etc.
 - To ensure the safety of workers, crosswalks, etc., are provided and road crossings are restricted.
 - Speed Limit: 20 to 30 km/h
- **Installation of signboards**

Item	Examples
guide sign	entrance and exit instructions, direction, direction and distance, landfill site guidance, etc.
warning sign	Intersection sign
regulation sign	Entry restrictions, one-way streets, speed limits, temporary stops, etc.

3.5.2 Safety Management of Landfilling Operation

- **Oxygen deficiency**
 - Ventilation
 - Measurement
 - Protective gear
 - Education
 - Signboard
- **Odors, and Noxious and flammable gas**
 - Detection of gas leak location
 - Disaster

3.5.3 Health care management for staffs and workers

- **Safety Measures**
 - Preventive measures should be taken in advance against possible disasters for each operation.
- **Hygiene measures**
 - Preventive measures against occupational diseases caused by work with hazardous gases, dust, and lack of oxygen
- **Health and Safety Education**
 - Training in the workplace and outside of the workplace
- **Health Management**
 - Health management: Periodic health checkups

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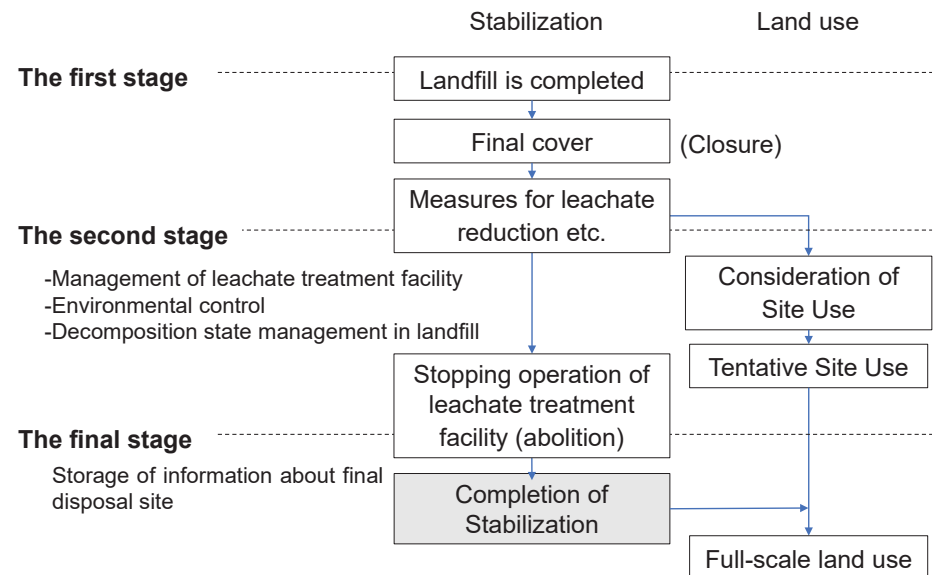
3.5.4 Accident Countermeasures

- **Countermeasures in advance**
 - 1) an internal contact network
 - 2) emergency contact information (outside the company)
 - 3) reporting procedures
 - 4) training on the assumption of an accident
- **Countermeasures after an accident**
 - 1) Conduct emergency inspections of each facility
 - 2) Make a decision as soon as possible on whether to continue delivery and notify the customer.
 - 3) Report abnormalities not only internally, but also externally as necessary (consider reporting to local residents as well as government agencies)

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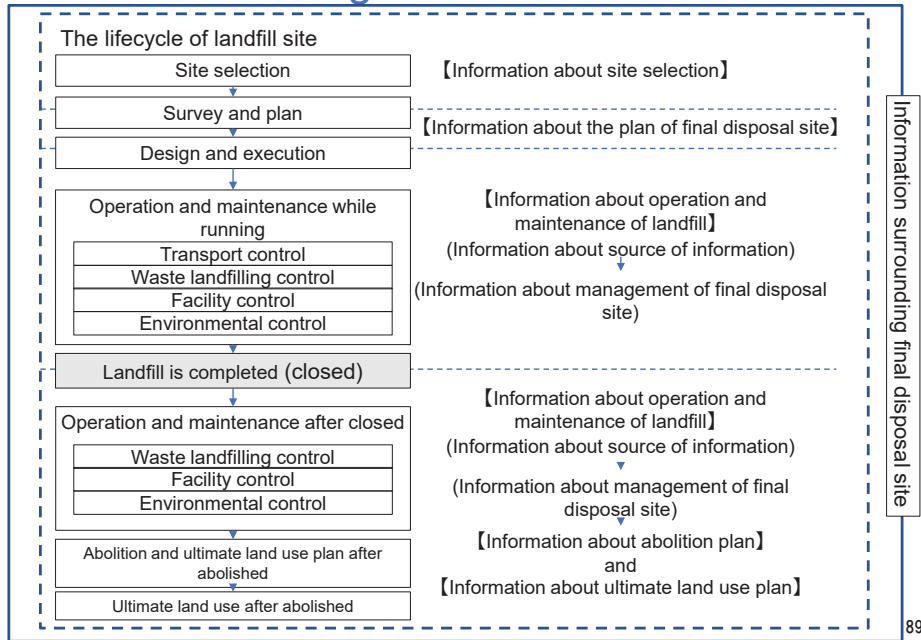
4. Site Management after Landfill Completion

4.1~4.4 Outline of closing a landfill and land use after



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Information management



Appendices of Chapter 2.6
Activities Related to Output 5

Appendix 6-1

DSMAS Operating Expense Accounts from
2016 to 2022

Appendix 6-2

DSMAS Operating Revenue Accounts from
2016 to 2022

Appendix 6-3

Financial Sustainability Strategy of Solid Waste
Management in Maputo City

Appendix 6-4

Plan for Updating the regulations related to
SWM in Maputo City

Appendix 6-5

Organizational and Human Resources
Development Plan of DSMAS

Appendix 6-1
DSMAS Operating Expense
Accounts from 2016 to 2022

BUDGET EXECUTIONS								
Classificação Económica	Descrição	2016	2017	2018	2019	2020	2021	2022
1.1.1	Salários e Remunerações	24,111,758.00	25,524,149.49	27,337,420.57	29,243,430.39	32,620,851.97	35,471,125.28	37,554,488.16
1.1.1.1.01	Vencimento Base do Pessoal do Quadro	11,812,099.00	12,043,453.61	11,891,350.10	12,566,206.52	14,447,823.44	14,900,255.38	15,196,173.32
1.1.1.1.02	Vencimento Base do Pessoal Fora do Quadro	2,537,170.00	2,728,962.24	3,132,703.61	3,305,449.31	3,258,486.15	3,282,805.63	3,632,027.51
1.1.1.1.04	Pessoal Aguardando Aposentação	810,392.00	1,022,930.21	1,250,904.42	1,316,899.48	1,670,678.05	1,904,701.58	3,046,233.59
1.1.1.1.05	Diuturnidade para pessoal civil	-	4,500.00	4,500.00	-			
1.1.1.1.06	Gratificação de Chefia	231,988.00	323,832.12	454,502.96	583,997.43	641,641.29	830,215.10	935,413.88
1.1.1.1.07	Outras Remunerações Certas	1,025,000.00	1,039,201.54	1,099,028.97	3,123,502.33	3,033,509.36	3,232,146.90	2,613,647.71
1.1.1.1.08	Remunerações extraordinárias	-	12,126.22	26,982.96	17,750.66	92,502.68	190,130.49	58,540.32
1.1.1.1.09	Subsidio de localizacao							
1.1.1.1.10	Subsidio de exclusividade	8,720.00	8,769.35	9,044.40	9,044.40	9,043.80	47,265.90	9,044.40
1.1.1.1.11	Bonos Especial	3,370,108.00	3,710,544.26	4,422,157.84	4,971,048.42	5,854,602.80	5,654,491.26	5,841,335.94
1.1.1.1.12	Rectroativos salariais do exercicio corrente para o pessoal civil		583,673.25	-				
1.1.1.1.13	Bonus de rendibilidade para pessoal civil							
1.1.1.1.14	abaonos 13: mês	1,269,978.00	588,683.26	1,425,436.50	1,523,107.15	1,568,028.93	1,640,470.86	1,814,071.87
1.1.1.1.99	Outras Remunerações	3,046,303.00	3,457,473.43	3,620,808.81	1,826,424.69	2,044,535.47	3,788,642.18	4,407,999.62
1.1.2	Outras Despesas com o Pessoal	232,675.60	1,183,425.05	451,129.18	1,074,746.99	313,350.00	762,340.00	740,733.28
1.1.2.1.01	Ajudas de Custo dentro do País	31,110.00	72,625.00	58,415.00	41,400.00	77,400.00	312,600.00	28,200.00
1.1.2.1.02	Ajudas de Custo fora do País	193,065.60	943,917.10	183,220.70	852,884.00			
1.1.2.1.05	Representação	-	45,000.00	45,000.00	45,000.00	47,250.00	4,500.00	210,593.28
1.1.2.1.06	Subsídio Combustível e Manutenção de Viaturas	8,500.00	121,882.95	164,493.48	135,462.99	188,700.00	445,240.00	501,940.00
1.1.2.1.07	Suplemento de Vencimentos	-	-	-				
1.1.2.1.09	subcidio de telefone	-	-	-				
1.1.2.1.99	Outras Depesas com pessoal civil	-	-	-				
1.2.1.0.00	Bens	12,613,681.96	12,219,731.12	12,175,022.32	7,984,473.90	12,764,186.00	5,690,052.51	3,294,401.31
1.2.1.0.01	Combustíveis e lubrificantes	7,652,198.75	8,950,587.81	9,377,488.38	4,736,358.20	7,667,804.43	2,137,800.00	1,978,811.20
1.2.1.0.02	Material para manutenção e reparação de bens imóveis	72,871.52	37,633.93	80,541.54	70,224.65	202,469.10	501,935.00	91,316.38
1.2.1.0.03	Material para manutenção e reparação de bens móveis + (RC)	1,100,876.00	1,636,011.73	1,278,532.25	1,955,454.20	1,819,043.48	1,076,578.50	239,716.88
1.2.1.0.05	Material de consumo para escritório	405,761.14	903,006.54	942,627.60	400,593.86	413,700.00	524,825.00	233,185.00
1.2.1.0.07	Fardamento e calçado	-	-	-	-	977,581.80	-	-
1.2.1.0.10	Géneros alimentícios	2,030,988.57	135,964.45	126,602.54	30,057.47	181,013.05	88,178.78	72,356.85
1.2.1.0.11	Material de limpeza e higiene	461,150.11	222,441.14	207,918.49	131,949.12	677,114.14	642,361.60	182,520.00
1.2.1.0.21	Material para festividades homenagens e premiação	338,782.50	-	-	297,443.40	-	-	5,265.00
1.2.1.0.22	Material de consumo para informática	304,033.98	321,596.20	90,105.00	313,710.00	440,500.00	376,778.29	489,850.00
1.2.1.0.26	Material de consumo para copa e cozinha	-	-	100.00	-	-	121,110.00	
1.2.1.0.31	Material para conservacao de rede de electrificacao	-	669.32	1,330.95	-	384,500.00	1,195.60	1,170.00
1.2.1.0.32	Material para aplicacao em projectos sociais e assistencia social	-	-	-	-	-	-	
1.2.1.0.34	Material para conservação de rede de água e esgoto	-	-	69,005.57	5,639.00	460.00	219,289.74	
1.2.1.0.98	Outros Bens	247,019.39	11,820.00	770.00	43,044.00			210.00
1.2.2.0.00	Serviços	269,183,421.31	323,111,625.14	277,593,181.56	529,378,426.63	501,334,463.10	368,509,449.91	450,395,571.52
1.2.2.0.01	Comunicação em geral	461,443.65	561,037.71	652,535.71	430,283.33	200,000.18	247,353.54	134,993.69
1.2.2.0.02	Passagens dentro do país	41,769.00	23,580.00	-	2,640.00	3,800.00	720.00	97,050.00
1.2.2.0.03	Passagens fora do país	7,974.00	-	-	279,488.00			471,449.00

1.2.2.0.05	Manutenção reparação de bens imóveis	44,109.00	-	-				
1.2.2.0.06	Manutenção e reparação de bens móveis	74,593.35	127,972.56	274,829.96		8,892.00	150.00	237,812.45
1.2.2.0.07	Manutenção e reparação de veículos	829,570.58	671,058.93	163,758.23	9,745.63	85,576.94	241,620.40	1,158,891.41
1.2.2.0.08	Transporte e Carga							421,200.00
1.2.2.0.09	Seguros							9,614.00
1.2.2.0.10	Servicos de representacao	-	-	-		20,277.50	648,922.95	
1.2.2.0.11	Festividades homenagens e premiação	-	-	-	218,850.00			
1.2.2.0.12	Água	537,993.79	361,334.99	413,882.10	610,635.42	579,343.55	1,202,808.49	650,614.06
1.2.2.0.13	Energia eléctrica	322,756.58	542,607.24	716,724.38	900,487.25	964,071.79	1,215,340.99	769,417.28
1.2.2.0.14	Consultoria e assistência técnica residente - pessoa singular (RC)	1,342,775.00	2,405,302.50	1,447,994.00	31,941.00			171,990.00
1.2.2.0.15	Consultoria e assistência técnica residente - pessoa colectiva	-	-	-	156,065.00			1,053,049.12
1.2.2.0.16	Consultoria e assistência técnica não residente - pessoa singular	-	-	-	-			
1.2.2.0.17	Consultaria e assistencia technica nao residente - pessoa colectiva							
1.2.2.0.18	Contratos de manutencao para maquinas e equipamentos	678,663.20	-	357,275.29		3,084,568.34	3,168,938.16	1,783,848.00
1.2.2.0.19	Locacao de bens moveis					3,486,600.00	198,494.01	3,486,600.00
1.2.2.0.21	Limpeza e conservacao			972.00				
1.2.2.0.24	Serviços gráficos	254,767.05	-	-	1,500.00	1,500.00	535,177.89	
	Servicos a projectos de assistancia social							
	Manutencao e reparacao de estradas e vias							
	Manutencao e reparacao de rede de electrificacao					308,655.95		
1.2.2.0.28	Manutencao e reparacao de rede de agua e esgoto	103,390.00	36,765.24	-				299,550.10
1.2.2.0.99	Outros Serviços + (RC)	264,483,616.11	318,381,965.97	273,565,209.89	526,736,791.00	492,591,176.85	361,049,923.48	439,649,492.41
1.4.1.0.0	Transferências correntes a Administrações Públicas	75,000.00	127,862.89	80,000.00	125,000.00	-	-	-
	Transferencias correntes a institucoes autonomas	75,000.00	85,000.00	80,000.00	125,000.00			
	Outras transferencial correntes a administracoes publicas		42,862.89					
1.4.2.0.0	Transferências correntes a Administrações Privadas							
1.4.3.0.0	Transferencias correntes a familias	-	-	-	-	146,456.00	383,839.13	287,776.00
	Subsidio por morte para civis							
	Subsídio funeral					130,000.00	160,000.00	230,000.00
	Transferencias a comunidade local					16,456.00	223,839.13	57,776.00
1.6.0.0.0	Execícios Findos	1,989,498.87	-	1,390,122.71	1,892.70	5,309,854.57	-	-
1.6.1.0.0	Retroactivos salariais	1,989,498.87		1,264,040.45				
1.6.2.0.0	Retroactivos de bens e servicos			126,082.26	1,892.70			
1.6.3.0.0	Retroactivos de Pensoes					5,309,854.57		
1.7.0.0.0	Demais despesas correntes	49,608.00	-	-	25,764.24	-	-	270,000.00
1.4.3.4.07	Transferências a comunidade local	49,608.00			25,764.24			270,000.00
	TOTAL OPERATIONS	308,255,643.74	362,166,793.69	319,026,876.34	567,833,734.85	552,489,161.64	410,816,806.83	492,542,970.27
2.0.0.0.0	Despesas de capital					83,287,675.69	29,942,459.16	169,350,883.99
2.1.0.0.0	Bens de capital					83,287,675.69	29,942,459.16	169,350,883.99
2.1.1.0.0	Construcoes					83,287,675.69	25,909,200.50	168,124,743.99
2.1.1.1.0	Construcoes em curso					83,287,675.69	25,909,200.50	168,124,743.99
2.1.1.2.0	Construcoes acabadas							
2.1.2.0.0	Maquinaria equipamento e mobiliarios						4,033,258.66	1,226,140.00
2.1.2.0.07	Maquinas e equipamento refrigeracao							

2.1.2.0.10	Equipamento de Segurança e Sinalização						1,475,398.66	
2.1.2.0.16	Aparelho de som e imagem							79,560.00
2.1.2.0.19	Equipamento Informático							1,146,580.00
2.1.2.0.20	Ferramentas de uso geral							
2.1.2.0.0.99	Outras maquinarias equipamentos e mobiliarios						2,557,860.00	
2.1.3.0.0	Meios de transporte							
2.1.4.0.0	Demais bens de capital							
2.1.4.1.0	Demais bens de capital-bens imoveis						-	-
2.1.4.1.01	Animais							
2.1.4.1.02	Software de aplicacao							
Total		308,255,643.74	362,038,930.80	319,026,876.34	567,706,842.15	635,776,837.33	440,759,265.99	661,893,854.26

Appendix 6-2
DSMAS Operating Revenue
Accounts from 2016 to 2022

ACTUALIZACAO DE RECEITAS

Balancete de Receita Arrecadada de 2016-2019

Rubrica	Provinciãncia	2016			2017			2018		
		DOTACAO (MT)	ACTUAL (MT)	REALIZACAO (%)	DOTACAO (MT)	ACTUAL (MT)	REALIZACAO (%)	DOTACAO (MT)	ACTUAL (MT)	REALIZACAO (%)
1 2 3	Receitas não Fiscais									
1 2 3 2	Coimas e Multas	641,923	329,227	51%	641,923	214,294	33%	641,923	223,815	35%
1 2 3 2 5	Cobrança de Multas DMSC (30%)	641,923	329,227	51%	641,923	214,294	33%	641,923	223,815	35%
	Multa de Residuos Sólidos									
1 3	Receitas Consignadas	175,842,026	149,139,406	85%	192,663,330	153,949,429	80%	220,487,625	172,332,607	78%
1 3 0 5	A Recolha e Tratamento de Lixo	175,842,026	149,139,406	85%	192,663,330	153,949,429	80%	220,487,625	172,332,607	78%
1 3 0 5 1	EDM - CMM (95%)	165,765,962	139,237,225	84%	176,071,474	141,663,806	80%	201,130,841	160,568,848	80%
1 3 0 5 2	Prova de Servico, Taxa de Limpeza	3,800,000	6,372,371	168%	9,854,181	6,555,489	67%	9,854,182	7,328,958	74%
1 3 0 5 3	Taxa de Lixeira Municipal de Hulene	2,700,000	1,454,278	54%	2,998,306	1,323,594	44%	2,998,306	1,364,649	46%
1 3 0 5 4	Contratos de recolha de residuos solidos	3,000,000	1,823,123	61%	3,112,024	3,983,209	128%	5,280,997	2,631,594	50%
1 3 0 5 5	Licencas de provisao de servicos de recolha	376,064	197,139	52%	427,345	402,561	94%	823,299	419,463	51%
1 3 0 5 6	Remocao especial	200,000	55,270	28%	200,000	20,770	10%	200,000	19,094	10%
1 3 0 5 7	Inceneracao	-	-		-	-		200,000	-	
	Licenciamento ambiental									
1 3 0 5	EDM - Prestacao de Servicos (5%)	8,513,998	7,174,468	84%	9,266,920	2,701,712	29%	10,585,834	8,450,992	80%
2 2	Outras Receitas de Capital	864,000	788,473	91%	1,419,251	1,101,688	78%	1,560,000	1,472,719	94%
	Bens imoveis, incluindo rendas e aforos sobre terra									
2 2 2 2	DMGRSU	864,000	788,473	91%	1,419,251	1,101,688	78%	1,560,000	1,472,719	94%
2 2 2 2 4	DMGRSU	864,000	788,473	91%	1,419,251	1,101,688	78%	1,560,000	1,472,719	94%
TOTAL DE RECEITAS		177,347,949	150,257,106	85%	194,724,504	155,265,411	80%	222,689,548	174,029,141	78%

2019			2020			2021			2022		
DOTACAO (MT)	ACTUAL (MT)	EALIZCAA (%)	DOTACAO (MT)	ACTUAL (MT)	ALIZAC (%)	DOTACAO (MT)	ACTUAL (MT)	ALIZAC (%)	DOTACAO (MT)	ACTUAL (MT)	REALIZACAO (%)
641,923	156,829	24%	2,139,743.00	397,635.99	19%	572,005.00	1,463,424.76	256%	2,031,799.00	1,272,631.00	63%
641,923	156,829	24%	2,139,743.00	397,635.99	19%	257,660.00	1,140,783.51	443%	2,031,799.00	1,272,631.00	63%
						314,345.00	322,641.25	103%			
270,640,197	176,417,594	65%	336,525,143.00	168,856,550.66	50%	312,027,680.00	181,210,223.97	58%	205,775,302.00	187,205,282.50	91%
270,640,197	176,417,594	65%	336,525,143.00	168,856,550.66	50%	312,027,680.00	181,210,223.97	58%	205,775,302.00	187,205,282.50	91%
250,000,000	164,051,500	66%	294,117,647.00	157,141,481.79	53%	276,824,616.00	168,916,517.80	61%	164,821,523.00	172,006,372.66	104%
11,137,595	7,221,338	65%	14,695,446.00	7,982,179.37	54%	12,000,000.00	8,261,088.81	69%	18,375,017.00	10,569,285.76	58%
2,998,306	2,149,029	72%	2,998,306.00	1,231,711.30	41%	1,500,000.00	1,274,767.23	85%	794,054.00	1,573,757.26	198%
5,280,997	2,343,871	44%	5,280,997.00	1,783,484.20	34%	2,500,000.00	2,115,540.88	85%	2,204,717.00	1,899,179.82	86%
823,299	548,630	67%	1,032,747.00	653,400.00	63%	1,100,000.00	621,186.25	56%	1,579,991.00	1,149,587.00	73%
200,000	103,226	52%	200,000.00	64,294.00	32%	103,064.00	21,123.00	20%	-	7,100.00	
200,000	-	0%	200,000.00		0%	-	-		-	-	
			18,000,000.00		0%	18,000,000.00	-	0%	18,000,000.00	-	0%
13,157,895	-	0%									
1,560,000	1,303,168	84%	1,560,000.00	1,105,903.10	71%	1,173,642.00	635,937.39	54%	1,173,642.00	329,362.80	28%
1,560,000	1,303,168	84%	1,560,000.00	1,105,903.10	71%	1,173,642.00	635,937.39	54%	1,173,642.00	329,362.80	28%
1,560,000	1,303,168	84%	1,560,000.00	1,105,903.10	71%	1,173,642.00	635,937.39	54%	1,173,642.00	329,362.80	28%
272,842,120	177,877,591	65%	340,224,886.00	170,360,089.75	50%	313,773,327.00	183,309,586.12	58%	208,980,743.00	188,807,276.30	90%

Appendix 6-3
Financial Sustainability Strategy of Solid
Waste Management in Maputo City

FINANCIAL SUSTAINABILITY STRATEGY OF SOLID WASTE MANAGEMENT IN MAPUTO CITY

The principle on which the strategy to achieve financial sustainability in the City's solid waste management is anchored on is **EQUITABILITY**.

The PRINCIPLE of EQUITABILITY
 Revenue enhancement without raising fees;
 Cost optimization without sacrificing operations.

The strategy will neither raise or create new fees, nor will it suggest a difficult compromise in operations to save on costs. Instead, it will bank on natural human tendency to support an endeavor that is perceived to be **JUST, CREDIBLE, and EQUITABLE** where everyone pitches in according to their utility and capacity.

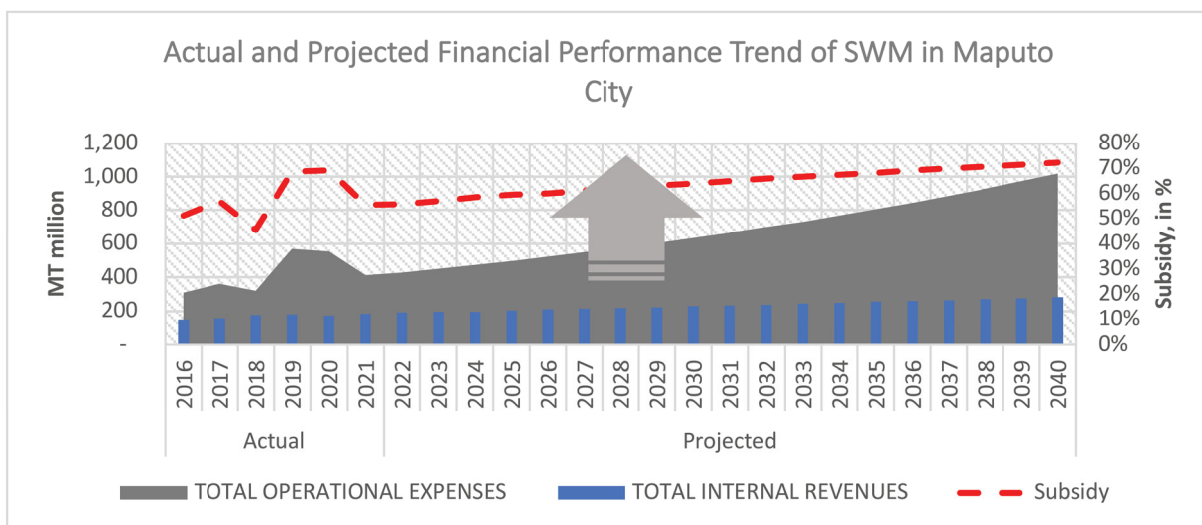


This means attaining sound financial operations will be realized through measures that will: (1) correct current systems, (2) provide mechanisms that would ensure transparency in transactions, and (3) ensure fairness in the distribution of costs of SWM.

The financial sustainability strategy is geared towards encouraging more public participation towards a better solid waste management in Maputo City.

From 2016 to 2021, the sector of SWM had been subsidized by an average of 58%. The years 2019 and 2020 were heavily affected by the unanticipated additional cost requirements after the Hulene dumpsite tragedy in February 2018. Internal revenue, which comprised an average of 42% of operational requirements, had only grown 4% in the last 6 years, whereas costs have annually increased by about 13%.

Given the business-as-usual trend, for internal revenue to catchup with budgetary requirements will be impossible. By 2040, total subsidy can reach over 70%.



With the City's planned investment on more advanced, environmentally-sound technology such as a sanitary landfill, operational funding requirements may double in time, as indicated by the grey-

colored upward pointing arrow on the graph. The already heavily subsidized sector will then require further external financial support, or its operations will direly suffer.

The primary implication of a heavily subsidized sector is that limited government resources will then have to be thinly spread to meet competing demands. The SWM sector is expected to be self-supporting at a reasonable level because of the fees that are charged for its services. However, its mediocre revenue-generation means it will have to compete with other sectors that are equally important but not income-earning, such as education, health, culture, and social welfare.



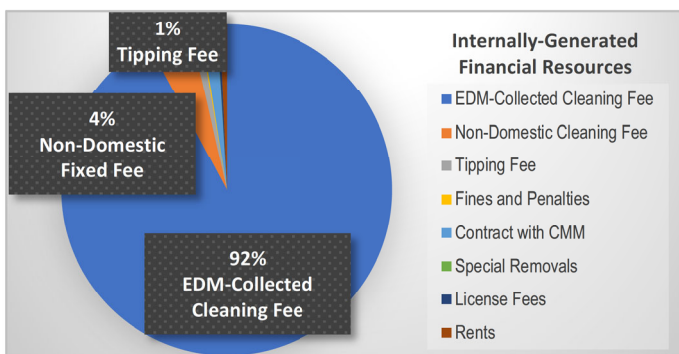
On the other hand, the Government is deeply obliged to subsidize solid waste management. If not, services may stop and this will result to uncollected garbage, filthy streets, and flooding which are problems that are very visual. These would quickly impact on tourism and on the investment attractiveness of the city. Eventually, this creates discontent among the general population and breed more social issues, causing an overall decrease in the quality of life of citizens and visitors.

The need for financial sustainability of the sector is critical. Financial sustainability is a state where self-generated financial resources would be sufficient to cover operational funding requirements. While a fully independent SWM sector is not envisioned in the short- to medium-term, weaning away from subsidy over time means scarce public resources can be freed for other uses. It will also be able to address service gaps in less time. The outcome will be beneficial for all.



Keeping the principle of equitability in mind, the financial sustainability strategy for Maputo City's SWM sector is two-fold because it touches on both revenue and cost sides.

On the revenue side, the strategy will focus on: (1) the cleaning fee collected through the monthly electricity bill, (2) the fixed non-domestic waste generation fee, and (3) the tipping fee.

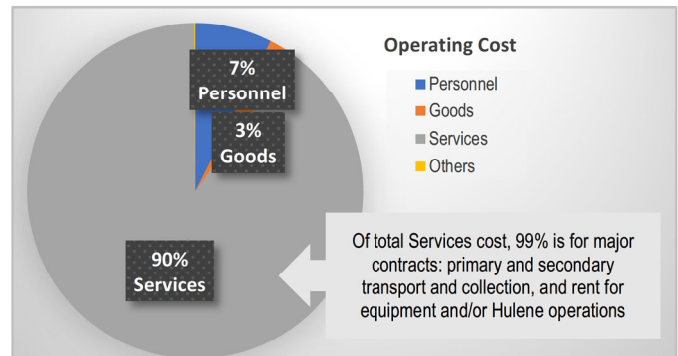


The **taxa de limpeza** is still the primary internal revenue source of the sector, with 92% contribution, overall. Its manner of collection, which is through the electricity bill, is still considered the most efficient method for Maputo City with over 95% electrification rate. Despite this, there are inherent weaknesses in the current fee structure. The strategy will address these.

Meanwhile, the **fixed non-domestic waste fee** imposed on businesses and other institutions is seen to have high potential for increase but the manner in which it is presently collected needs to be anchored on a more efficient --- and existing --- system.

The **tipping fee** for the use of Hulene dumpsite is another internal revenue source with considerable potential for improvement. It is not so much on the fee itself, but, as again, on the way it is collected.

Scrutinizing costs is imperative to financial sustainability. Analysis of the sector from 2016 to 2021 shows that 90% of the total cost of SWM is on provision of Services. And of this, 99% is spent on major contracts for the primary and secondary transport and collection of waste, and the rent for equipment that were used in Hulene operations.



This underscores the criticality of **contract management**. DSMAS, as it is now, must be restructured to give more emphasis on monitoring the performance of all its contractors. DSMAS must give focus on its responsibilities as administrator of contracts. DSMAS must make sure that the City receives appropriate services for the contracted work that it is pays for.

In the interest of optimizing costs¹, the following must be done:

1. A restructure of DSMAS to reflect emphasis on Contracts Management as a key department, among other things;
2. Participation of SWM technical and financial experts in the drafting of *Terms of Reference* when contracting services, which should include key performance indicators, among others, that set conditions for incentives or disincentives;
3. Development of reliable cost benchmarks against which proposals may be assessed or compared;
4. A transparent bids evaluation that involves financial evaluation of proposals;
5. A systematic monitoring of performance against commitments or targets within defined timeframes.



In a recent survey that the JICA Project conducted among over 400 companies in Maputo City, the correlation between waste generation and electricity consumption is statistically significant. Results prove that energy consumption is a good indicator of wealth, which translates to more economic activities, thereby creating waste as a natural by-product. Thus, using the electricity bill as a collection vehicle for the cleaning fee is logical and practical.

However, there are fundamental issues in the current structure of the cleaning fee. First, it distinguishes waste generators according to 3 echelons of electricity consumption: low, medium, high. For both domestic and non-domestic waste generators, the definition of echelons by levels of kWh consumption for the month are the same. This assumes that electricity demand for both types of consumers is identical --- this is not correct.

Energy Consumption	Domestic		Non-Domestic	
	kwh	MT	kwh	MT
Low	Up to 200	45	Up to 200	80
Medium	201-500	75	201-500	160
High	500 <	110	500 <	250

¹ These strategies touching on cost optimization is in collaboration with Output 2 of the JICA Project which aims to improve the operational and institutional efficiency of the SWM sector.

Current Situation for Domestic Waste Generators			
Budget (MT)	Energy Purchase (kWh)	Taxa de Limpeza (MT)	Impact on Budget (%)
100.00	7	45	45%
2,000.00	241	75	4%
5,000.00	611	110	2%

It is also difficult to justify the intervals in consumption levels, and the corresponding fee per level. The set fees are also neither related to the volume of waste generation, nor to the cost of SWM. Furthermore, there is unfair subsidization by the lower income for higher income waste generators within category, as well as across categories. For example, households with only MT100 budget for electricity has to pay the MT45 *taxa de limpeza*. This impacts on their monthly utility budget by 45%. The impact decreases as the consumer becomes richer. It is a classic case of the poor supporting the rich.

Based also on several testimonies, the current charging system of the pre-paid CREDELEC of EDM has limitations. Because the system charges only once a month, the fee is applied only on the first purchase of the month, and usually, it is the lowest fee. If the consumer makes several purchases within the period, which is a typical practice, the household can consume as much energy even going beyond the fee category but without paying a corresponding increase in the *taxa*. Moreover, if a consumer does not purchase electricity for several months, say due to a long travel, they will be charged with the fee multiplied by the number of months they were gone even if they did not generate waste in the City for that period.



In 2021, the cost of SWM² was MT0.84/kg.³ During this year, the total waste generation was 448.2 million kilograms, of which 61% came from the households (domestic waste), and 39% from businesses, institutions and other such entities (non-domestic waste).

The electricity company, EDM, also reported a total energy consumption of 506.2 MW, in the 2021 Statistical Yearbook of the INE.

Using published data on electricity consumers and their corresponding consumption, and relating them to waste generation, it was calculated that an average domestic consumer (a household connection in EDM) produces 0.71kg of waste for every 1kWh of energy consumed. On the other hand, an average non-domestic consumer (a commercial connection in EDM) produces 1.45kg of waste for every 1kWh consumed.

By putting together the unit cost of SWM (MT/kg) and the waste generation per energy consumed (kg/kWh), the appropriate unit pricing of SWM anchored on electricity consumption is derived for the year 2021 with MT/kWh as unit of measure.

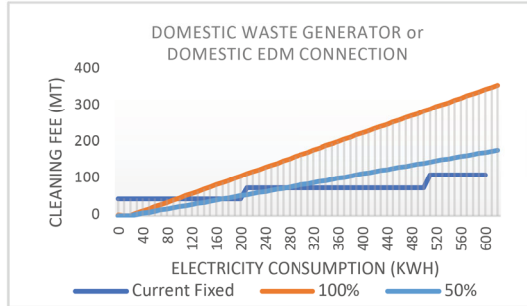
Domestic: MT0.59/kWh
Non-Domestic: MT1.21/kWh

This unit cost can be revised and updated every 3 or 5 years depending on policy to reflect the appropriate levels of cost, waste generation, and electricity consumption.

² Referring only to Goods and Services [Personnel Cost is not considered as cost to recover.

³ MT374.6million total DSMAS budget less personnel cost / 448.2million kilograms of waste generated

Budget (MT)	Energy Purchase (kWh)	Taxa de Limpeza (MT)	Impact on Budget (%)
100.00	12	7	7%
2,000.00	231	148	7%
5,000.00	579	372	7%



Applying 100% of the unit costs on the electricity bill of domestic and non-domestic EDM connections will allow the City to efficiently collect the total cost of SWM, less Personnel costs. And there would be no need for any other fees to generate other revenues.

The strategy also presents enough flexibility for policy-makers to ensure full public understanding and acceptability of this innovative change.

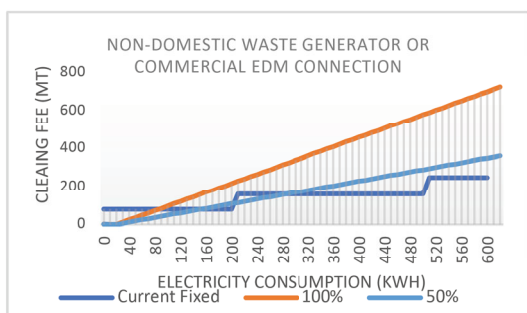
At MT0.59/kWh or 100% of domestic unit cost, the impact on all household budgets for the monthly electricity bill is 7%. If the 100% unit cost is implemented, households consuming an average of 75kWh of energy will feel a reduction in the taxa de limpeza. At 50% unit cost implementation, even households consuming 150kWh⁴ per month will feel the benefit.

Analysis shows that for CMM to generate increase in total revenue with this strategy on households, the Government can choose from a minimum of 50% unit cost implementation; but we recommend an option between 75% to 100%.

Nonetheless, at any scenario, a consumer with only MT10 will be able to afford electricity and as well as contribute fairly to the cost of SWM in the City, correspondent to his economic status.

Similarly, for the commercial connections of EDM, or the non-domestic waste generators, decision-makers may choose a reasonable level of implementation of the MT1.21/kWh unit charge.

The impact of the unit cleaning fee on commercial consumers is bigger than on the households because they require more energy for their operations and also produce more wastes as a by-product of their economic activities.



At 100%, the impact of the fee on the monthly electricity bill will be high at 30%. This could potentially spark protest among members of the private sector, given that they are also required by law to contract private service providers for the transport and collection of their waste.

Policy on Unit Cost for SWM	Impact on Budget for Electricity
100%	30%
75%	23%
50%	15%
45%	14%
40%	12%
35%	11%
30%	9%

With a lower policy on the unit price application, this unfavorable scenario can be avoided by choosing a policy of up to 30% implementation of the unit cost. Thus, instead of imposing the full MT1.21/kWh, only MT0.36/kWh will be applied which takes away just 9% from the electricity bill.

The study proposes a reasonable policy between 30% to 40% for non-domestic waste generators, which includes businesses, social and public institutions, as well as all other private local and international organizations.

⁴ Even higher than the average domestic monthly consumption of 120.45kWh in Maputo City

Current fixed cleaning fee collected from non-domestic waste generators

Category	Waste Generation per day	Corresponding Monthly Cleaning Tax
A	More than 350 kg or 1000 liters	MT 5200
B	Up to 350 kg or 1000 liters	MT 2600
C	Up to 200 kg or 500 liters	MT 1300
D	Up to 100 kg or 250 liters	MT 650
E	Up to 25 kg or 50 liters	MT 325

Actual survey and data simulation results

Proposed fixed cleaning fee collected from non-domestic waste generators

Category	Waste Generation per day	Corresponding Monthly Cleaning Tax
A	Mora than 300 kg or 850 liters	MT 2,600
B	Up to 300 kg or 850 liters	MT 1,300
C	Up to 200 kg or 500 liters	MT 650
D	Up to 100 kg or 250 liters	MT 325
E	Up to 25 kg or 50 liters	MT 162

One of the existing revenue sources that will be enhanced is the monthly fixed cleaning fee that is collected from the non-domestic waste generators and recorded under the Proof of Service (PdS). The collection efficiency of this is 18% in 2021 and has been consistently low.

The strategy on this is to significantly lower the fee to encourage better participation, correct the classification of non-domestic entities, AND expand the revenue base by tapping an existing --- but relatively more efficient --- system.

Based on the JICA Project study backed by a survey on 400+ companies in the City, the fixed fees can optimally be lowered by 50%. Waste generation per classification must

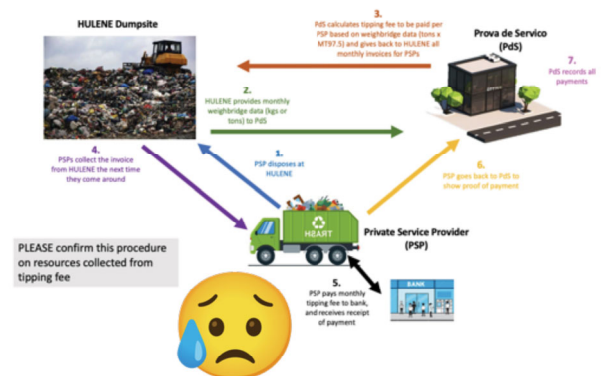
also be corrected by reflecting a more realistic interval of waste generation. With this, more entities will move from a low category to a higher category.

Moreover, the PdS will be made to stop sending monthly invoices to the registered entities which consumes too much resources (manpower, time, paper, etc.) but with consistently dismal results. The collection is proposed to be done through the annual business registration or the economic activity tax (TAE), which is obligatory for businesses and institutions that operate in the City.

It is also important to note that the CMM business licensing section has 16,000 entities in its database compared to only 10,000 registered entities in the PdS. If databases can be integrated, the potential income can increase from a mere MT8.2 million in 2021, to MT99million. The scenario will even be more favorable if the EDM database with over 30,000 non-domestic or commercial connections can be utilized. The maximum gain for the City could be as much as over MT230 million in a year.

Finally, the tipping fee collection will be simplified. As again, no increase in the fee is proposed.

Currently, tipping fee collection method is complicated and confusing. Invoices can potentially get lost or disregarded, and in many cases are unpaid. The payment and reporting methods are likewise troublesome for the users of Hulene, as they are required to present the proof of bank payment, manually, to the PdS for it to be acknowledged.



The proposal is to collect the tipping fee at *point-of-sales*, or at Hulene weighbridge/entry through a mobile payment platform such as M-PESA, e-MOLA, and MKESH. Hulene tipping fee will have its own QR code for easy payment and direct transfer to CMM account from the mobile companies. This dispenses the need for monthly invoicing. And because the weighbridge automatically captures data of entry of trucks in Hulene, including those that are contracted by the City for the primary and secondary collection, it is easy to verify payments. In the MasterPlan, it was likewise

proposed that these CMM-contracted major companies must pay the tipping fee, in the interest of financial transparency.

Potential increase in revenue from tipping fee could be from the 2021 collection level of less than MT2 million, to about MT16 million, or an increase by 700%.

The decision on the *taxa de limpeza* will be influenced by various social and political factors. The strategy provides sufficient flexibility and allows a mix of reasonable policies to attain a level of financial sustainability that is beneficial to all constituents of Maputo City.



Thus, the need to enhance the fixed non-domestic cleaning fee, the classifications of non-domestic waste generators, and the manner of collecting the tipping fee must be simultaneously done.

From an alarming scenario of 70% subsidy in the future, mid-term subsidy can go down significantly. Depending on the policy mix, and political will to enjoin stakeholders, financial surplus will be attainable even in the medium-term.

Critical activities and institutional linkages to support the proposed financial sustainability strategy are:

- Stronger efforts in public information dissemination: MESSAGING WILL be very important
- Strong collaboration among CMM Business Registration/Revenue Sections, DSMAS and EDM especially on information-sharing/data integration



The JICA Project also provides a simple MS Excel-based tool that will visually provide possible scenarios for all policy mixes.

This will be very helpful for the technical people and decision-makers of CMM.

MUITO OBRIGADA!

Appendix 6-4
Plan for Updating the regulations
related to SWM in Maputo City

The Republic of Mozambique

Directorate of Municipal Service of Environment and Waste
(DSMAS), Municipal Council of Maputo

The Project for the Capacity Development to Realize Integrated Solid Waste Management in Great Maputo

Plan for Updating Regulations related to Solid Waste
Management in Maputo City

June 2023

Japan International Cooperation Agency (JICA)

Nippon Koei Co., Ltd.

The Project for the Capacity Development to Realize Integrated Solid Waste Management in
Great Maputo

Plan for Updating Regulations related to Solid Waste Management in Maputo City

Table of Contents

1.	Waste Collection and Transportation.....	1
2.	Financial Management of SWM	3
3.	Promotion of Recycling.....	7

1. WASTE COLLECTION AND TRANSPORTATION

In order to implement the MP and the Plan for Improvement of Waste Collection and Transportation Service in Maputo City, the current CMM resolutions and their provisions that need to be revised, and the recommended revisions, are summarized as follows.

Resolution	Article	Recommendation for update
Resolution nr. 86/AM/2008, from May 22nd SWM	<p>Article 20 (Collection contracts)</p> <ol style="list-style-type: none"> Public and private producers are required to engage a USW collection service if they produce, on a daily basis, quantities equal or above 25kg or 50 litres. For this purpose, producers mentioned in the above item can engage collection services from Maputo Municipal Services or provide evidence of a contract with a duly licensed private entity, called “proof of service”. 	<ul style="list-style-type: none"> Should be changed the classification of waste producer: <ul style="list-style-type: none"> Public producers to <u>domestic waste producer</u> Private waste producer to <u>non-domestic waste producer</u>. The condition for <u>domestic waste producers</u> will remain (special collection or PSP when producing equal or above 25 kg or 50 litres). For <u>non-domestic waste producers</u>, independently of the quantities or volumes produced, they should engage a USW collection service (contract with PSP). Article 20, nr. 2 Seems to be unclear, “called Proof of service” should be changed to <u>PSP</u> or if it is to mention the evidence as proof of service, the number 2 should be re-formulated.
	<p>Article 26 (cleaning fee for the utilization of Municipal Services)</p> <p>2</p> <ol style="list-style-type: none"> Domiciliary producers Non-domiciliary producers Large non domiciliary producers 	<p>Should be used the same classification as in article 20:</p> <ul style="list-style-type: none"> a) <u>Domestic waste producers</u> b) <u>Non-domestic waste producers</u>
Resolution nr. 88/AM/2008, from May 22 license	<p>CHAPTER III COLLECTION CONTRACTS BETWEEN LARGE PRODUCERS AND PRIVATE ENTITIES</p> <p>Article 12(Collection contracts)</p> <ol style="list-style-type: none"> Public and private producers are obliged to engage USW collection services if they produce quantities equal of above 25 kg or 50 liters daily, and in such case they will be referred to as large producers. 	<p>First should be revised the chapter name to match with the Article 20 of the Resolution nr. 86/AM/2008, from May 22nd as same as the contents. For Example: Collection contracts.</p> <p>Nr.3 should be deleted following the condition:</p> <ul style="list-style-type: none"> For <u>non-domestic waste producers</u>, independently of the quantities or volumes produced, they should engage a USW collection service (contract with PSP).

Resolution	Article	Recommendation for update
	<p>2. For this purpose, alternatively to enter a waste collection contract with Maputo Municipal Council, the producers mentioned in the above paragraph may display evidence of a service provision contract entered with a duly licensed private entity. This option is referred to as “proof of services” (prova de serviço).</p> <p>3. Public and private producers who produce quantities of USW less than 25kg or 50 liters are exempted from the provisions in the above paragraphs, and they may use the locations, equipment and facilities previously defined for placement, and covered by the Municipal Collection Services.</p>	
	<p>Article 13 (clauses of the collection contract)</p>	<p>Should be removed the word large producer and substitute by waste producers.</p>
<p>Resolution nr. 89/AM/2008, from May 22nd</p>	<p>Article 12 (Schedule for discharge)</p> <p>1. The USW to be collected by the Municipal Services or by duly licensed private entities must be discharged in appropriate containers during the period between 3:30pm to 7pm.</p> <p>2. In areas where there are no public containers, serviced by the door-to-door system, the placement of USW must be between 6pm and 8pm.</p> <p>3. The Municipal Services may determine for the USW to be discharged, within a period to be determined, directly into the municipal vehicles or in vehicles of licensed entities, as well as in different days or schedules for certain neighbourhoods or areas.</p>	<p>Should be deleted number 2 because it is included in number 3.</p>
	<p>Article 18 (Conservation of USW placement equipment)</p> <p>1. It is up to each owner to maintain the USW placement equipment in good condition.</p>	<p>Five days after issuing the notification? The starting day should be defined.</p>

Resolution	Article	Recommendation for update
	2. Whenever any equipment is in poor conservation condition, the respective owner will be notified to repair it, within a period of five days.	
	<p>Appendix 2, article 37/nr. 2</p> <p>According to RFM, DSMAS is using Appendix 2, article 37/nr. 2 as a reference for penalties to non-domestic waste producers when discharging waste into CMM containers.</p> <p><u>But this article refers to special waste</u> (information from RFM);</p> <p>Information from the resolution nr. 89/AM/2008, from May 22nd at our SharePoint – <u>The use of Municipal dumping sites without permission.</u></p>	No penalty for non-domestic waste discharged into CMM container was identified at the resolution. So, it should be decided considering the different categories of the non-domestic waste producers.

Source: JICA Project Team

2. FINANCIAL MANAGEMENT OF SWM

In order to implement the MP and the Financial Sustainability Strategy of Solid Waste Management in Maputo City, the current CMM resolutions and their provisions that need to be revised, and the recommended revisions, are summarized as follows.

Resolution	Article	Recommendation for update
<p>Resolution nr. 86/AM/2008, from May 22nd SWM</p>	<p>Art. 20, nr. 1</p> <p>1. Public and private producers are required to engage a waste collection service if they produce, on a</p>	<p>Non-domestic waste generators are obliged to contract a CMM-accredited waste collection service, regardless of the daily amount of waste produced. The contract shall be one of the obligatory documents to obtain an annual business registration certificate.</p> <p>For those that are renting space for business operations and whose waste collection are taken cared of by the owner/management of the establishment, a proof of contract between the lessor and a CMM-accredited private service provider is a required document for the annual business license to operate in Maputo City.</p> <p>ALL businesses/institutions must undergo a one-time orientation and obtain certification of attendance by the Public Information Office (PIO) (a newly proposed section of the DSMAS) on the SWM, environment and other related City regulations prior to obtaining a license to operate. A re-orientation will also be required</p>

JICA Project Team

	<p>daily basis, quantities equal or above 25kg or 50 litres.</p>	<p>each time a business entity is found to have violated the relevant regulations, in addition to applicable fines and penalties.</p> <p>----</p> <p>Private service providers in the business of collecting waste in the City, whether for domestic, non-domestic and other municipal wastes, must be duly accredited by the CMM.</p>																								
	<p>Art. 26, nr. 1 (Annex I) Municipal Cleaning Fee</p>	<p>THE matrix below is to be removed and, instead, the Financial Sustainability Strategy on unit pricing of SWM with respect to electricity for domestic and non-domestic EDM consumers must be included, including principles and calculation factors.</p> <table border="1" data-bbox="745 523 1825 834"> <thead> <tr> <th rowspan="2">Consumption</th> <th colspan="2">Domestic</th> <th colspan="2">Non-Domestic</th> </tr> <tr> <th>kwh</th> <th>MT</th> <th>kwh</th> <th>MT</th> </tr> </thead> <tbody> <tr> <td>Low</td> <td>Up to 200</td> <td>45</td> <td>Up to 200</td> <td>80</td> </tr> <tr> <td>Medium</td> <td>201-500</td> <td>75</td> <td>201-500</td> <td>160</td> </tr> <tr> <td>High</td> <td>500 <</td> <td>110</td> <td>500 <</td> <td>250</td> </tr> </tbody> </table> <p>The following steps of calculating the unit pricing for SWM must be included. Assessment or revision of unit pricing may be done every 5 years to reflect prevailing situation.</p> <p>Step 1: Calculating the unit operating cost of SWM (Mt/kg) for FY₁</p> <p style="padding-left: 40px;">Total Operating Cost of SWM (MT) (Less: 1.1 Personnel) in FY₀ / Total Waste Generation (kg) in FY₀ = Unit operating cost of SWM (Mt/kg)</p> <p>Step 2: Calculating waste generation per energy consumed (kg/kwh) for FY₁</p> <p style="padding-left: 40px;">a. Total Domestic Waste Generation (kg) in FY₀ / Total Energy Consumed by Domestic Consumers (kWh) in FY₀ = Waste generation per energy consumed of Domestic Consumers (kg/kWh)</p>	Consumption	Domestic		Non-Domestic		kwh	MT	kwh	MT	Low	Up to 200	45	Up to 200	80	Medium	201-500	75	201-500	160	High	500 <	110	500 <	250
Consumption	Domestic			Non-Domestic																						
	kwh	MT	kwh	MT																						
Low	Up to 200	45	Up to 200	80																						
Medium	201-500	75	201-500	160																						
High	500 <	110	500 <	250																						

		<p>b. Total Non-Domestic Waste Generation (kg) in FY₀ / Total Energy Consumed by Non-Domestic Consumers (kWh) in FY₀ = Waste generation per energy consumed of Non-Domestic Consumers (kg/kWh)</p> <p>Step 3: Deriving unit cost of SWM for each unit of energy consumed (Mt/kWh) for FY₁</p> <p>a. Unit operating cost (Mt/kg) of SWM x Waste generation per energy consumed of Domestic Consumers (kg/kWh) = Domestic unit price of SWM (Mt/kWh)</p> <p>b. Unit operating cost (Mt/kg) of SWM x Waste generation per energy consumed of Non-Domestic Consumers (kg/kWh) = Non- Domestic unit price of SWM (Mt/kWh)</p> <p>Where:</p> <ul style="list-style-type: none"> • FY₁ pertains to fiscal year on which the pricing will be applied • FY₀ preceding fiscal year • Total operating cost of SWM, less personnel, is available from RAF • Waste generation according to source is data from Hulene dumpsite • Energy consumption per consumer type is data from EDM <p>The matrix below is to be corrected and, instead, the Financial Sustainability Strategy on monthly fee for non-domestic producers according to category must be included.</p> <table border="1" data-bbox="763 1086 1666 1305"> <thead> <tr> <th colspan="2">Producer Category</th> <th>Monthly Fee to be paid</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Daily production of MSW greater than 350 kg or 2000 L</td> <td>5,200.00 Mts</td> </tr> <tr> <td>B</td> <td>Daily MSW production up to 350 kg or 1000 L</td> <td>2,600, Mts</td> </tr> <tr> <td>C</td> <td>Daily production of MSW up to 200 kg or 500 L</td> <td>1,300, Mts</td> </tr> <tr> <td>D</td> <td>Daily MSW production up to 100 kg or 250 L</td> <td>650, Mts</td> </tr> <tr> <td>E</td> <td>Daily MSW production up to 25 kg or 50 L</td> <td>325, Mts</td> </tr> </tbody> </table> <p>Replace with the following matrix, which is a 50% reduction of the current rates:</p>	Producer Category		Monthly Fee to be paid	A	Daily production of MSW greater than 350 kg or 2000 L	5,200.00 Mts	B	Daily MSW production up to 350 kg or 1000 L	2,600, Mts	C	Daily production of MSW up to 200 kg or 500 L	1,300, Mts	D	Daily MSW production up to 100 kg or 250 L	650, Mts	E	Daily MSW production up to 25 kg or 50 L	325, Mts
Producer Category		Monthly Fee to be paid																		
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	<p>Art. 26, nr. 2</p> <p>For the purposes set out in number 1, producers are classified as:</p> <p>a) Home producers;</p> <p>b) non-domestic producers;</p> <p>c) Large non-domestic producers</p>	<p>For the purposes set out in paragraph 1, producers are classified as:</p> <p>a) Domestic producers;</p> <p>b) Non-Domestic Producers</p>																		
<p>Resolution nr. 15/AM/2004</p>	<p>Art. 50, nr. 1</p> <p>For the use of municipal services in cleaning operations, when requested or imposed, the fees set out in Annex I are charged, taking into account the provisions of number 1 of Article 29</p>	<p>Article 29 has been repealed, but the current fees for the use of municipal services, which must be included as an annex, are as follows:</p> <table border="1"> <thead> <tr> <th>Service</th> <th>Fee</th> </tr> </thead> <tbody> <tr> <td>Using the Hulene Dumpsite</td> <td>97.50 Mts per ton</td> </tr> <tr> <td colspan="2">RS collection and transport services by:</td> </tr> <tr> <td>• 12 m3 container</td> <td>2,621.00 Mts</td> </tr> </tbody> </table>	Service	Fee	Using the Hulene Dumpsite	97.50 Mts per ton	RS collection and transport services by:		• 12 m3 container	2,621.00 Mts										
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		<ul style="list-style-type: none"> • 6 m3 container • 1.1 m3 container • 100 liter plastic bag • 240 liter container • Loader (Machine) • tractor cart 	<table border="1"> <tr> <td>1,872.00 Mts</td> </tr> <tr> <td>702.00 Mts</td> </tr> <tr> <td>234.00 Mts</td> </tr> <tr> <td>325.00 Mts</td> </tr> <tr> <td>1,775.00 Mts per hour</td> </tr> <tr> <td>1,040.00 Mts</td> </tr> </table>	1,872.00 Mts	702.00 Mts	234.00 Mts	325.00 Mts	1,775.00 Mts per hour	1,040.00 Mts	
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1,040.00 Mts										
<p>Resolution nr. 89/AM/2008, from May 22nd SWM</p>	<p>Art. 32, nr. 2 Individuals or Companies that, as a result of their activities, deposit their waste directly in the Municipal Dumpster, must pay a fee for each ton deposited, under the terms of Annex I of these Regulations.</p>	<p>Update Annex I Ensure that ALL private service providers using the Hulene dumpsite MUST pay, following the point-of-sales payment method through mobile cash transfer. There are no exemptions. Corresponding receipt will be provided upon payment.</p> <table border="1"> <thead> <tr> <th>Service</th> <th>Fee</th> </tr> </thead> <tbody> <tr> <td>Using the Hulene Dumpsite</td> <td>97.50 Mts per ton</td> </tr> </tbody> </table> <p>monthly invoicing by Proof of Service --- by all PSPs using the disposal site. This will be done via mobile payments available (M-PESA, M-KESH, and e-MOLA, etc.). Hulene dumpsite account must have it's own unique QR code from the mobile payment servisse companies.</p>	Service	Fee	Using the Hulene Dumpsite	97.50 Mts per ton	<p>Payment and receipting will be at point-of-sales (POS) --- no more</p>			
Service	Fee									
Using the Hulene Dumpsite	97.50 Mts per ton									

Source: JICA Project Team

3. PROMOTION OF RECYCLING

In order to implement the MP and to promote recycling in Maputo City, the draft resolution on the promotion of source separation and recycling was proposed by including provisions on recyclable waste items, color-coding, container, obligations and responsibilities of waste generators and recycling-related actors, composting and recycling platform and association.

Appendix 6-5
Organizational and Human Resources
Development Plan of DSMAS

The Republic of Mozambique

Directorate of Municipal Service of Environment and Waste
(DSMAS), Municipal Council of Maputo

**The Project for the Capacity Development to
Realize Integrated Solid Waste Management
in Great Maputo**

Organizational and Human Resources Development Plan of
DSMAS

July 2023

Japan International Cooperation Agency (JICA)

Nippon Koei Co., Ltd.

The Project for the Capacity Development to Realize Integrated Solid Waste Management in
Great Maputo
Organizational and Human Resources Development Plan of DSMA

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1. DSMAS ORGANIZATIONAL DEVELOPMENT PLAN

1.1 Organizational Structure of DSMAS

1.1.1 The Municipal Directorate of Environment and Health Service (DMAS)

The Municipal Directorate of Environment and Health Service, abbreviated as DMAS is headed by the Director and Deputy Director and the management has 4 staff including a secretary, messenger, and servant. The scope of work of the entire DSMAS is stipulated in the CMM's internal regulation 2022 as below.

Article 4

- Propose and implement policies and strategies for cleaning the Municipality.
- Ensure the collection, handling, and transportation of municipal solid waste produced in the Municipality.
- Ensure the final disposal of urban solid waste in environmentally acceptable conditions.
- Promote reduction, reuse, and recycling activities for urban solid waste.
- Elaborate and collaborate in studies, guidelines, and regulatory norms that support the Municipality's action in environmental matters.
- Prevent and control noise pollution within the scope of the competencies attributed to the Municipalities, defining and supervising operating conditions regarding acoustics resulting from the licensing of noisy activities of permanent or temporary nature.
- Propose and implement environmental management policies.
- To elaborate and review Environmental Impact Studies
- Elaborate resettlement action plans for investment projects in the Municipality of Maputo
- Proceed with Environmental Licensing
- Ensure implementation of environmental and social safeguards for municipal investment projects
- Supervise/inspect the operation of public and private economic agents.
- To fine violators of the provisions of environmental licenses during the exercise of economic activities
- Elaborate and update the city's strategic noise map.
- Coordinate the preparation of municipal noise reduction plans or action plans to manage noise.
- Promote air pollution control actions in partnership with other internal or external entities.
- Participate in the definition and development of environmental indicators to characterize the quality of the urban environment.
- To issue an opinion in the scope of industrial licensing or other economic activities with relevant pollutant emissions, in what concerns the different environmental aspects, namely residual waters, residues, noise, and atmospheric emissions, based on the applicable legal norms.
- Develop and promote the municipal strategy of mitigation and adaptation to climate change.
- Ensure the participation of citizens, community organizations, and the private sector in the management of urban solid waste.
- Supervise the quality standards of the provision of internal or external services (providers) as well as the compliance of the posture by the Municipalities.
- Coordinate and control the sweeping of roads and berms considering the protection of drainage systems and general cleaning of the city.
- Ensure strategic and operational planning, as well as its monitoring.
- Ensure the acquisition, maintenance, and repair of the collection means.
- Manage the service provision contracts.
- Ensure the implementation of a strategy for environmental, economic, and financial sustainability of urban solid waste management.
- Ensure the application of the proof of service to all non-household producers.
- Promote the integration of the informal sector in the integrated management of urban solid waste.
- Ensure the maintenance and repair of garbage collection vehicles.
- Prepare the Organic Unit's Plan of Activities and Budget proposal and ensure its implementation, monitoring, and evaluation in articulation with the Organic Units responsible for its coordination and control.

- Ensure the implementation, monitoring, and assessment of the City Council's Human Resources Management Policies
- Ensure compliance with the technical-administrative policies, standards, and procedures in force at the City Council.

1.1.2 Department of Administration, Human Resources and Finance (DARHF)

The Department of Administration, Human Resources and Finance (DARHF) headed by the Department Head has 4 sections with the scope of work as below.

Article 16

- Organizing the processes and files related to promotion, promotion, transfer, exoneration, retirement, leave of absence, and related tasks.
- Organizing the register of employees and certifying their effectiveness for legal purposes
- To elaborate, execute and control, in coordination with the Municipal Planning and Finance Department, the plan and budget, guaranteeing the correct distribution, rational and efficient use, and maintenance of the means assigned to the Department.
- To elaborate the reports, balance sheets, and other control maps of the Directorate's use of budget funds
- To elaborate on the Department's quarterly, semi-annual, and annual reports
- To evaluate the performance and effectiveness of resource utilization and propose corrective measures if necessary.
- To support other departments in the preparation of strategies and plans for budget execution and forecasting
- To make an inventory of the existing movable assets, keeping the respective books duly registered
- To promote professional training actions for the continuous improvement of the employees' performance
- To conduct studies on the composition, sizing, and control of the staff
- To collect revenues and forward them to the Municipal Planning and Finance Department
- Ensure the registry of licensed companies in the occupation of public spaces, users of the WWTP, and other emerging areas.

(1) Administration and Finance Section (RAF)

The Administration and Finance Section (RAF) headed by the Section Chief has 10 staff with the scope of work as below.

Article 29

- To elaborate on the requisition of funds for payment execution.
- To assist in the coordination of the material acquisition process.
- To elaborate on reports and balances of control and use of funds from the Directorate's budget.
- To guarantee the execution and control, in coordination with the Municipal Finance Department, of the plan and the budget, guaranteeing the correct distribution, rational and efficient use, and maintenance of the means assigned to the Department.
- To support the evaluation of the performance and effectiveness of resource use and propose corrective measures if necessary.
- To elaborate on quarterly, semi-annual, and annual reports of the Department.
- To ensure the expansion of the Service's sources of revenue.
- To ensure the collection of the Fees from the large MSW producers.
- To register large and small USW producers.
- To manage licensing, proof of service, and contracts.
- To issue invoices for proof of service receipts.
- To ensure the collection, organization, and forwarding of revenues.
- To manage the collection of fees and other taxes, as well as coercive collections.
- To control the collection of fees, licenses, and fines foreseen in the directorate and the compliance with established procedures (through awareness, inspection, and corrective inspection actions).

- Ensure the strict control of the receipt books and several services intervening in the revenue collection operations.
- Register the licensed companies in the occupation of public spaces, users of the WWTP, and other emerging areas
- To carry out the collection, organization, and forwarding of revenues and other taxes, as well as the coercive collections
- Control the collection of fees, licenses, and fines foreseen in the management and compliance with established procedures (through awareness, inspection, and corrective inspection actions).

(2) Human Resources Section (RRH)

The Human Resources Section (RRH) headed by the Section Chief has 5 staff with the scope of work as below.

Article 30

- To carry out the processing of salaries.
- Ensure the social assistance of the employees.
- To ensure the production of information necessary to the Department.
- To ensure the evaluation of individual performance.
- To ensure the professional development of the employees.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To elaborate proposals for training and capacity-building plans.
- To analyze and issue opinions about different human resource management processes, observing the legislation in effect.
- Ensure the organization and updating of Individual Processes.

(3) Property Section (RP)

The Property Section (RP) headed by the Section Chief has 2 staff with the scope of work as below.

Article 31

- Managing, and inventorying the Directorate's assets.
- To execute tasks pertinent to the receipt, distribution, conservation, registration, and control of the Directorate's patrimonial assets.
- Proposing, periodically, the list of patrimonial goods to be disposed of.
- To keep the bookkeeping of the patrimonial accounts.
- To watch over the movable and immovable assets.
- To control the stock of consumable and non-consumable goods.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To analyze the processes of disposal and transfer of assets between the Organic Unit and the Planning and Finance Department.
- To elaborate on specifications for the acquisition of new assets.

(4) Municipal Secretariat (SM)

The Municipal Secretariat (SM) headed by the Section Chief has 15 staff with the scope of work as below.

Article 14

- Reception, classification, and expedition of the expedient.
- Keep records up-to-date and the accessibility of documents.
- Carry out periodic document evaluation, to guarantee the transition of documents between the current, intermediate, and permanent archives.
- To control and supervise the time books and to elaborate on the management's effectiveness.
- To control and supervise the work of the Directorate's servants.
- To elaborate quarterly, semester, and annual reports of the activities developed in the sector.
- To analyze and receive requests from the citizens and verify if they fulfill the requirements to enter these services.

- To clarify to the citizen any doubt regarding the processing of their files/requests or related to the matters handled by the Department.
- To proceed with the physical and digital registration of the documentation.
- To clarify any doubts the citizens may have to deliver Dispatch Communications Notes to the respective addressees.
- To issue communication notes on applications for the extension of Building Permits.
- To sign 6th Category permits.
- Send the processes to file in the City Foral Tramitar.

1.1.3 Department of Municipal Solid Waste Management (DGRSU)

The Department of Municipal Solid Waste Management (DGRSU) headed by the Department Head has 4 sections with the scope of work as below.

Article 18

- To guarantee the services of collection and transport of solid urban waste in the Municipality of Maputo.
- To fix the limits of the operation areas and the routes for garbage collection, as well as for weeding and sweeping operations.
- Develop studies and carry out research regarding volume, weight, origin (domestic, industrial, among others), and approximate composition (estimated quantity of organic material, paper, cans, glass, inert material) of the garbage collected, aiming at its utilization.
- To guarantee the operationalization and maintenance services of the Municipal Dump of Hulene.
- coordinate with other collective or singular entities in the cleaning activities of public and private spaces in the context of camping and the development of cleaning campaigns.
- To promote coordination meetings of sweeping activities with the Municipal Districts.
- To collaborate in the cleaning and removal of vegetation soils in untreated public spaces.
- To accompany the management of services entrusted to concessionary companies, namely informal dumps and selective collection.
- To propose the acquisition of goods and services, and promote the installation, and conservation for the disposal of solid urban residues.
- To participate in awareness actions related to public cleaning.
- To participate in the elaboration of norms and regulations concerning the management of urban solid residues, in harmony with national legislation and regional and international norms, when applicable.
- To give opinions about Projects, regarding the fulfillment of the regulations about solid residues and the feasibility of collection and transport.
- To keep up to date with all relevant statistical data relating to the collection of solid urban waste in the municipality of Maputo.
- To coordinate the process of elaboration, implementation, and monitoring of the Directorate's Annual Plan of Activities.
- To record and provide periodic information about the provision of services under the contracts.
- To control the performance of the operators of the Bascule and dump services.
- To guarantee the implementation of the maintenance and repair plan of the equipment and circulating means in coordination with the Department of Workshops and Auto Park.
- r. To elaborate on quarterly, half-yearly, and annual reports of the Department.

(1) Contract Management Section (RGC)

The Contract Management Section (RGC) headed by the Section Chief has 4 staff with the scope of work as below.

Article 36

- To manage and supervise the contracts signed with public or private entities for the provision of services and supply of materials in general.
- To keep up to date with all relevant statistical data relating to the collection of solid urban waste in the municipality of Maputo.

- To register and provide periodic information about the rendering of services under the scope of major contracts.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- Create and monitor performance and/or execution standards to compare them with planned and executed actions.
- Propose the renewal or opening of new contracts when the expiration of the same is observed.

(2) Inspection Section (RFM)

The Inspection Section (RFM) headed by the Section Chief has 35 staff with the scope of work as below.

Article 37

- Ensure compliance with the rules regarding the inspection of cleaning activities.
- Enforce municipal norms and laws.
- Ensure that the RSU ordinance is fully complied with.
- To note infractions and to issue a notice of infraction.
- Raise awareness and sensitize citizens and commercial institutions.
- To guarantee that the final deposition and disposal of USW is done according to the norms.
- To control the suppliers' registry.
- To guarantee the supervision and management of critical areas.
- To do the daily supervision of the containers in Urban and Suburban areas.
- To identify informal dumpsites.
- To elaborate quarterly, semi-annual, and annual reports of the Division.
- To transform decisions into practical actions of prompt intervention in the course of implementation.

(3) Hulene Dumping Site Section (RLH)

Hulene Dumping Site Section (RLH) headed by the Section Chief has 17 staff with the scope of work as below.

Article 39

- Ensure compliance with the Dumpsite Regulation.
- Register the database of the entries.
- Control and register the performance of the machines.
- Ensure the operationalization of the track scale, and the reliability, and integrity of the daily registration data.
- Guarantee the operationalization of the machines.
- Creating deposition fields and opening access ways for the circulation of RSU discharge vehicles.
- To elaborate quarterly, half-yearly, and annual reports of the Division.
- To guarantee an adequate final deposition, organized in environmentally acceptable conditions.
- To create a database for the registration of information.

(4) Public Removal Section (RRP)

The Public Removal Section (RRP) headed by the Section Chief has 22 staff with the scope of work as below.

Article 38

- Respond to the collection and transportation of urban solid residues.
- To systematize the data of the entries in the dumpsite.
- Supervising the defined Routes.
- To monitor the public sweeping to the Municipal Districts.
- To promote the cleaning campaigns, and elimination of vegetation, soils, and emerging informal dumps.
- To determine the needs for equipment and material for Public cleaning.
- To do the technical and administrative management of the activities of special removal, contracts, and at the level of the City of Maputo.
- To make a technical survey of the work requested by the Municipality.

- To plan and monitor contract activities in coordination with the Proof of Service.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- Coordinate the licensing activities of the cleaning services.

1.1.4 Department of Fleet Management and Workshops (DGFO)

The Department of Fleet Management and Workshops (DGFO) headed by the Department Head has 4 sections with the scope of work as below.

Article 19

- Ensure the acquisition, maintenance, and repair of the collection means.
- Ensure the maintenance and repair of the garbage collection vehicles.
- Managing the stock of fleet material (accessories, batteries, and tires).
- To ensure the registration of all circulating means and machinery in the Municipal Patrimony Register attached to the Municipal Directorate of Planning and Finance.
- To elaborate quarterly, semi-annual, and annual reports of the Department.

(1) Mechanical Section (RM)

The Mechanical Section (RM) headed by the Section Chief has 9 staff with the scope of work as below.

Article 40

- Perform preventive and equipment maintenance according to the plan.
- Ensure the acquisition of workshop equipment and tools and their maintenance.
- Plan daily, weekly and monthly activities and ensure their fulfillment.
- To ensure the operability of the fleet through routine maintenance to minimize breakdowns.
- Manage and evaluate the performance of the workshop staff.
- To elaborate weekly and monthly reports of work done or completed.
- To elaborate training plans, internships, and refresher courses by specialty.
- To elaborate quarterly, semi-annual, and annual reports of the Department.

(2) Procurement Section (RA)

The Procurement Section (RA) headed by the Section Chief has 4 staff with the scope of work as below.

Article 41

- Controlling the maintenance of the equipment in the warehouse.
- To elaborate proposals for ordering parts for stock replacement.
- To register the incoming and outgoing materials.
- To make the warehouse inventory.
- To proceed with the requisitions of materials observing the legal procedures instituted.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To analyze the proposals/quotations presented by suppliers and service providers.
- Suggest organizational changes and other measures for the better functioning of the department.

(3) Fleet Management Section (RGF)

Fleet Management Section (RGF) headed by the Section Chief has 9 staff with the scope of work as below.

Article 42

- To elaborate reports on the entry and exit of vehicles.
- To manage drivers' schedules and control vehicles.
- Preparing and scheduling the systematic maintenance plans of vehicles and machines and checking the technical condition of the vehicles in the park.
- To control, suggest improvements, and register the functioning of the vehicles.
- To control the validity of insurance and vehicle documentation and their timely updating.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To keep the automobile patrimony data up to date.
- To report all breakdowns and accidents involving fleet vehicles.

- To elaborate monthly reports on the activities developed in the sector as well as on the functioning and maintenance of the fleet.

(4) Workshop Section (RO)

The Workshop Section (RO) headed by the Section Chief has 5 staff with the scope of work as below.

Article 43

- Carry out periodic examinations of the facilities by performing corrective and preventive maintenance of the metallic structures.
- To provide repairs and replacements of whatever is necessary, adopting care to each type of work, aiming at the perfect functioning of the installations.
- To carry out technical examinations in the installation and maintenance of metallic structures.
- To execute services of welding or confection of small iron pieces.
- Performing general bodywork painting, disassembling, and assembling components.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To detect and eliminate paint defects and prepare the vehicle for delivery.
- To assemble and repair body parts or other component parts of motor vehicles.

1.1.5 Department of Environmental Management and Inspection (DGIA)

The Department of Environmental Management and Inspection (DGIA) headed by the Department Head has 3 sections with the scope of work as below.

Article 17

- Propose environmental management policies with the evolution of the main factors of impact on the urban environment.
- Participate in the process of urban planning and licensing, particularly in the verification of urban environmental constraints and compliance with the requirements and characteristics stipulated in sectoral management plans.
- Direct the Municipality's programs and projects on environmental protection and the rational use of natural resources.
- Promote the survey of the necessary information to keep the Master Plan and the action plans of the Municipality's government up to date regarding the protection of the environment.
- To enforce the technical norms and Standards of environmental protection, control, and conservation defined in the legislation in force.
- To promote the updating of the municipal legislation about the environment and to propose mechanisms for its effective application.
- To elaborate on the Municipality's studies and opinions on licensing processes for the installation, construction, expansion, operation, and functioning of polluting or potentially polluting activities.
- To propose norms aiming at the control of environmental pollution in all its forms.
- To ensure the requirement, monitoring, and approval of environmental impact studies for projects, services, and activities carried out by public and private entities.
- To ensure the monitoring of the most relevant environmental factors to urban activity (water quality, sanitation, solid waste, soil occupation, air quality, beaches)
- To carry out the environmental licensing of activities and the periodic monitoring of the operation of public and private economic activities with the potential to influence the environment.
- To elaborate and prepare the approval of strategies and plans for the resettlement of populations and activities affected by projects, in coordination with the department responsible for their implementation.
- To elaborate, review, and implement climate change adaptation plans to make Maputo City more resilient.
- To elaborate quarterly, semi-annual, and annual reports of the Department.

(1) Urban Resilience Section (RRU)

The Urban Resilience Section (RRU) headed by the Section Chief has 4 staff with the scope of work as below.

Article 35

- Propose the development and revision of policies on environmental and social safeguards and the municipal resettlement policy framework.
- Ensure compliance with national and World Bank policies on environmental and social safeguards for municipal investment projects.
- Develop, review, and monitor the implementation of Resettlement Action Plans (RAP) for Municipal investment projects.
- Produce a database on the resettlement process carried out in Maputo Municipality.
- Monitor those affected post-resettlement and produce reports on the implementation of resettlement action plans.
- Elaborate, review, and monitor the implementation of the Climate Change Adaptation plan to make the city of Maputo more resilient.
- Mapping of risk areas, to the impacts of extreme events (cyclones, droughts, floods, and areas more vulnerable to seismic events).
- To carry out surveys of households living in areas at risk from natural disasters, and to promote awareness campaigns to voluntarily leave these areas, in coordination with other related units.
- Propose and follow up the implementation of local urban resilience plans against natural disasters, always seeking to ensure the participation of the affected communities in the search for solutions.
- Carry out the post-voluntary resettlement monitoring of families in coordination with the related Organic Units.
- Participate and promote events to exchange experiences with other municipalities, both national and international, regarding climate change adaptation, making the city more resilient.
- Seek different types of national and international partnerships to develop and implement projects, strategies, and local plans for urban resilience.
- Insert Maputo and the companies based in the city that collaborates in the development and implementation of resilience projects as references in this field, as well as international institutions.
- Ensure the integration of resilience in the planning and governance cycle of the Municipality.
- Prepare quarterly, semi-annual, and annual reports of the Office.
- Create and lead urban resilience networks in all spheres national and international that deal with this matter, creating a database, and disseminating strategies and projects developed at the level of the Municipality of Maputo.

(2) Environmental Inspection Section (RIA)

The Environmental Inspection Section (RIA) headed by the Section Chief has 4 staff with the scope of work as below.

Article 33

- Propose environmental management policies with the evolution of the main factors of impact on the urban environment.
- Supervising, demanding, monitoring, and approving environmental impact studies for projects, services, and activities carried out by public and private entities.
- Ensure the monitoring of the most relevant environmental factors to urban activity (water and air quality, sanitation, solid waste, soil occupation, beaches).
- To elaborate studies and opinions for the Municipality in licensing processes for the installation, construction, expansion, operation, and functioning of polluting or potentially polluting activities
- To carry out the environmental licensing of activities and the periodic monitoring of the operation of public and private activities with the potential to influence the environment.
- To manage the environment's Geographic Information System, through the rationalization of the use of natural resources.

- Promote the environmental zoning, in the Municipality, identifying, characterizing, and registering the environmental resources with a view to the execution of a management policy, based on ecological criteria compatible with the general definitions of the Municipality's Master Plan.
- To implement the Ecological Zoning Plan, to control the use and destruction of the hillsides, dunes, springs, and mangroves.
- Identify and prevent the use of risk areas.
- To periodically monitor the operation of public and private economic activities.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To fine violators of the provisions of the environmental licenses for the exercise of the activity.
- To produce a database for all inspection actions carried out by the sector.

(3) Environmental Education Section (REA)

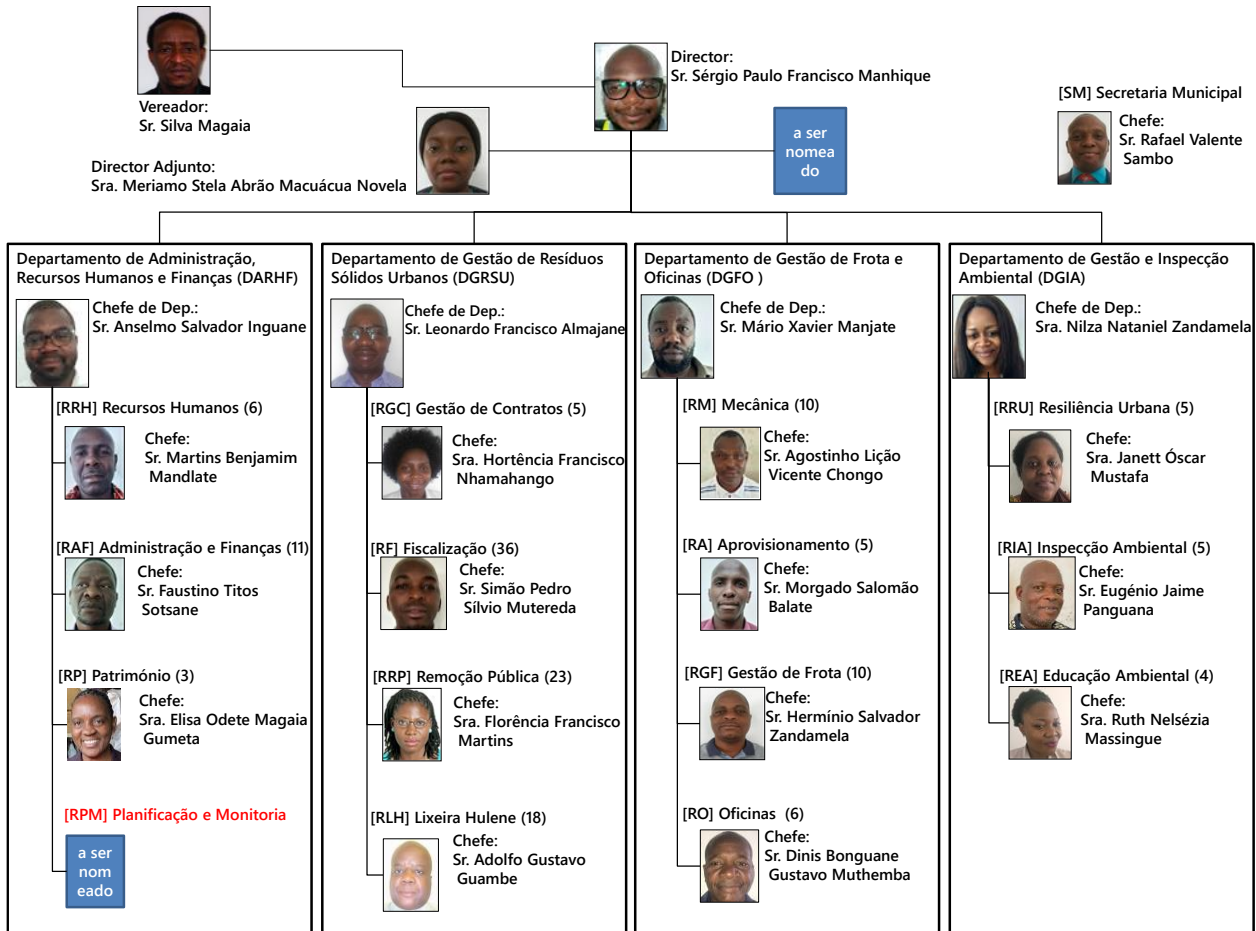
The Environmental Education Section (REA) headed by the Section Chief has 3 staff with the scope of work as below.

Article 34

- Promote education and awareness projects for sustainable development (ESD) with and among the educational community.
- Guide community education campaigns, aimed at making the public and institutions acting in the Municipality aware of environmental preservation issues.
- Promote staff training for the application of the norms regarding environmental preservation.
- To advise the Municipal Administration in all aspects related to ecology and environmental preservation.
- To program the divulgation of events, actions, and municipal programs related to protection, control, and environmental development.
- To elaborate and review environmental education programs.
- To elaborate quarterly, semi-annual, and annual reports of the Department.
- To promote environmental education actions at formal and non-formal levels, aiming at the active participation of the school community and population in general in the defense of the environment, including urban solid residues.
- To sensitize the citizens of the City of Maputo on good practices of Urban Solid Waste Management.
- To create environmental clubs in primary and secondary schools, in neighborhoods, and municipal districts in general.
- Introduce and sensitize teachers and students on the importance of environmental preservation, regarding the good practices GRSU, 5Rs (Reduce, Reuse, Recycle, Rethink, and Refuse).
- Carry out cleaning and awareness campaigns on the public road, semi-collective transporters, and motorists at public transport terminals, on beaches, and in neighborhoods.
- Produce a database for activities developed in this sector.

1.1.6 Organizational Chart of DSMAS

The organizational chart of DSMAS with the names and portraits of each head/chief as of May 2023 is summarized as shown in the figure below.



Source: JICA Project Team

Figure 1 DSMAS Organizational Chart

1.2 Measures on DSMAS organizational development

1.2.1 Concept and direction

The concept and direction of DSMAS organizational development is as below.

Strengthening contract management, financial management and planning & monitoring function

1.2.2 Measure 1: Enhancing RGC (Contract Management Section)

Contract management of private service providers has already become the major task of DSMAS, i.e., primary collection service contracts (46 MEs), secondary collection service contracts (6 Districts), and Hulene dumping site operation contracts, which account for 90% of DSMAS operating expenses.

Hence, Capacity building of the staff, standardizing monitoring and reporting forms, and increasing number of technicians are necessary. It is also important to have specific sections or units for: (1) primary collection services, (2) secondary collections services, (3) Hulene operations-related service, and (4) consultancy services.

All other contracts on goods and services pertinent to office operations of DSMAS must be under the responsibility of RAF.

1.2.3 Measure 2: Re-creation of Proof of Service (PdS) section

The PdS serves important functions for the sector. Currently, this is only a staff designation instead of a section under the DARHF. It is necessary to clearly define the real mandate of the DSMAS Proof of Service

and why it is important: licensing, correct classification of non-domestic waste generators, registration of non-domestic waste generations, management of database related to its functions.

At the Proof of Service space, there are four (4) distinct activities being undertaken: (1) the operations of the General Secretary of DSMAS, (2) fee collection function of CMM, (3) properties management and, (4) the regular Proof of Service operations. This results to having many people in one room with different purposes, creating confusion and disorder. It is important to organize or redesign the physical layout of the office to delineate specific operations and improve overall condition.

1.2.4 Measure 3: Enhancing REA (Environmental Education Section)

REA should also be responsible for coordination and liaison with related actors for the promotion of recycling, in addition to various environmental education and awareness activities. Hence enhancing human resources of REA is necessary.

1.2.5 Measure 4: Realizing DPM (Planning and Monitoring Department)

It is recommended to create a department responsible for monitoring the implementation of M/P and A/P, formulating and updating various plans, and centrally managing various information and data within DSMAS.

The supervisors (RFM) should be under this Department as a specific section and will no longer be involved in the distribution of invoices with the full implementation of the financial sustainability strategy. Also, the RGC should be under this Department.

1.2.6 Measure 5: Create a Management Information System (MIS)

The MIS must be directly under the Director, and it will be the repository of technical information from all the sections of DSMAS.

1.2.7 Measure 6: Create the Public Information Office (PIO)

The PIO must be directly under the Director, which will be in-charge of the following: (1) one-time orientation and certification of businesses on environmental and SWM-related regulations as a requirement for business licensing (for new businesses) or registration (for existing businesses), (2) conduct of regular civic education activities, (3) management of DSMAS library where materials developed for the sector, M/P, related laws and regulation, and other publications are kept, catalogued and made available for public use, (4) hotline number for the sector to receive calls from the general public.

1.2.8 Measure 7: Optimizing DGFO (Department of Fleet Management and Workshops)

Waste collection & transportation, and final disposal site operations are increasingly outsourced to the private service providers, and maintenance of heavy equipment and vehicles currently owned by DSMAS is often outsourced. Hence it is reasonable to examine optimization of the DGFO.

1.2.9 Measure 8: Optimizing RRP (Public Removal Section)

The RRP is responsible for waste collection services for several government facilities and special collection services for illegal dumping. Currently, RRP provides waste collection services to some business waste generators, but it should be left to licensed private service providers.

The RRP should continue so CMM can provide the minimal service of collection and transport for special public institutions and public events, but it must operate at efficient levels. For a more focused/efficient operation, RRP should not engage in any transport and collection of waste from business waste generators.

1.2.10 Measure 9: Creation of Katembe landfills management section

Assuming Katembe sanitary landfill will be operated by a private service provider, a contract management section for landfill operation will be necessary.

2. DSMAS HUMAN RESOURCES DEVELOPMENT PLAN

2.1 Current human resource management in DSMAS

Although a list of personnel exists, it is inefficiently created by adding necessary information when it is needed for a particular purpose in an ad hoc manner. The database isn't organized as a database that can be used for planning human resource development and personnel transfers.

With regards to the database in Excel format, personnel data hasn't been compiled as a single output sheet but was divided into sheets of category, including sectors, careers, gender, and education course, etc., thus the database is composed of over twenty input-output sheets. Furthermore, it is found that some large parts of the data input at the personnel sheet is misspelled and/or blank.

2.2 DSMAS human resources database

2.2.1 Development of DSMAS human resources database

Based on the above, the DSMAS staff database that will contribute to the human resource development of DSMAS staff has been organized as a result of discussion and work among JET and the team of Human Resources Section (RRH).

Over twenty input-output sheets as in the Excel file of previous personnel database were reexamined well and were compiled into three sheets comprehensively. Each sheet in this revised database is explained as follows.

- **Master Input Data Sheet:** A master input data sheet contains all detailed information list of 17 category items, such as sector, career, function/position, gender, academic level, educational and training background, three internal promotion codes, date of birth, year of service at CMM/DSMAS, retirees' information and penalty information, etc. as a compiled information to be input currently. This input data is to be pulled down at cells of a personnel input-output sheet.
- **Personnel Input-Output Sheet:** In the personnel input-output sheet, each staff name is allocated at the vertical column, whereas each categorized information is allocated at the horizontal row. Hence, each staff name and categorized information are integrated into rows as a matrix. In addition, each category item is to be pulled down from the list, where data is aligned at master input data sheet, for input-output of personnel information at the matrix. Furthermore, as the AutoFilter function is built-in to this matrix, it is easy to either hide and rest categorized data in column optionally, or reapply a filter to get up-to-date results, or clear a filter to redisplay all of the data.
- **Figure Output Sheet:** Some categories of input-output data, which is appropriate to be utilized statistically, are output to a pie chart, treemap charts, column charts in the figure output sheet. These figures are to be utilized for mass-analyzing the personnel data to find out the tendency of human resource management from a bird's-eye view.

Figure 2 shows a screenshot of Master Input Data Sheet, and Figure 3 shows a screenshot of Personnel Input-Output Sheet.

In Figure 3, names of personnel are grayed out in this report to protect personal information. In addition, the category information selected in the pull-tab is framed in red for reference.

No.	Sector	Career	Function/Position	Gender	Academic level	Education Course	GS	Class	Esc	Yr
1	DARHF	Administrative Assistant	Administrative Assistant	Male	No level	Accounting	1	AND	1	1956
2	DGFO	Assistant	Administrative Technician	Female	Primary	Accounting and Auditing	2	B	2	1951
3	DGIA	Aux. Administrative	Assistant	-	Primary 2nd class	Accounting Technician	3	C	3	1952
4	Office / Management	Factory Worker	Bodywork	-	Basic	Admin Pub. Eat. End (Sup)	4	THE	4	1953
5	RA	Professional Technician	BS Team A	-	5th grade	Admin School Planning	5	u	5	1954
6	REA	Senior Technician N1	BS Team B	-	Graduation	Admin School Planning (Sup)	6	u	6	1955
7	RFM	Service Agent	BS. of Removal	-	7th grade	Administration, Commerce and Finance	7	u	7	1956
8	RGC	Tec.Prof. Info	Bureau Chief	-	8th grade	Ambient Management and Design Community	8	u	8	1957
9	RGF	Tech.Prof. admin public	Camp Manager	-	Secondary 2nd degree	Chemistry	11	u	9	1958
10	RIA	Tech Professional	Chief Secretary	-	Medium	Civil Engineering	25	u	10	1959
11	RLM	Tech Superior N1	Cleaning coordinator	-	Medium Professional	Computing	65	u	11	1960
12	RM	Tech.Prof.Tech.Inf.Com	Cleaning Servant	-	10th grade	Construction	u	u	12	1961
13	RO	Technical Agent	Computer Technician	-	12th grade	Customs Technician	u	u	13	1962
14	RP	Technician	Contract Management Technique	-	Higher	Economy	u	u	14	1963
15	RRH	Technical Assistant	Courier	-	Engineer	Economy and Education	u	u	15	1964
16	RRP	Department Boss	Department Boss	-	Technician	Education and Environmental Management	u	u	16	1965
17	RRU	Deputy Municipal Director	Deputy Municipal Director	-	Medium Technician	Environmental Engineering	u	u	17	1966
18	SM	Driver	Driver	-	Bachelor's degree	Environmental Management	u	u	18	1967
19			Driver (affect at SCM)	-	Master's degree	Environmental Management and Community Development	u	u	19	1968
20			Driver (affectation at ADKaMpumumu)	-		Environmental Management, Planning and Community Development	u	u	20	1969
21			Driver (affectation at ADKaMubukwana)	-		Financial Management	u	u	21	1970
22			Electrician	-		Geography	u	u	22	1971
23			Engine	-		Histry	u	u	23	1972
24			Environmental Inspection Technician	-		Human Resource Management	u	u	24	1973
25			Executive Secretary	-		Hydraulic Construction	u	u	25	1974
26			Financial Technician	-		Linguistics	u	u	26	1975
27			Firefighter	-		Master in Education	u	u	27	1976
28			Guard	-		Master in Education Systems Design	u	u	28	1977

Source: JICA Project Team

Figure 2 A Screenshot of Master Input Data Sheet as an example

No.	Name	Career	GS	Class	Esc	Function/Position	Academic level	Education Course 1	Education Course 2
1		Senior Technician N1	11	B	1	Municipal Director	Graduation	Political History and Public Management	
2		Technician	7	C	4	Deputy Municipal Director	Bachelor's degree	Admin School Planning	
3		Senior Technician N1	11	AND	1	Deputy Municipal Director	Medium Professional	Public Administration	
4		Assistant	1	u	6	Driver	ary		
5		Assistant	1	u	3	Driver (affect at SCM)	ary		
6		Assistant	1	u	7	Driver (affectation at ADKaMpumumu)	level		
7		Professional Technician	8	C	4	Driver (affectation at ADKaMubukwana)	Medium Professional	Public Administration	Accounting and Auditing
8		Senior Technician N1	11	AND	1	Engine	Graduation	Economy	
9		Tech Superior N1	11	AND	1	Environmental Inspection Technician	Graduation		
10		Tech.Prof.Tech.Inf.Com	65	C	4	Technician	No level	Computing	System and Network Administration
11		Technician	7	C	1	Technician	Medium	Financial Management	
12		Tech Superior N1	11	AND	1	Technician	Graduation	Public Administration	
13		Tech Superior N1	11	THE	1	Technician	Economy		
14		Tech Superior N1	11	B	1	Technician	Graduation	Financial Management	
15		Tech Superior N1	11	AND	1	Technician	Medium Professional	Human Resource Management	
16		Tech Professional	8	AND	1	Technician	Graduation	Accounting	
17		Tech Superior N1	11	C	1	UGEA Coordinator	Graduation	Administration, Commerce and Finance	
18		Tech Superior N1	11	AND	1	UGEA Technician	Medium	Human Resource Management	Human Resource Management
19		Senior Technician N1	25	C	4	Bureau Chief	Graduation	Teaching Physical Education and Sports	
20		Tech Superior N1	11	C	1	Technician	Graduation	Public Administration	
21		Tech.Prof. admin public	8	AND	1	Technician	Medium Professional	Public Administration	
22		Tech.Prof. admin public	8	B	1	Technician	Medium Professional	Public Administration	Right

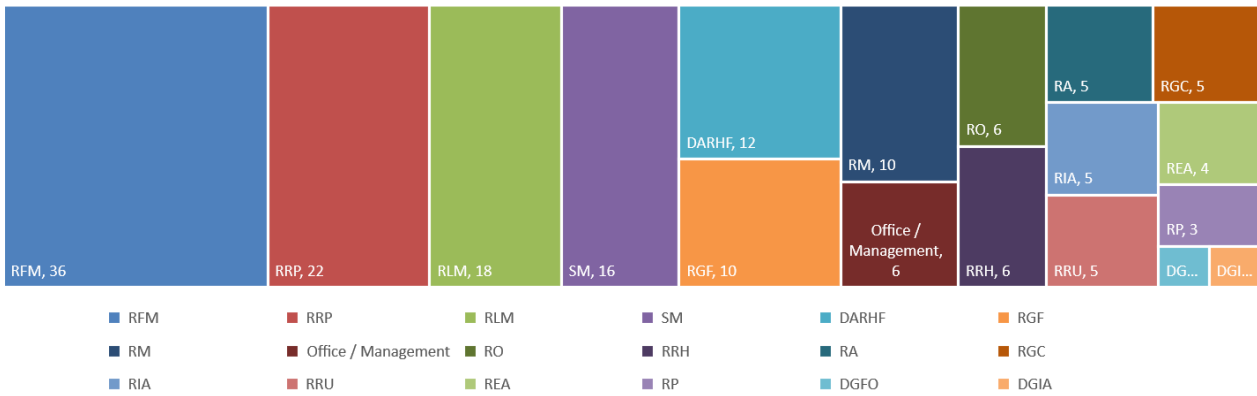
Source: JICA Project Team

Figure 3 A Screenshot of Personnel Input-Output Sheet as an example

Figure 4 in treemap chart shows a composition of sectors in DSMAS in 2022, and Figure 5 in treemap chart shows a composition of function/position in DSMAS in 2022. The value of data in figures are of persons.

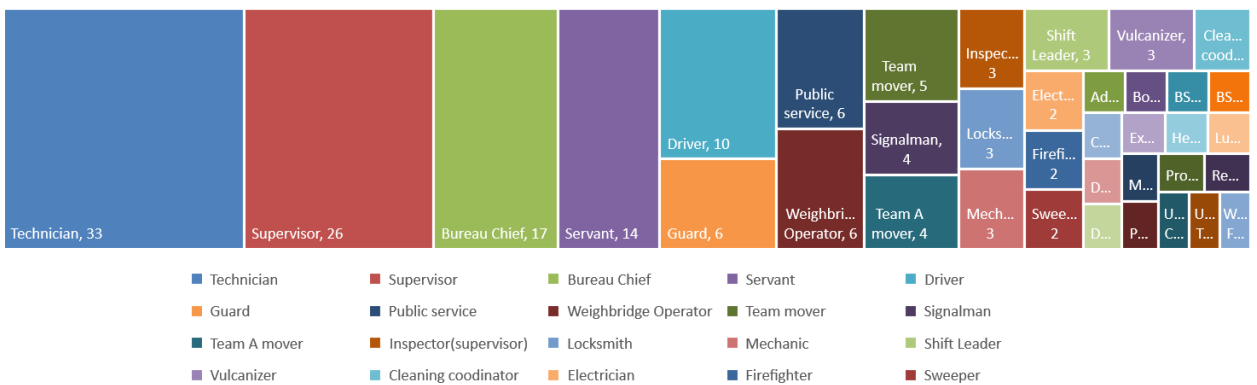
As a reference, abbreviations of sectors in Figure 4 have the following meanings respectively.

RFM: Supervision Section, RRP: Public Removal Section, RLM: Municipal Dumping Site Section, SM: Municipal Secretary, DARHF: Department of Administration, Human Resources and Finance, RGF: Fleet Management Section, RM: Mechanical Section, RO: Workshop Section, RRH: Human Resources Section, RA: Procurement Section, RGC: Contract Management Section, RIA: Environmental Inspection Section, RRU: Urban Resilience Section, REA: Environmental and Sanitation Education Section, RP: Property Section, DGFO: Department of Fleet Management and Workshops, DGIA: Department of Environmental Management and Inspection.



Source: JICA Project Team

Figure 4 Composition of Sectors in DSMAS in 2022 (Data Value: Persons)

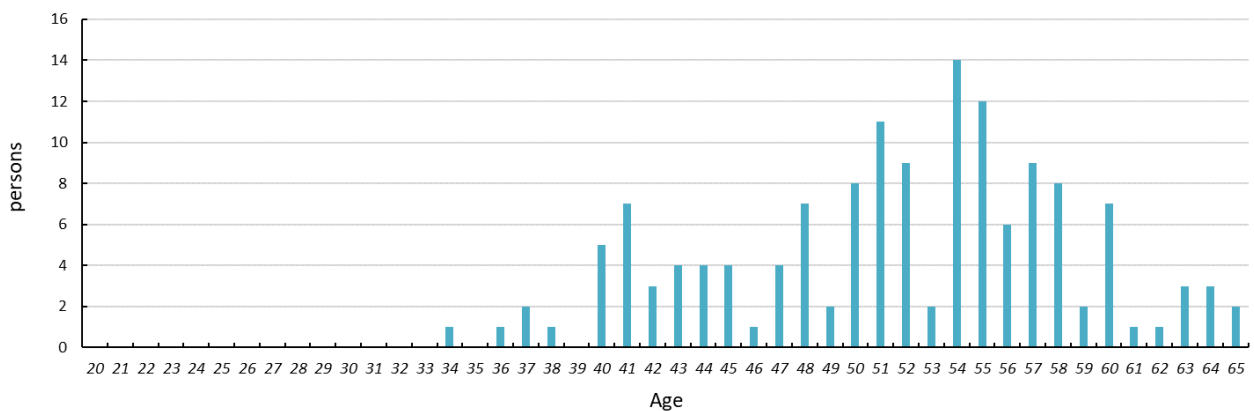


Source: JICA Project Team

Figure 5 Composition of Function/Position in DSMAS in 2022 (Data Value: Persons)

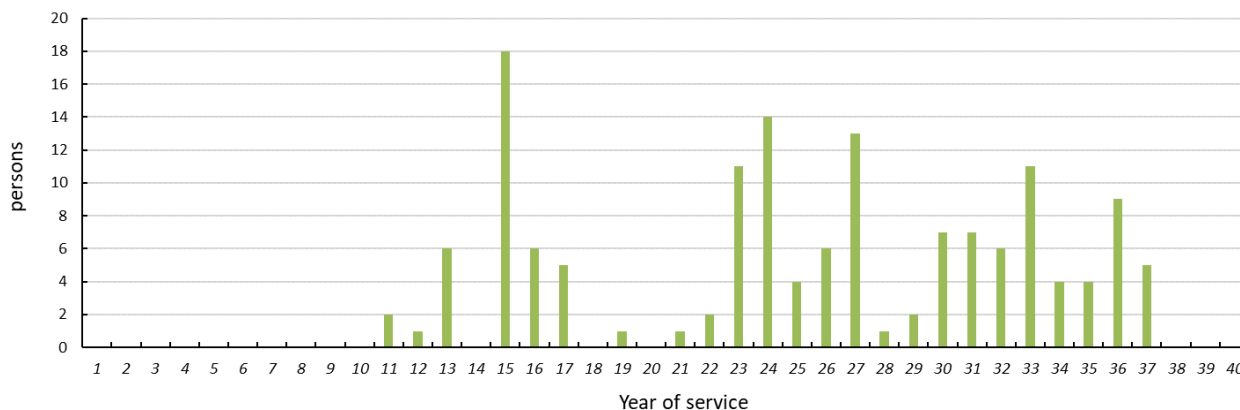
Figure 6 in column chart shows age hierarchy of DSMAS staff in 2022, and Figure 7 in column chart shows year of service of staff at CMM/DSMAS in 2022.

In Figure 6, age of each staff was calculated from the information; date of birth, today's date, whereas year of service of staff in Figure 7 was calculated from the information; date of entrance into CMM/DSMAS, today's date respectively.



Source: JICA Project Team

Figure 6 Age Hierarchy of DSMAS Staff in 2022



Source: JICA Project Team

Figure 7 Year of Service of Staff at CMM/DSMAS in 2022

These figures developed based on statistical data is helpful for organizational management without doubt.

Notwithstanding, it is necessary to note that there are quite a few fundamental pieces of information including date of birth, gender, year of entrance into CMM/DSMAS, academic level, etc., that are blank in the file. Besides that, as having already been mentioned in this report, there is redundant or almost same input data still exist at master input data sheet. To resolve the above issues, JET and HHR staff in DSMAS are continuously working on adding, fine-tuning the data together, in addition to that, HHR staff shall be eagerly devoted to improving the structure of the file to be utilized more effectively for managing their whole directorate in organized manner in near future.

Furthermore, as requested from HHR, JET has set the password to the file for security management. This security management was shared with HHR and they learned that the file which includes personal information shall be secured well and be accessed by limited persons.

2.3 Measures on DSMAS human resources development

Utilizing the above database, the following human resource development policies shall be established.

(1) Well harmonized staffing

A well harmonized assignment of senior and junior staff will be organized in each department, and the work environment will be tuned in which skills can be transferred from senior to junior staff through on-the-job training.

(2) Personnel transfer based on the expertise and background of personnel

To implement personnel transfers based on the expertise and work history of each staff member, taking into consideration the future career path of the staff member.

(3) Recruitment of staff according to needs

To hire staff with the necessary expertise and skills, based on the duties and responsibilities of each department as outlined in the organizational development plan and the direction of future organizational restructuring.

(4) Selection of suitable trainees for various training programs

Systematically and strategically select participants for training programs provided by international donors such as JICA.

Appendices of Chapter 2.7
Activities Related to Output 6

Appendix 7-1

Waste Separation Game Manual

Appendix 7-2

Eco-point Operation Manual

Appendix 7-3

Spo-Gomi Manual

Appendix 7-4

Environmental Picture Diary Manual

Appendix 7-1
Waste Separation Game Manual

*Waste is just waste when mixed
It has value when separated*



Manual of Waste Segregation Game

0

1. Preparation

1-1 General Preparation

1. Coordination of date and time
 - * Required time is approximately 45 minutes
2. Arrangement of venue
 - * Ex. Meeting room
3. Invitation of the participants
 - * 15-20 participants
 - * Moderator, assistant, note-taker, photographer

2

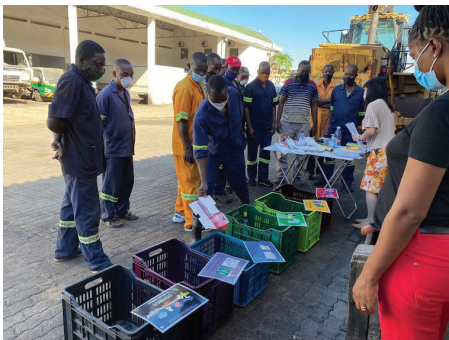
Example of Timetable

Activity	Time	Contents	Person in Charge
Preparation	-	<ul style="list-style-type: none">● Sample waste● Boxes, baskets, or bags to segregate into "Plastic," "Metal," "Glass," "Paper," "Hazardous Waste" and "Others"	Organizer of the activity
Presentation	15 min	<ul style="list-style-type: none">● Why do we need waste segregation?	Presenter
Game	15 min	<ul style="list-style-type: none">● All the participants segregate the sample waste into the boxes of "Paper," "Plastic," "Metal," "Glass" and "Hazardous Waste"	All the participants
Closing	15 min	<ul style="list-style-type: none">● All the participants check together if the segregation is correct● Free discussion, free comments, Q&A session	All the participants

3

1-2 Preparation of the Items

1. Red, yellow, green, blue, purple and black boxes
2. Laminated signboards * See Appendix
3. Sample waste



4

Sample Waste

Plastic



PET bottle



Plastic cup

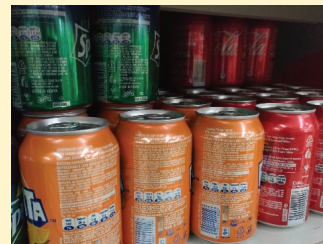


Plastic cutlery



Plastic container

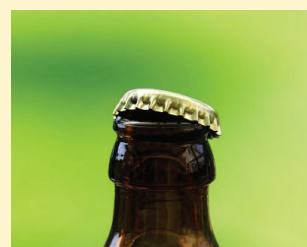
Metal



Aluminum can



Steel can



Bottle cap



Clip

5

Sample Waste

Glass



Wine bottle



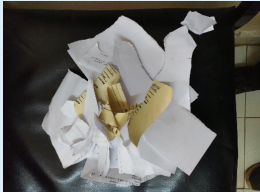
Food bottle

Paper



Newspaper

Magazine



Copy paper



Paper package



Cardboard



Toilet paper tube

Sample Waste

Hazardous waste



Battery



Fluorescent lamp

Others



Tissue



Toilet paper



Organic waste



Cloth



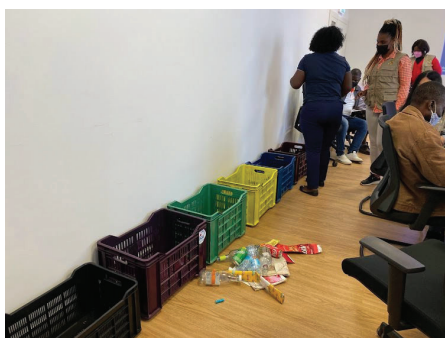
Cigarette

2. Procedure

8

2-1 Opening

- All the participants introduce themselves.
- The moderator explain the purpose of the game “To understand how to and why segregate recyclable waste”
- Explain the rule of the game “Segregate the sample waste into the boxes of correct categories of the resource”

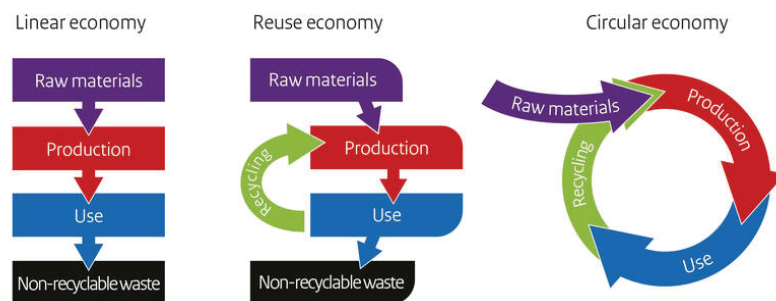


9

2-2 Why do we have to segregate?

The presenter explains the reasons why waste segregation is necessary.

- Natural resources are limited.
- To reduce the quantity of the waste to be dumped so that the dumping site can be used for a long time.
- To keep the quality of recycled material.



10

2-3 Separate the waste

- All the participants segregate the sample waste into the boxes of correct categories of the resources



11

2-4 Closing

- All the participants check the segregation of each sample waste
- Q&A



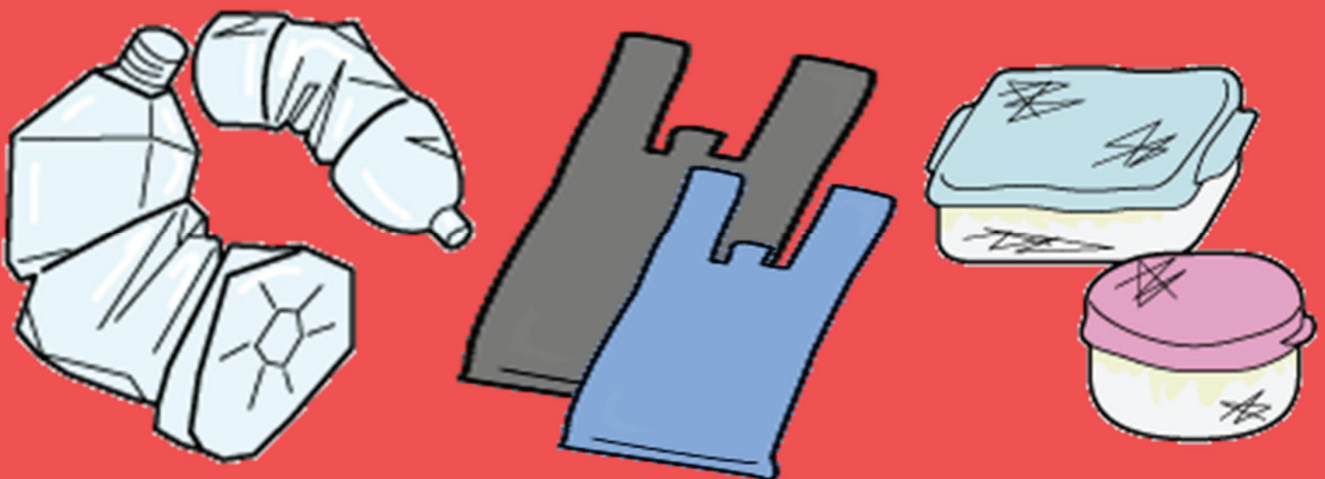
12



Anybody that segregates waste is a hero to save the planet

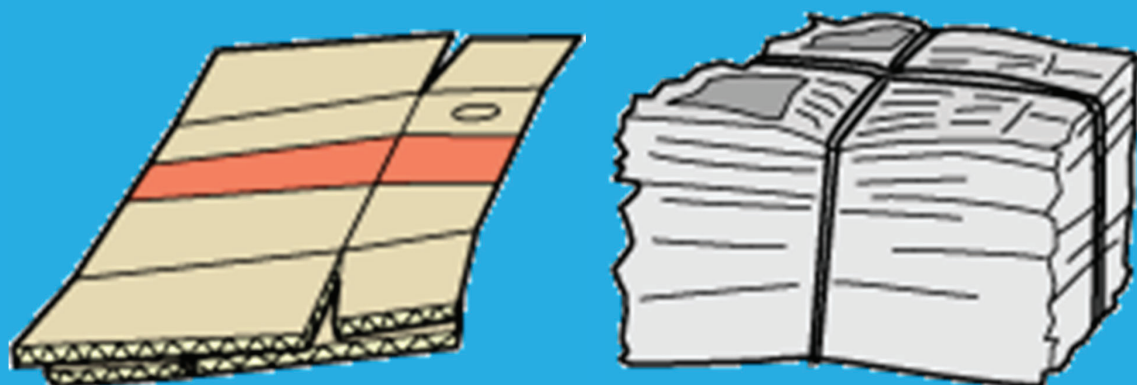
Appendix

14



GARRAFAS PET PLASTICO DURO/LIMPO

SWITHUMBANA SWA KUBASA, MIMKWAMA NI
MATIGELA YA KU BASA



PAPEL LIMPO CARTOLINAS

MAPAPELA YA KU BASA NI
MAPAPELA YA KAKI

Ilustração de resíduos por METI, Japão



LATAS/METAL

SWIKOTELA / TISIMBI

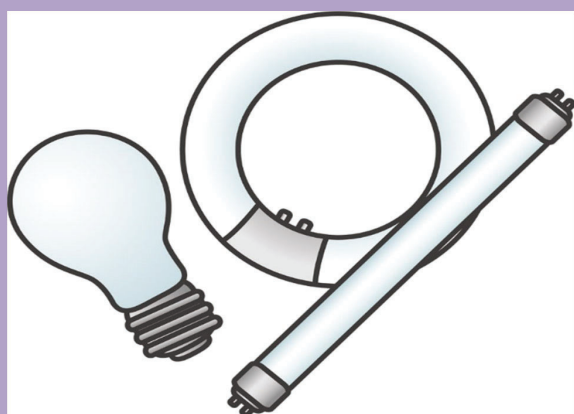
Ilustração de resíduos por METI, Japão



VIDROS

ŜWIGADZANA

Ilustração de resíduos por METI, Japão



LÁMPADA FLORESCENTE E PILHAS

MAGEZI YA KU VANINGA NI MAPILHA



OUTROS

TI NSILA TI NWANA

Appendix 7-2
Eco-point Operation Manual



Operation Manual for Eco-Points

Category of Eco Point

 <p>GARRAFAS PET PLASTICO DURO/LIMPO SWITHUMBANA SWA KUBASA, MIMKWAMA NI MATIGELA YA KU BASA</p>	 <p>LATAS/METAL SWIKOTELA / TISIMBI</p>	 <p>VIDROS ŠWIGADZANA</p>
 <p>PAPEL LIMPO CARTOLINAS MAPAPELA YA KU BASA NI MAPAPELA YA KAKI</p>	 <p>LÁMPADA FLORESCENTE E PILHAS MAGEZI YA KU VANINGA NI MAPILHA</p>	 <p>OUTROS TI NSILA TI NWANA</p>

What do we do for operation of Eco Points?

1. Check the Eco Point
2. Improve the Eco Point if necessary
3. Weigh and record the weight of the waste



2

1. Check the Eco Point

No.	Check Point	If	Countermeasure
1	Is the waste segregated correctly?	NO ➔	Segregate again (→ Improve the Eco Point ①)
2	Are signboards pasted on the wall?	NO ➔	Paste (→ Improve the Eco Point ②)
3	Are the boxes placed correctly and beautifully?	NO ➔	Rearrange (→Improve the Eco Point ③)

3

2. Improve the Eco Point ①

No good!!



Plastics in "Metal" box!!



- ❑ Segregate correctly again
- ❑ Raise awareness of the colleagues
- ❑ Share information with the cleaning staff

4

2. Improve of Eco Point ②

No good!!



Signboard is fell in the ground!!



- ❑ Paste the signboard beautifully again

5

2. Improve of Eco Point ③

No good!!



There is a gap between the boxes!!



- ❑ Place the boxes without any gaps
- ❑ Place the boxes just below the signboards
- ❑ Wash the boxes to look beautiful

6

3. Weigh and record the weight of the waste ①



- ❑ Collect the waste in the bag of each category
- ❑ Move to the warehouse

Attention!!



Never take the boxes to the warehouse!

It would cause the box to be missing.

The boxes never leave the Eco Point.

7

3. Weigh and record the weight of the waste ②



- Weigh the waste of each category
- Keep the record
- Weigh the waste for twice a month

Date	Plastic (kg)	Metal (kg)	Vidro (kg)	Paper (kg)	Hazardous waste (kg)	Remarks
2022/9/3						
2022/9/17					2.59	HW:fluore scent tube
2022/10/8						
2022/10/29	2.45			12.15		



Example of Assigning Persons in Charge of Eco Points

No.	Location	Person in Charge	Cleaning Staff
1	Secretart	Mr. Raul	Ms. Arminda Mr. Cumbula
2	REA	Mr. Edson Mr. Bila	Ms. Marta Mr. Ricardo
3	DOPA	Mr. Silvino	Mr. Dionildes
4	Proof of Service	Mr. Morgado	Mr. Calcavato
5	Meeting Room	Ms. Mafalda	Mr. Bernardo Ms. Marta
6	Finance	Ms. Rita	Mr. Malevane
7	Project Office	Ms. Stella	Mr. Malevane

Appendix 7-3
Spo-Gomi Manual

*Waste is only waste when mixed
but has value when segregated*



Manual for Implementation of SPO GOMI Activity

0

What is SPO GOMI?

SPO GOMI is a **new waste collection technique that incorporates elements of sports**, promoted by a Japanese association called 'Social Sports Initiative.' It is a sport in which teams collect waste within a designated perimeter and earn points according to the amount of waste collected, with the purpose of leaving a clean and healthy city, and to raise awareness and interest in waste issues among children and adults. Adding new elements such as sports, competition and fun to the clean-up campaigns can encourage the participation of more people, including those with little interest in waste issues, and promote the interest and sensitivity of all citizens in Mozambique.



1



Basic Rules

1. The participants make groups of 3-5 persons each
2. The groups collect and segregate waste in the bags
3. Measure the weight of collected waste
4. The group which collects the most waste is the winner

2



1. Preparation in Advance

3

1-1 Preparatory Meeting

- Meeting with the participants and the guests
- Perimeter of waste collection, location of the opening, measuring waste and closing ceremony
- Arrangement of the recycling company for the collected waste



4

Example of the Program

Time	Agenda	Presenter / Person in Charge
8:30-9:00	Distribution of the bags for each category of waste to the participants	Organizer of the activity
9:00-9:05	Opening remarks	Representative of the participants
9:05-9:10	Rule explanation	Organizer of the activity
9:10-9:40	Competition (Waste collection)	All the participants
9:40-9:50	Measuring the waste and classification	Organizer of the activity
9:50-10:00	Announcement of the results, handing over the prizes, the winners' speech	Organizer of the activity

5

Example of waste categories and points

<p>Plastic and PET bottle</p>  <p>1 g = 1 point</p>
<p>Metal</p>  <p>1 g = 1 point</p>
<p>Glass bottle</p>  <p>1 g = 1 point</p>
<p>Paper</p>  <p>1 g = 1 point</p>
<p>Other waste</p>  <p>1 g = 1 point</p>

6

Example of the criteria on point deduction

Item	Action	Point to be reduced
Rule breaking	Team members who are not using proper garbage bags	100
	Team members who are running	
	Group members not coordinated as a group	
	Collecting oversized garbage	
	Not following the rules of waste separation	
	Purposefully increasing the weight of waste	
Violation of the time allocated for the competition	Create garbage on purpose	100
	Team members do not return within the allotted time	
	Team members fail to report to the secretaries or the weighing team within the allotted time	
Violation of the spirit of sportsmanship	Only a few team members are back within the allotted time	Disqualification
	Conduct contrary to the instructions and warnings of the referees	

1-2 Preparation of the items

- Waste collection bags
- Signboards on the bags
- Scales
- Score tables
- (If necessary) gloves, tongs, prizes, bottled water for the participants



8

1-3 Preparation of Persons

- Moderator
- Monitors
- Person to measure the weight of waste
- Person to write down the weight of waste
- Photographer



9

2. Flow of Activity

10

2-1 Distribution of the bags and explanation of the rules

- Distribute the bag and the items for the participants
- Explain the rules including the point system
- Confirm the of the perimeter and the time for waste collection



11

2-2 Competition (waste collection)

- The participants collect the waste in the designated perimeter.
- The monitors check their actividade para garantir que os participantes sigam as regras.



12

2-3 Weighing the Waste

- The participants hand over the bags to be weighed.
- The weighers weigh the waste of each category with the scales.
- The registrars pair up with those responsible weighing and make the register the points.



13

2-4 Awarding and Handing Over the Waste

- The organizers announce the results.
- The winners are rewarded.
- The waste is handed over to a recycler.

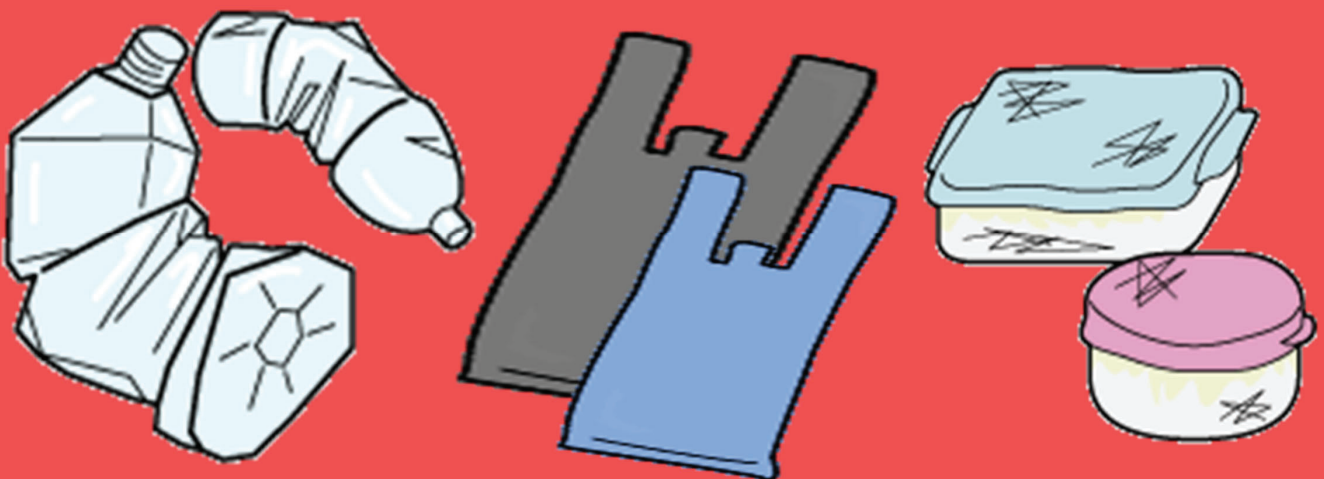


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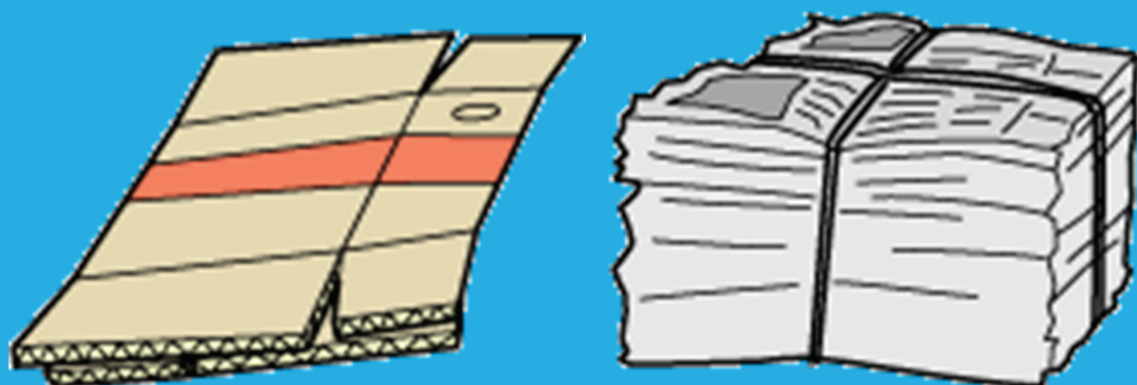
Appendix

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GARRAFAS PET PLASTICO DURO/LIMPO

SWITHUMBANA SWA KUBASA, MIMKWAMA NI
MATIGELA YA KU BASA



PAPEL LIMPO CARTOLINAS

MAPAPELA YA KU BASA NI
MAPAPELA YA KAKI

Ilustração de resíduos por METI, Japão



LATAS/METAL

SWIKOTELA / TISIMBI

Ilustração de resíduos por METI, Japão



VIDROS

ŜWIGADZANA

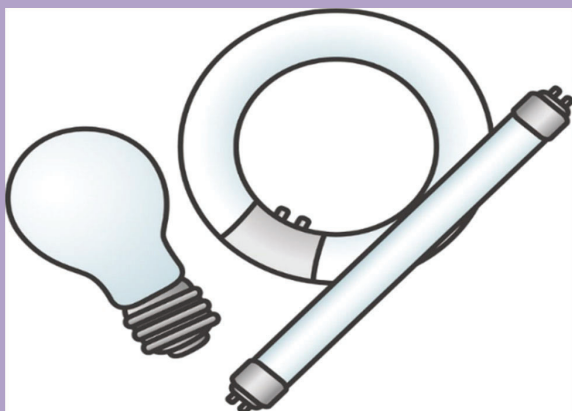
Ilustração de resíduos por METI, Japão



OUTROS

TI NSILA TI NWANA

Ilustração de resíduos por METI, Japão



LÂMPADA FLORESCENTE E PILHAS

MAGEZI YA KU VANINGA NI MAPILHA

Table of weighing the collected recyclebles and the waste
Cleaning Campaign "SPO GOMI"

Names of the Members	
Weight of the Collected Recyclebles and Waste	
Items	g
Metal 1g=1p	
Plastic and PET 1g=1p	
Glass 1g=1p	
Paper 1g=1p	
Others 1g=1p	
Total	
Name of Person Responsible for weighing	

Appendix 7-4
Environmental Picture Diary Manual



Manual for Implementation of Environmental Picture Diary

0

What is Environmental Picture Diary?

Environmental Picture Diary is a picture diary in which children freely express what they have discussed and thought about environmental issues and conservation at home and school through a combination of pictures (visual expression) and text. By thinking of environmental issues together with family and friends from elementary school age, children will acquire correct environmental knowledge and develop "new environmental awareness". Children will take this opportunity to discuss the environment at home and at classes.



1

Preparation

1. Topic (Anything about environment?
Solid waste management?
Ideal city that you want to live?)
2. Crayons
3. Paintings and belongings
4. Paper



2

Basic Implementation Flow

1. Children draw picture and text about the environment
2. Children do presentation about their own drawings
3. Children discuss environmental issues based on their own and others' drawings



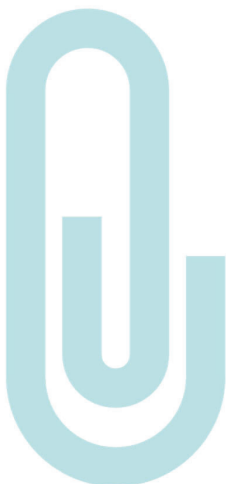
3

Options

1. Just drawing
2. + Essay (composition) about environment
3. + Presentation
4. + Discussion with family



Masterpieces of Environmental Picture Diary



Carmelia Yolanda



Luiza Carlota Rhamulho



m'hananda lisa y= detard kurama s
 mbu am...
 a sarna di gustabulal
 et m' h...
 fut d' toia g...



Nome: Bellen Fernando Namuco class F

Grade: Year 1



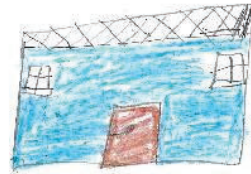
ABATI uma Anvor

Planta uma Anvor

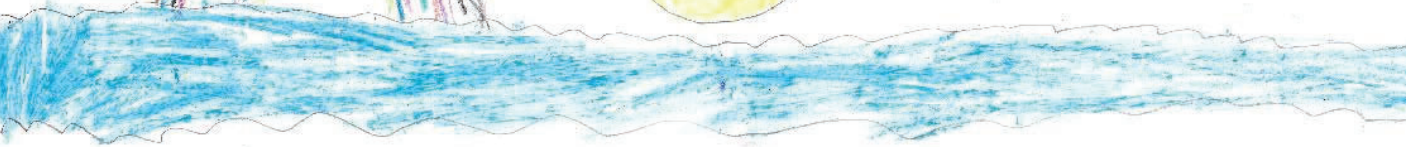
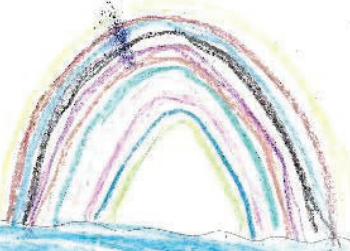
Art. G. F.

Christiane Redacção sobre meio ambiente

não devemos deixar lixo no chão deixar a escola sempre limpa devemos separar o lixo papel no caixote de papel, garrafa de vidro devemos deixar no caixote de vidro garrafa de plástico no caixote de garrafa devemos deixar a casa sempre limpa tirar o lixo todos os dias não deixar o lixo no chão



regar as plantas todos os dias



Delma Fernando Mourão





Environmental Picture Diary in Other African Countries

Environmental Picture Diary in Japan

題名 だんご虫横はま

3年 7月 29日 曜日 晴

学校 中和小学校 3年

名前 藤原 まさ

環境絵日記2019

題名 22歳の私と世界

1年 8月 11日 曜日 天気 晴れ

学校 あざみ野第一小学校 6年

名前 河井 咲良

環境絵日記2019

