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

AGENDA of the 5th Joint Coordination Committee Meeting

- Date: 7 December 2022 (Wednesday)
- Time: 13:00 to 16:00
- Venue: CMM Training Center
- Agenda:

Time	Agenda	Presenter/in-charge
12:30-13:00	*Registration/Preparation*	DSMAS/JET
13:00-13:10 (10 min)	Introduction of participants	Mr. Simão Mutereda Chief of Section, DSMAS
13:10-13:20 (10 min)	Opening remarks by CMM	Mr. Silva Magaia Councilor, CMM
13:20-13:30 (10 min)	Opening remarks by JICA	Mr. Kobayashi Deputy chief representative of JICA Mozambique office
13:30-13:35 (5 min)	Introduction on major achievement and way forwards of the Project	Mr. Sergio Director of DSMAS
13:35-13:50 (15 min)	Monitoring of Action Plan and Master Plan (Output 1)	Mr. Chilaule RIA, DSMAS
13:50-14:05 (15 min)	Draft plan for improvement of waste collection and transportation (Output 2)	Mr. Almajane Head of Department, DSMAS
14:05-14:20 (15 min)	Guideline on operation and management of sanitary landfill (Output 4)	Mr. Hosono Chief Advisor, JET
14:20-14:40	*Break*	
14:40-14:55 (15 min)	Strategy on improving financial sustainability of solid waste management sector (Output 5)	Mr. Anselmo Head of Department, DSMAS
14:55-15:10 (15 min)	Proposal on DSMAS organizational, human resources and institutional development (Output 5)	Mr. Martins Chief of Section, DSMAS
15:10-15:20 (10 min)	Progress of public awareness and environmental education activities (Output 6)	Ms. Nilza Zandamela Head of Department, DSMAS
15:20-15:50 (30 min)	Overall discussion	Mr. Simão Mutereda Chief of Section, DSMAS
15:50-16:00 (10 min)	Closing remarks by CMM	Mr. Silva Magaia, Councilor, CMM

- End of document -

Maputo Municipal Council
Municipal Directorate for Environment and Solid Waste Management

"Master Plan for Urban Solid Waste Management (MPUSWM)" Planning and Monitoring

Prepared by: Raúl Chilaúle, Technician at the Municipal Directorate of Environment and Solid Waste Management

Maputo, December 2022

MUNICÍPIO DE MAPUTO

PRESENTATION CONTENTS

1. Objective of the presentation;
2. Legal Framework on planning and Monitoring of SWM Activities;
3. Master Plan Monitoring:
   - 3.1. Identifying the Monitoring Indicators
   - 3.2. Definition of the date of the monitoring and assign the team;
4. Monitoring of the Action Plan for Municipal Solid Waste Management in the Municipality of Maputo from January to December 2022
   - 4.1. Verify the progress of the actions and complete the Monitoring Sheet;

MUNICÍPIO DE MAPUTO

PRESENTATION CONTENTS

5. Results of the Monitoring of the Action Plan for the Management of Urban Solid Waste in the Municipality of Maputo from January to December 2022.
   a) PA 1: General Provisions
   b) PA 2: Organizational Structure
   c) PA 3: Collection and Transport
   d) PA 4: Treatment and Disposal
   e) PA 5: 5Rs
   f) PA 6: Civic Education
   g) PA 7: Financial management

MUNICÍPIO DE MAPUTO

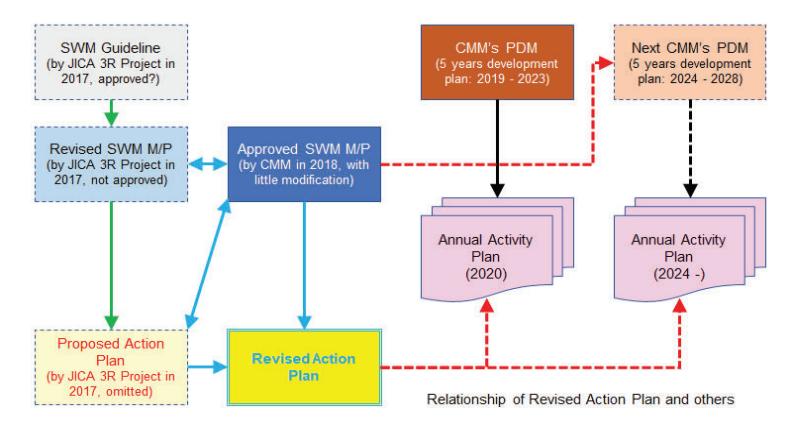
1. Background

The Municipality of Maputo, through its **Strategic Plan**, has as one of its priorities the improvement of Urban Solid Waste Management (USWM) and to make this activity sustainable in order to ensure sanitation conditions with reduction of negative environmental impacts. Thus, this presentation is intended to:

- ✓ Inform about the current stage of the implementation of the Urban Solid Waste Management Master Plan in the Municipality of Maputo through DMAS;
- ✓ Present the results of the monitoring of the Action Plan for USW Management in the Municipality of Maputo for the period of January to December 2022.

MUNICÍPIO DE MAPUTO

2. Legal Framework for Planning and Monitoring MSWM Activities



MUNICÍPIO DE MAPUTO

3. USW Management Activities Planning Stages

3.1 Identification of Monitoring Indicators

Using the Matrix of Activities aimed at achieving the strategic objectives of the MP and PDM, the monitoring indicators are identified, and the following steps are taken: "definition of each indicator," "measurement methodology," "responsible organization," and "its frequency.

MUNICÍPIO DE MAPUTO

4. Master Plan monitoring procedure:

3.1. Identifying Indicators for Monitoring

a) Collection and Transport

- Amount of Waste collected by all service providers (ton/day) (Weighbridge record).
- Quantity of Waste collected by secondary collection service providers (Weighbridge record).
- Number of neighbourhoods covered by primary collection (Monthly microenterprise reports

b) Treatment and Deposition

- Daily average of waste quantity deposited in the landfill/landfill (ton/day) (Weighbridge record).
- Average daily amount of recycled waste collected at the IRM (ton/day)
- Average daily amount of waste disposed of in the landfill/dump site (ton/day) (Obtained through calculation/projections).

UNICÍPIO DE MAPUTO

4. Master Plan monitoring procedure:

3.1. Identifying Indicators for Monitoring

c) Promotion of 5R (3R) (1):

- Amount of recyclable waste collected in the urban area (ton/day).
- Amount of recyclable waste collected in the suburban area (ton/day)

d) Environmental Education

- Environmental awareness campaigns in places of major USW production.
- Workshop held with actors promoting the 5Rs

4. Master Plan monitoring procedure:

3.1. Identifying indicators for Monitoring.

f) Fanancial Management:

- Target Rate - Cost Coverage for SWM.
- Target coverage rate for proof-of-service revenue.
- Target Coverage Rate for Cleaning Fee

3.2. Definition of the date of the monitoring and members of the team that will do the monitoring.

✓The date of the monitoring should be determined according to the Monitoring Schedule in the Action Plan, that is, there should always be a well-defined Action Plan before the Monitoring process begins.

✓To appoint the member of the monitoring team, the department/section in charge, should always consult the supervisor.

4.3. Results of the Monitoring of the Action Plan for the Management of Municipal Solid Waste in the Municipality of Maputo from January to December 2022.

4.1. Verifying the progress of the actions and filling out the monitoring sheet;

i. Verificar o progresso de cada acção, comparando-a com o previsto no cronograma
ii. Comparar a "Situação Planeada" e a "Situação Real" e em seguida seleccionar o menu nas caixas de monitoria designadas

Situação Planeada das Actividades no Plano de Acção	Situação Actual	Resultado da Monitoria
☐ Não inciada ainda	☐ Não inciada ainda	☐ Consideravelmente atrasada
☐ Em curso (30%)	☐ Em curso (30%)	☐ Atrasada
☐ Em curso (50%)	☐ Em curso (50%)	☐ Realizada a tempo
☐ Em curso (70%)	☐ Em curso (70%)	☐ Realizada atempadamente
☐ Realizada	☐ Realizada	

5. Results of the Monitoring of the Action Plan for the Management of Municipal Solid Waste in the Municipality of Maputo from January to December 2022.

a) PA 1: General Provisions

b) PA1-1: Monitoring of the Progress of the MP approved in 2018

Attempts were made to establish a monitoring team and design a schedule for the monitoring to take place in 2021, however this was not possible due to the possibility of the construction of the new landfill in Katembe. The MP monitoring is scheduled for the second half of 2022, as part of the Output 1 activities.

PA1-2: (MP Progress Monitoring (2020 to 2024)

Due to the delay in preparing the AP monitoring guidelines, the monitoring was also delayed. However, with JET assisting by creating he guidelines, the monitoring has been started since the beginning of August and its result is expected to be reflected in the Annual Activity Plan by the end of September by DSMAS.

PA1-3: The mid-term review has not yet been implemented.

It was expected to implement the mid-term review of the MP in 2021, but due to CMM intention to build the landfill in Katembe instead of Mathleleme, in 2021, would be supported by the WB, the timing of the review was changed in 2022.

5. Results of the Monitoring of the Action Plan for the Management of Municipal Solid Waste in the Municipality of Maputo from January to December 2022.

a) PA 1: General Provisions

PA 1-4: Implementation of Waste Quantity and Quality Survey

Budgeted for the implementation of the MSW Quantity and Quality survey for the 2023 fiscal year. Note that this activity will be carried out with the funds from the Municipality through the item for consultancies.

PA 1-5: Minor Updates to the MP approved in 2018 (MP Updated for 2023)

This action will be conducted together with the mid-term review of the MP. DSMAS team will be responsible for conducting the mid-term review of the M/P.

PA 1-6: Cleaning Ordinance Review

The Consultant has started its work since mid-July and needs about 6 months to complete. However, the goal of submitting a new proposed Ordinance is provisionally set until the end of February 2023 for approval by the Municipal Assembly.

b) PA 2. Revision of the Organic Structure of DSMAS

PA 2-1: Creation of DSMAS

This action has already been completed.

PA 2-2: Review of the new organizational structure of DSMAS

This action has already been completed.

PA 2-3: Capacity building of DSMAS staff

There is an annual training plan for CMM staff, hence DMAS informs its training needs to PDBRH, although the request is not always answered satisfactorily allegedly due to financial constraints. However, some online training opportunities have been provided by JICA for some DMAS staff.

PA2-4: Reflection on the Inter-municipal Committee for Landfill Operation.

No action is implemented because it is still under discussion which landfill will be used for the final disposal of USW (KaTembe or Mathlemele). It should be pointed out that since 2019, there has been no discussion between the two Cities on the issue. After the decision is made, further discussions will be held to determine whether or not this action will continue.

.

c) PA 3: Waste Collection and Transportation (MP Chapter 6.3)

PA 3-1: Reflexion on Increasing the Transport Distance to the New Mathlemele Landfill and/or Katembe in Urban Collection

The implementation of the time and motion study is planned in the annual plan of activities (Plan and Budget 2022). On the other hand, Output 2 team and JET will conduct a survey on Google map or similar tools.

PA 3-2: Expansion of Door-to-Door Collection in the Urban Area

The implementation of the door-to-door collection study is planned in the annual activity plan 2022. On the other hand the output 2 and JET team will verify the effectiveness of door-to-door collection, which is not highly prioritized.

PA 3-3: Reflection on Increasing the Transport Distance to the New Matlhemele and/or Katembe Landfill for Secondary Collection in the Suburban Area

All activities are within the initially defined schedule, although they have not yet started because they depend on the construction of the landfill, except for the Time and Motion study (1) which depends on budget programming.

PA 3-4: Transport of Waste from Katembe

The management of solid urban waste in Katembe will be discussed in the studies planned by the World Bank for the construction of the new landfill with technical input from JET.

PA 3-5: Primary collection in Katembe

The activity was mostly carried out as planned. It should be noted that there was a decentralization process for contracting Primary Collection services (Micro Companies) for all municipal districts, which caused delays in the preparation of the tender.

PA 3-6: Elimination of Informal Dump sites

Three trucks were procured, two (02) of the Roll on Roll off type and one (01) compactor to carry out the work of eliminating informal dumps sites and respond to emergency cases in coordination with the Municipal Districts.

AP 3-7: Improvement of Special Removal by DSMAS

specific implementation plan for the improvement of special collection is not prepared. However, DMAS has procured three Roll on roll off trucks for interventions in case of failure or lack of collection.

.

d) PA 4: Waste Treatment and Disposal (P/D Chapter 6.4)

PA 4-1: Construction and Operationalization of the New Landfill in Matlhemele

Since the construction plan for the new landfill in Katembe is underway, the coordination has been provisionally suspended. However, there is still a possibility for the CMM to use the landfill in Mathlemele due to transportation efficiency.

PA 4-2: Construction and Operation of the New Landfill in Katembe

The availability of 60 ha for the construction of the landfill, including the necessary buffer area for the accumulation of waste from Maputo for about 20 years was ensured.

PA 4-3: Closure of the Hulene Dump

It was contracted a consulting service for the closure of the hulene dumpsite through PTUM in September 2022.

PA 4-4: Introduction of SWM Intermediate Treatment System

No action related to the introduction of an intermediate treatment system has been carried out. Waste reduction methods will be discussed during the PTUM Study or the mid-term review of the MP.

.

e)) PA 5: Promoting the 5Rs

PA 5-1: Enhancing the 5Rs Policy Framework

The 5Rs forum has been organized four times so far. In parallel, intermittent and irregular meetings were held with MTA in order to discuss issues related to the 5Rs policy.

PA 5-2: Promoting 5Rs In The Urban Area

DMAS is preparing a pilot project for segregated collection of recyclables in public buildings, and with JET support is also looking for the recycler to handle the collected recyclables.

PA 5-3: Expansion of 5Rs Stations in the Suburban Area

The study of the need for 5Rs stations in the suburban area is still ongoing. This action will be done under PTUM, that also proposes the creation of 5Rs stations of the same type.

.

e) PA 5: Promoting the 5Rs

PA 5-4: Introduction of Separate Collection in the Suburban Area

DMAS with support from Italian Cooperation is preparing to implement segregated collection in Chamanculo C, including community composting from the collected organic waste...

PA 5-5: Promotion of Home Composting

DMAS is planning to implement the segregated collection study in Chamanculo C, including community composting. Note that composting is one of the alternatives to reduce the volume of waste to be disposed in the landfill.

.

f) PA 6: Civic (Environmental) Education

PA 6-1: Introduction of the 5Rs Principle in Educational Institutions

It has been introduced in 05 schools, including Primary and Secondary schools. The Instruction Manual is being updated considering the 5Rs policy with support from JET. It should be noted that due to the outbreak of COVID-19, this activity is being carried out following the health protocol.

PA 6-2: Public Awareness Campaigns at Critical Points of USW Generation

All actions related to the public awareness campaign at critical USW generation points have been implemented in compliance with the sanitary protocol imposed by the COVID-19 situation.

.

g) PA 7: Financial Management

AP7-1: Estimated Major Expenses for New Waste Management Systems

The studies on the major expenditures in municipal solid waste management was completed with the support from JET, which also includes the construction situation of the new landfills in Katembe, through PTUM and Matlhemele.

AP 7-2: A Mechanism for Improving the Revenue Collection

A financial sustainability strategy has been developed for May 2022 consisting of correcting the operation of the revenue collection system through EDM and Proof of Service with support from JET.

AP 7-3: Study for Changing the Cleaning Fee and its Collection System

The study has already been completed and the financial strategy for SWM has been prepared, presented to the technicians of the Revenue Department of the Municipal Finance Directorate and we await for an opportunity to present at at the CMM session.

THE END

THANK YOU FOR THE ATTENTION

OUTPUT 2

[Activity 2-1] Organize trainings, seminars and workshops for CMM officers on the supervision of Waste Collection Service Providers (WCSP).

[Activity 2-2] Study the current situation of the WCSPs and their contracts.

[Activity 2-3] Develop a draft plan to optimize the waste collection and transportation service in the entire CMM area

[Activity 2-4] Examine the revision of contracts with the WCSPs for improving waste collection service.

[Activity 2-5] Study monitoring and control system of waste collection services using ICTs (Information and Communication Technologies).

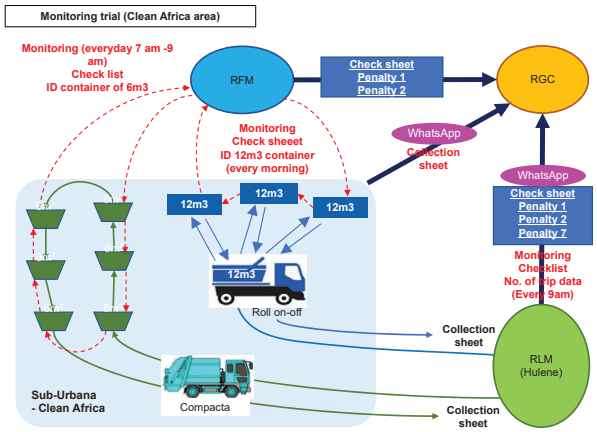
Develop a draft plan to optimize the waste collection and transportation service in the entire CMM area [Activity 2-3]

I. **Current situation**
   1. **Monitoring trial.**
   2. **ME Survey**

II. **Draft plan to optimize the waste collection and transportation service**
   1. **Capacity development & waste collection and transportation service information management**
      i. Management of container information
      ii. Management of collection route
      iii. Data management
      iv. Information sharing management
   2. **Waste collection and transportation service monitoring management**
      i. Weighbridge data management
      ii. Monitoring of waste collection and transportation services for MEs and large WCSP based on ICTs (MOPA)-Activity [2-5]
      iii. Identifying problems
   3. **Measures for waste reduction**
      i. Non-domestic waste management
      ii. Management of market waste
   4. **Future collection plan for sub-urban and urban area**
   5. **Examine the revision of contracts with the WCSPs for improving waste collection service-Activity [2-4]**

III. **Waste transfer methods**

1.Monitoring trial



Problems

1. Container and collection route management
2. Waste amount management
3. Waste flow management
4. Waste collection management
5. ToRs of the bidding and WCSPs contracts
6. Supervision management
7. Collection of empty containers
8. Unreliable information on secondary collection
9. More than two collections per day per container
10. Weighbridge management

2. Microenterprise (ME) survey

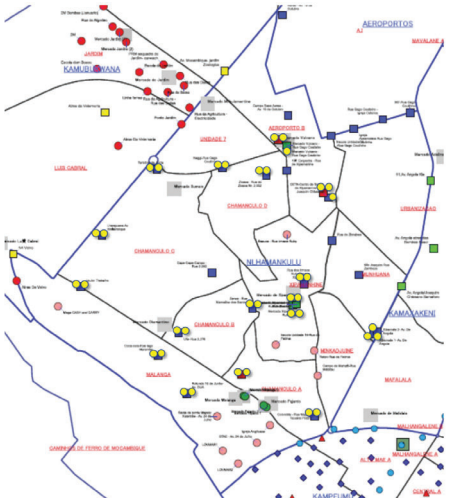
DIS	CONT NAME	CA	MEs	Problem	Business mix	Mercado	1 MEs							2 MEs							3 MEs						
							S	T	Q	Q	S	S	D	MEs	S	T	Q	Q	S	S	D	MEs	S	T	Q	Q	S	S	D	MEs
12m3	Nihamankulo	CETA-Centro de Saude de Xipamanine - Av. Joaquim Chissano	1.5	1	V (overload)																								
12m3	Nihamankulo	Escola Unidade 18 -Rua Gago Coutinho	1.0	1																									
12m3	Nihamankulo	Igreja Assembleia-Rua Gago Coutinho	1.0	1					C					AEROPORTO								AEROPORTO B							
12m3	Nihamankulo	Rua Gago Coutinho - Igreja Catolica	1.1	1		V (small)			C																				
12m3	Nihamankulo	007- Rua Gago Coutinho	1.0	1					C																				
12m3	Nihamankulo	Entrada da Base Aerea - Av. 19 de Outubro	1.0	1					A																				
12m3	Nihamankulo	Campo Base Aerea - Av. 19 de Outubro	1.1	1					A	B		A	B																
12m3	Nihamankulo	Mercado Vulcano - Rua Gago Coutinho	1.8	1			V		A	B	C	A	B	AEROPORTO								UNIDADE 7							
12m3	Nihamankulo	10- Esquadra - Rua de Xipamanine	1.0	1						C																			
12m3	Nihamankulo	Rua dos Irmaos Ruby/Parque Xipamanine	1.5	1		V	V (rehoused)		A			A		XIPAMANINE			C			C		MINKADJUINE							
12m3	Nihamankulo	Rua do Zimabwe	1.3	1					A			A				A				A		XIPAMANINE							
12m3	Nihamankulo	S$@ Joaquim Rua Zambeze	1.4	1					A	C	A			MUNHUANA															
12m3	Nihamankulo	Xibamate 1- Av. De Angola	1.6	1						B			B				B		B	C		MINKADJUINE			B	C	B	C	MAFALALA
12m3	Nihamankulo	Xibamate 2- Av. De Angola	1	0.5						B			B				B		B	C					B	C	B	C	
12m3	Nihamankulo	Colombia - Rua Major Teixeira Pinto	1.1	1					A	B	C	A	B	CHAMANCULO A															
12m3	Nihamankulo	Zanza - Rua Marcelino dos Santos	1.3	1		V			A	B	C	A	B	CHAMANCU	A	B			A	B		CHAMANCULO B							
12m3	Nihamankulo	Ufe- Rua 2.276	1.6	1						B	C		B	CHAMANCULO B															
12m3	Nihamankulo	Cape-Cape-Campo - Rua 2.282	1.5	1	V (overload)				A		A		C									CHAMANCULO B			A	B	C	A	CHAMANCULO A
12m3	Nihamankulo	Terminal da Junta	1.3	1	V (overload)	V (big)				B			C	CHAMANCU															
12m3	Nihamankulo	Lhanguene-Av. Mo#mbique	1.6	1		V				B	C		B																
12m3	Nihamankulo	Zixaxa - Rua do Zixaxa Nr. 2.302	1.6	1					A	B	C	A	B	CHAMANCULO D															
12m3	Nihamankulo	Rotunda 16 de Junho- Av. OUA	1.1	1		V				B			B																
12m3	Nihamankulo	Coca-cola-Rua Iago Maramba	1.3	1		V				B			B	MARANGA															
12m3	Nihamankulo	Up- Av. Trabalho	1.4	1		V				C			B																
12m3	Nihamankulo	Nagqi-Rua Gago Coutinho	1.4	1	V (overload)	V (corporation)			A	B		A	B	UNIDADE 7															
12m3	Nihamankulo	Mercado Xipamanine - Rua Zixaxa 1	1.7				V		A	B	C	A	B	every day collection															
12m3	Nihamankulo	Mercado Xipamanine - Rua Zixaxa 2	1.8				V		A	B	C	A	B	every day collection															

Adequate management and monitoring of waste collection and transportation contracts

- 1.Capacity development & waste collection and transportation service information management
  - i. Management of container information
  - ii. Management of collection route
  - iii. Data management
  - vi. Information sharing
- 2. Waste collection and transportation service monitoring management
  - i. Weighbridge data
  - ii. Informations from ME and WCSPs
  - iii. Identifying problems
- 3. Measures for waste reduction
  - i. Non-domestic waste
  - ii. Waste of markets

1. Capacity development & waste collection and transportation service information management

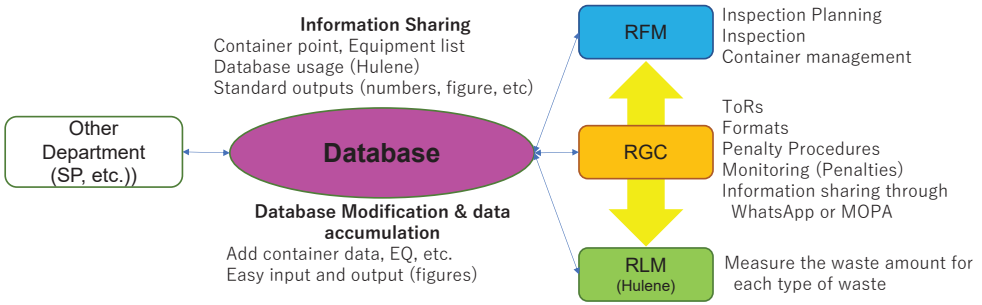
i. Management of container information



ii. Management of collection route

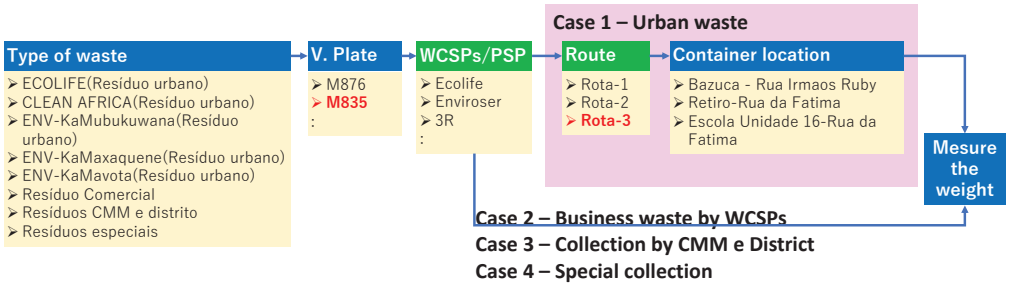
	Now	New	DIS	CONT NAME (12m3)	Mercado	Problem	Business	1 MEs	2 MEs	CA	
1	12m3	12m3	Nhamankulu	Igreja Assembleia-Rua Gago Coutinho				AEROPORTO A		1.2	
2	12m3	12m3	Nhamankulu	Escola Unidade 18 -Rua Gago Coutinho					AEROPORTO B	1.2	
3	12m3	12m3	Nhamankulu	Rua Gago Coutinho - Igreja Catolica			V(small)			1.1	
4	12m3	12m3	Nhamankulu	007-Rua Gago Coutinho						1.2	
5	12m3	12m3	Nhamankulu	Entrada da Base Aerea - Av. 19 de Outubro				AEROPORTO B		1.2	
6	12m3	12m3	Nhamankulu	Campo Base Aerea - Av. 19 de Outubro						1.1	
7	12m3	12m3	Nhamankulu	10- Esquadra - Rua de Xipamanine						1.2	
8	12m3	12m3	Nhamankulu	Rua do Zimabwe				XIPAMANINE	MUNHUANA	1.3	
9	12m3	12m3	Nhamankulu	S§ Joaquim Rua Zambeze				MUNHUANA		1.4	
10	12m3	12m3	Nhamankulu	Cape-Cape-Campo - Rua 2.282		V(overload)		CHAMANCULO C	CHAMANCULO B	1.5	ABC->C (Solved)
sum	120m3	120m3									
1	6m3	12m3	Nhamankulu	CETA 1-Centro de Saude de Xipamanine - Av. Joaquim Chissano		V(overload)		AEROPORTO A		1.5	Add container (Solved)
2	6m3	-	Nhamankulu	CETA 2-Centro de Saude de Xipamanine - Av. Joaquim Chissano				AEROPORTO B			New container (Solved)
3	6m3	12m3	Nhamankulu	CETA 3-Centro de Saude de Xipamanine - Av. Joaquim Chissano							New container (Solved)
4	6m3	12m3	Nhamankulu	Rua dos Irmaos Ruby/Parque Xipamanine		V(informal)	V	XIPAMANINE	MINKADJUINE	1.5	no change->everyday
5	6m3	-									
6	6m3	12m3	Nhamankulu	Xibamate 1- Av. De Angola				MINKADJUINE		1	everyday
7	6m3	12m3	Nhamankulu	Xibamate 2- Av. De Angola				MUNHUANA			
8	6m3	-	Nhamankulu	Xibamate 3- Av. De Angola				MAFALALA		1.6	A to C change->everyday
9	6m3	12m3	Nhamankulu	Colombia - Rua Major Teixeira Pinto				CHAMANCULO A		1.1	
10	6m3	-	Nhamankulu								
11	6m3	12m3	Nhamankulu	NEW for Chamanculo A					MALANGA		
12	6m3	-	Nhamankulu								
13	6m3	12m3	Nhamankulu	Zanza - Rua Marcelino dos Santos			V	CHAMANCULO B		1.3	reduce->business
14	6m3	-	Nhamankulu								
15	6m3	12m3	Nhamankulu	Ufa- Rua 2.276						1.6	no change, 1.6time->everyday
16	6m3	-	Nhamankulu								
17	6m3	12m3	Nhamankulu	Lhanguene-Av. Mo¶mbique			V	CHAMANCULO C		1.6	no change, 1.6time->everyday
18	6m3	-	Nhamankulu								
19	6m3	12m3	Nhamankulu	Zixaxa - Rua do Zixaxa Nr. 2.302				CHAMANCULO D		1.6	no change

iii. Data management



2. Waste collection and transportation service monitoring management

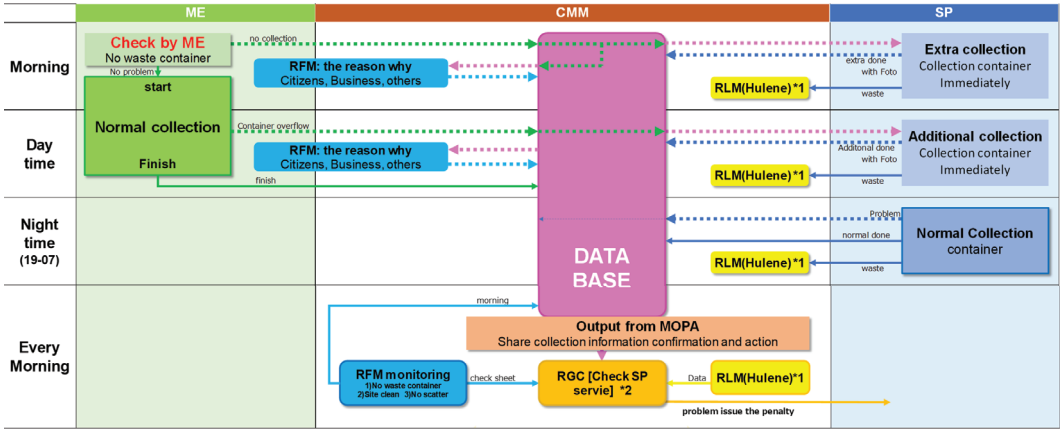
i. Weighbridge data management



Report (Daily, weekly, Monthly)

Information on the type of waste (*amount, *number of trips)

ii. Information from ME and WCSPs



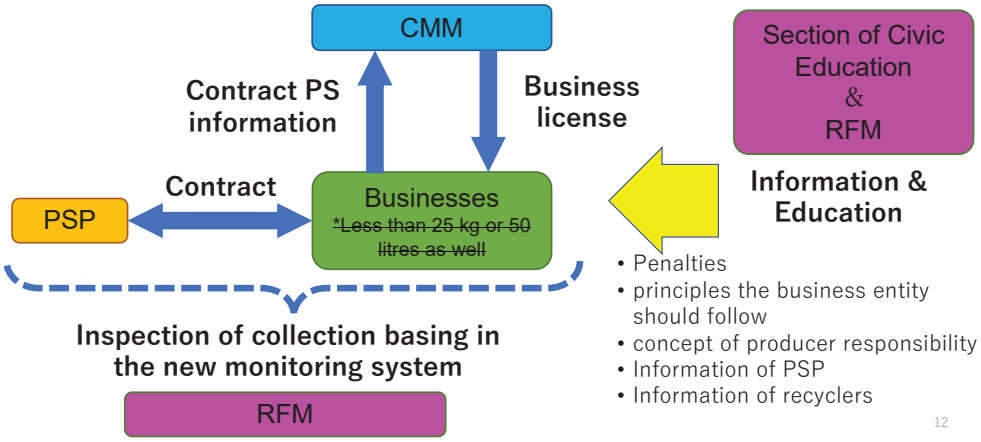
Monitoring of waste collection and transportation services based on ICTs-Activity [2-5]

Daily Repo DATE: 2022.XX.XX. (Tuesday) 9:00

		CONT NAME	Extra(7-8) ME trip	Extra(7-8) SP trip	Extra(7-8) Fiscal why	additional(8-19) ME trip	additional(8-19) SP trip	additional(8-19) Fisical why	Normal(19-7) SP trip	Normal(19-7) SP foto&why	Extra & Add ME	Extra & Add SP	Extra & Add difference	Normal difference	Normal 2nd collection plan sum week	*1 S	T	Q	Q	F	S
1	12m3	CETA-Centro de Saude de Xipamanine - Av. Joaquim Chissano	1	1	Citizen	1	1	Busines	1		2	2		0	6	1	1	1	1	1	1
2	12m3	Escola Unidade 18 -Rua Gago Coutinho				1	1	Other	1		1	1		0	3	1	1	0	0	1	0
3	12m3	Igreja Assembleia-Rua Gago Coutinho							1		0	0		1	3	1	0	1	0	0	1
4	12m3	Rua Gago Coutinho - Igreja Catolica				2	2	Busines	1		2	2		1	3	1	0	1	0	0	1
5	12m3	007-Rua Gago Coutinho							1		0	0		1	3	1	0	1	0	0	1
6	12m3	Entrada da Base Aerea - Av. 19 de Outubro							1		0	0		1	2	1	0	0	1	0	0
7	12m3	Campo Base Aerea - Av. 19 de Outubro							1		0	0		0	4	1	1	0	1	1	0
8	12m3	Mercado Vulcano - Rua Gago Coutinho							1		0	0		0	6	1	1	1	1	1	1
9	12m3	10- Esquadra - Rua de Xipamanine							1		0	0		1	3	1	0	1	0	0	1
10	12m3	Rua dos Irmaos Ruby/Parque Xipamanine	1	1	Business				1	overload	1	1		1	4	1	0	1	1	0	1
11	12m3	Rua do Zimabwe							1		0	0		1	2	1	0	0	1	0	0
12	12m3	S福 Joaquim Rua Zambeze							1		0	0		1	4	1	0	1	1	0	1
13	12m3	Xibamate 1- Av. De Angola							1		0	0		0	5	1	1	1	0	1	1
14	12m3	Xibamate 2- Av. De Angola							1		0	0		0	5	1	1	1	0	1	1
15	12m3	Colombia - Rua Major Teixeira Pinto							1		0	0		0	6	1	1	1	1	1	1
16	12m3	Zanza - Rua Marcelino dos Santos							1		0	0		0	6	1	1	1	1	1	1
17	12m3	Ufa- Rua 2.276							1		0	0		0	5	1	1	1	0	1	1
18	12m3	Cape-Cape-Campo - Rua 2.282							1	fire	0	0		0	6	1	1	1	1	1	1
19	12m3	Terminal da Junta							1		0	0		0	3	1	1	0	0	1	0
20	12m3	Lhanguene-Av. Mo軋mbique							1		0	0		0	5	1	1	1	0	1	1
21	12m3	Zixaxa - Rua do Zixaxa Nr. 2.302							1		0	0		0	6	1	1	1	1	1	1
22	12m3	Rotunda 16 de Junho- Av. OUA							1	other	0	0		0	3	1	1	0	0	1	0
23	12m3	Coca-cola-Rua lago Maramba							1		0	0		0	3	1	1	0	0	1	0
24	12m3	Up-Av. Trabalho							1		0	0		1	3	1	0	1	0	0	1
25	12m3	Naggi-Rua Gago Coutinho							1		0	0		0	4	1	1	0	1	1	0
26	12m3	Mercado Xipamanine - Rua Zixaxa 1							1		0	0		0	6	1	1	1	1	1	1
27	12m3	Mercado Xipamanine - Rua Zixaxa 2							1		0	0		0	6	1	1	1	1	1	1
	162	**Total**	2	2		4	4		27		6	6	0	9	115	27	18	19	14	18	19
		RLM data(from Hulene)		1			4		27			32									

3. Measures for waste reduction

i.Non-domestic waste management



- Penalties
- principles the business entity should follow
- concept of producer responsibility
- Information of PSP
- Information of recyclers

4. Future collection plan for sub-urban and urban areas

i. Sub-urban area

Management by PDCA

Plan	Do	Check	Action
Container management -Container list -Container map -Collection route sheet -ME's container map -Monitoring methods **Data management** -Input & Output	**Monitoring** -Collection -Problem **Data management** -Input & Output -Data collection -Identification of problematic data	**Problem check** -More than 2 time trip/d -Empty containers -Others **Check the reason why** -Business waste mixed -MEs using same containers same day -MEs not using some containers -Others	**To resolve problem** -Add container point -Organize MEs container **Modification plan** -Container list -Container Map -Collection route sheet -ME's container map -Penalty & monitoring methods **Modification of the data management** -Input & Output

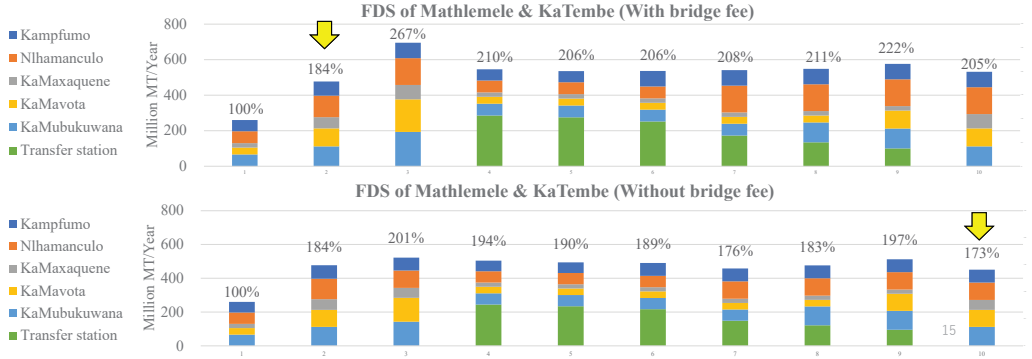
Reflect to the ToRs

ii. Urban area

1. Measures to non-domestic waste presented above.
2. Door-to-door collection in isolated houses - an area should be selected and started as a pilot project.
3. Waste collection in Apartments - Own container should be installed inside the yard of apartments to avoid the action of waste pickers. Article 11 of resolution 89/AM/2008 of 22 May, mentions this.

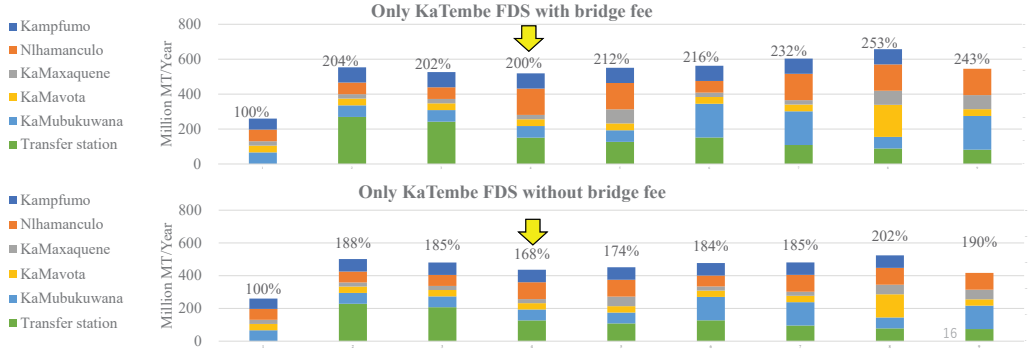
1. Operation of both FDS of Mathlemele & KaTembe

	Actual	DT->Mathleme	DT->KaTem	Final Disposal Sites (FDS) of Mathlemele & KaTembe						
Kampfumo	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT
Nlhamanculo	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	TS->Mat	DT->KaT	DT->KaT	DT->KaT	DT->KaT
KaMaxaquene	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	TS->Mat	TS->Mat	TS->Mat	TS->Mat	DT->KaT
KaMavota	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	TS->Mat	TS->Mat	TS->Mat	DT->Mat	DT->Mat
KaMubukwana	->Hulene	DT->Mat	DT->KaT	TS->Mat	TS->KaT	TS->Mat	TS->Mat	DT->Mat	DT->Mat	DT->Mat
Transfer station t/d				1,093	1093	928	635	351	138	



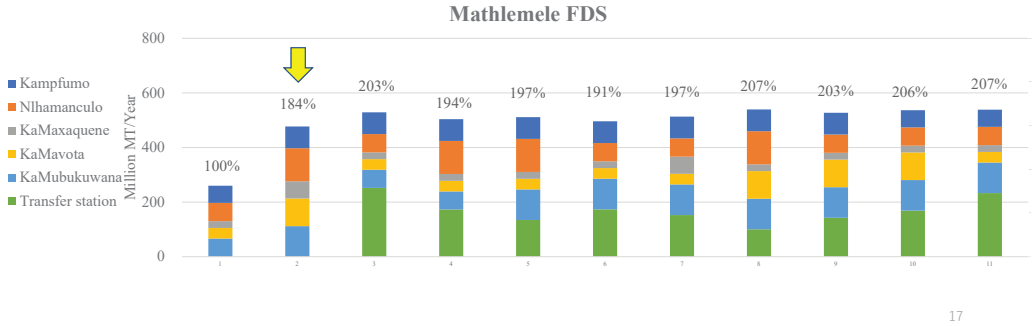
2. Only KaTembe FDS

	Actual	Only KaTembe FDS							
Kampfumo	->Hulene	TS->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT
Nlhamanculo	->Hulene	TS->KaT	TS->KaT	DT->KaT	DT->KaT	TS->KaT	DT->KaT	DT->KaT	DT->KaT
KaMaxaquene	->Hulene	TS->KaT	TS->KaT	TS->KaT	DT->KaT	TS->KaT	TS->KaT	DT->KaT	DT->KaT
KaMavota	->Hulene	TS->KaT	TS->KaT	TS->KaT	TS->KaT	TS->KaT	TS->KaT	DT->KaT	TS->KaT
KaMubukuwana	->Hulene	TS->KaT	TS->KaT	TS->KaT	TS->KaT	DT->KaT	DT->KaT	TS->KaT	DT->KaT
Transfer station t/d		1,093	928	635	497	644	351	284	213

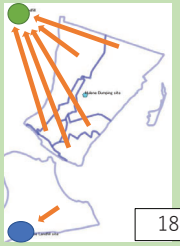
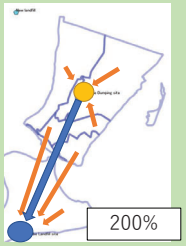
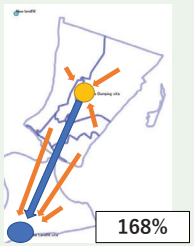
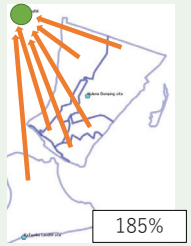


3. Only Mathlemele FDS

	Actual	DT->Mat	Only Mathlemele FDS								
Kampfumo	->Hulene	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	TS->Mat	TS->Mat
Nlhamanculo	->Hulene	DT->Mat	TS->Mat	DT->Mat	DT->Mat	TS->Mat	DT->Mat	DT->Mat	TS->Mat	TS->Mat	TS->Mat
KaMaxaquene	->Hulene	DT->Mat	TS->Mat	TS->Mat	TS->Mat	TS->Mat	DT->Mat	TS->Mat	TS->Mat	TS->Mat	TS->Mat
KaMavota	->Hulene	DT->Mat	TS->Mat	TS->Mat	TS->Mat	TS->Mat	TS->Mat	DT->Mat	DT->Mat	DT->Mat	TS->Mat
KaMubukwana	->Hulene	DT->Mat	TS->Mat	TS->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat
Transfer station t/d			928	635	351	644	506	138	431	596	809

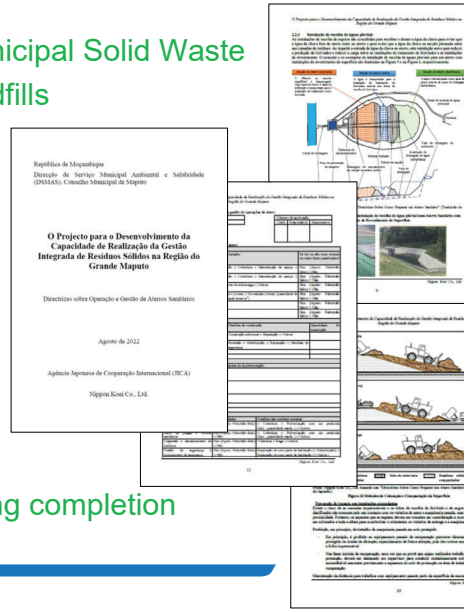


III. Waste transfer methods

Actual: Hulene		Case 1: Operation of Mathlemele e KaTembe FDS	Case 2: Only KaTembe FDS	Caso 3: Only Mathlemele FDS
 100%	With bridge fee	 184%	 200%	—
	Without bridge fee	 173%	 168%	 185%

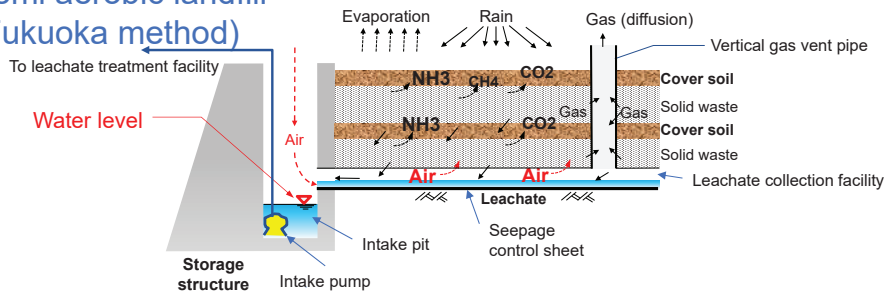
Introduction of Guideline on Sanitary Landfill Operation and Management

Table of Contents of the Guideline on Sanitary Landfill Operation & Management

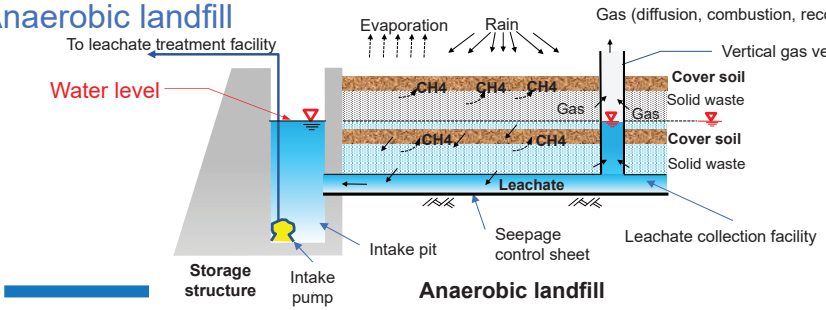


1.2 Landfilling Structure

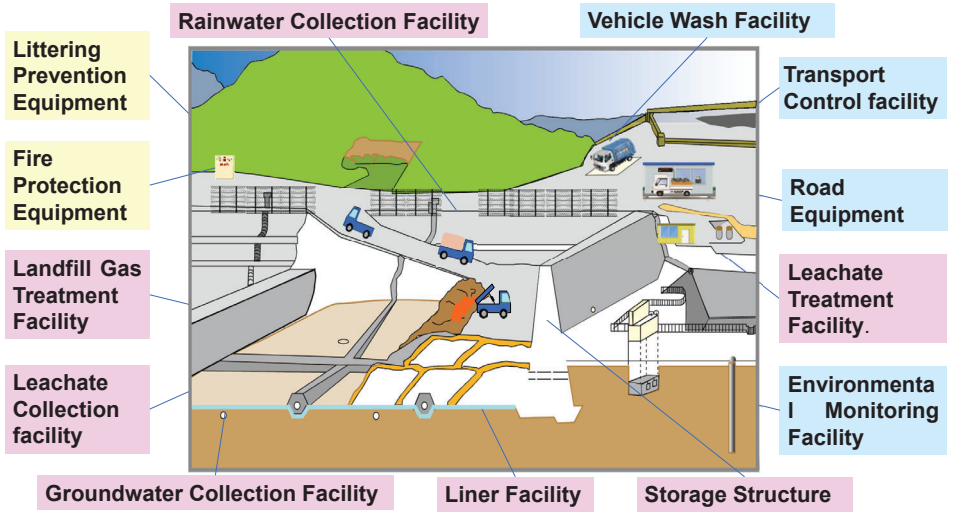
Semi aerobic landfill (Fukuoka method)



Anaerobic landfill

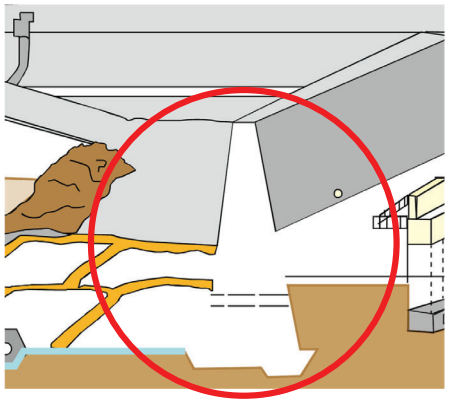


2.1 Facilities in Sanitary Landfill



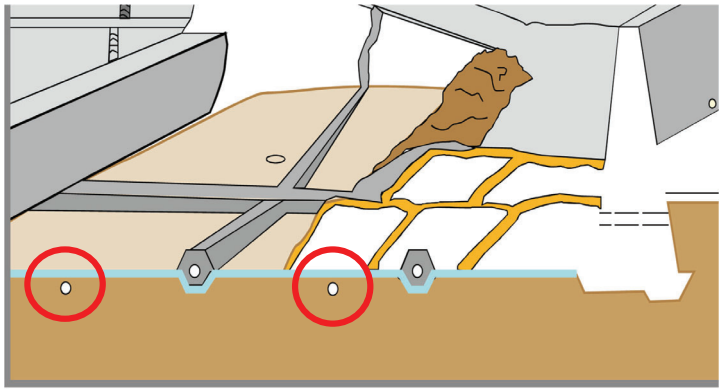
Main facilities | Control facilities | Related facilities

2.2.1 Storage Structure



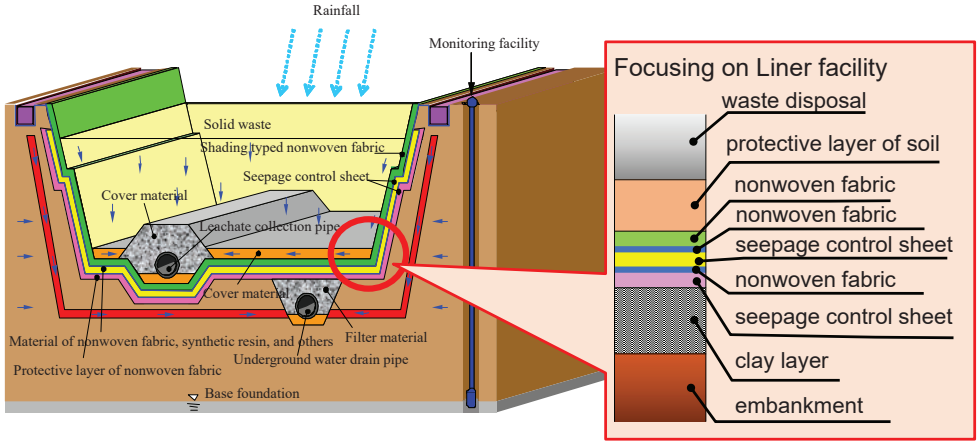
The facility for retaining solid wastes safely to prevent the effluence of solid waste and leachate outside.

2.2.2 Groundwater Collection and Drainage Facilities



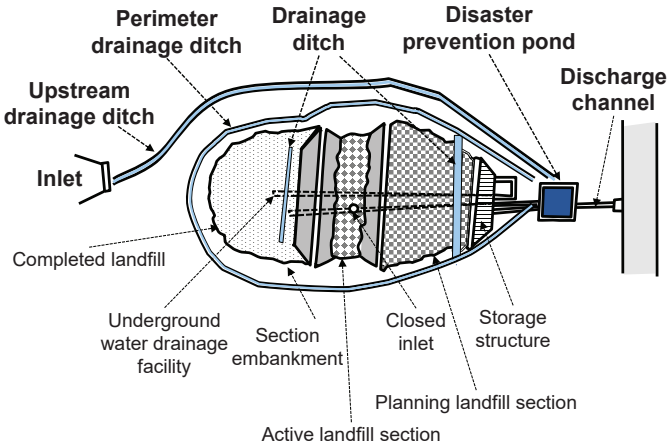
The facility for collecting and discharging underground water efficiently to prevent underground water from affecting the effects of seepage control work.

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

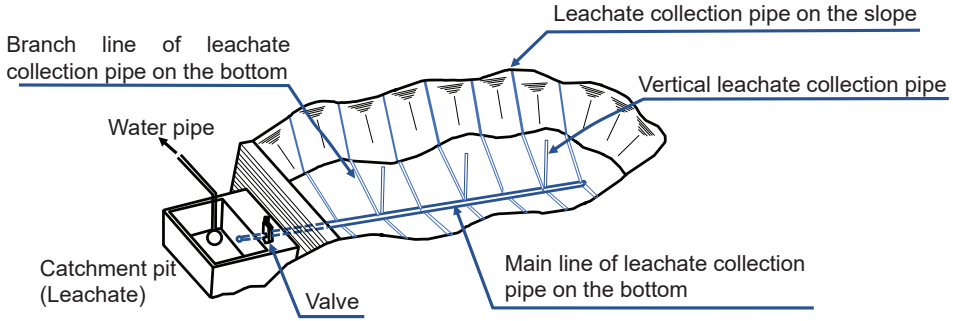


Drainage ditch

Disaster prevention pond

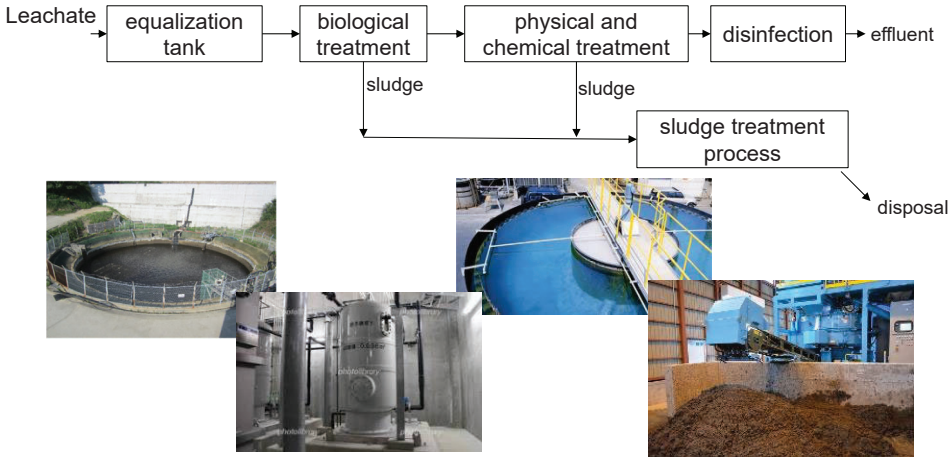
The facility for preventing rainwater from flowing into the landfill site, and to reduce the amount of leachate.

2.2.5 Leachate Collection Facilities



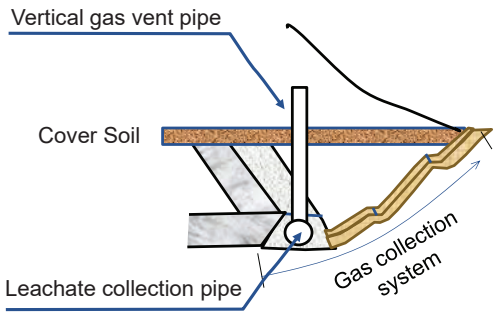
The facility for the collection and discharge of leachate, and intaking the fresh air into the landfill in Fukuoka method.

2.2.6 Leachate Treatment Facility



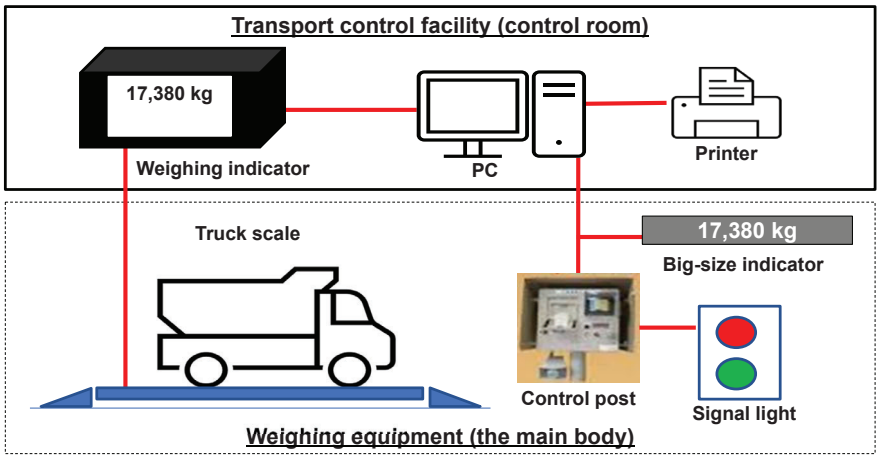
The facility for treating leachate to meet the designed effluent quality standard, and preventing leachate from contamination of a public water body and underground water.

2.2.7 Landfill Gas Treatment Facilities



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

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.

2.3.4 Road Equipment


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

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.

3. What is Sanitary Landfill Management?

The followings are necessary for sanitary landfill management

3. Management of sanitary landfill

- 3.1 Waste delivery management
  - ・Recording quality and quantity of transported solid waste, and removing unsuitable waste
- 3.2 Landfill operation management
  - ・Landfilling operation and plan
- 3.3 Facility management
  - ・Operation and maintenance of the final disposal site
- 3.4 Environmental management
  - ・Environmental monitoring the final disposal site and the peripheral area
- 3.5 Safety management
  - ・Accident prevention, emergency response, etc.

3.1.1 Transported Waste

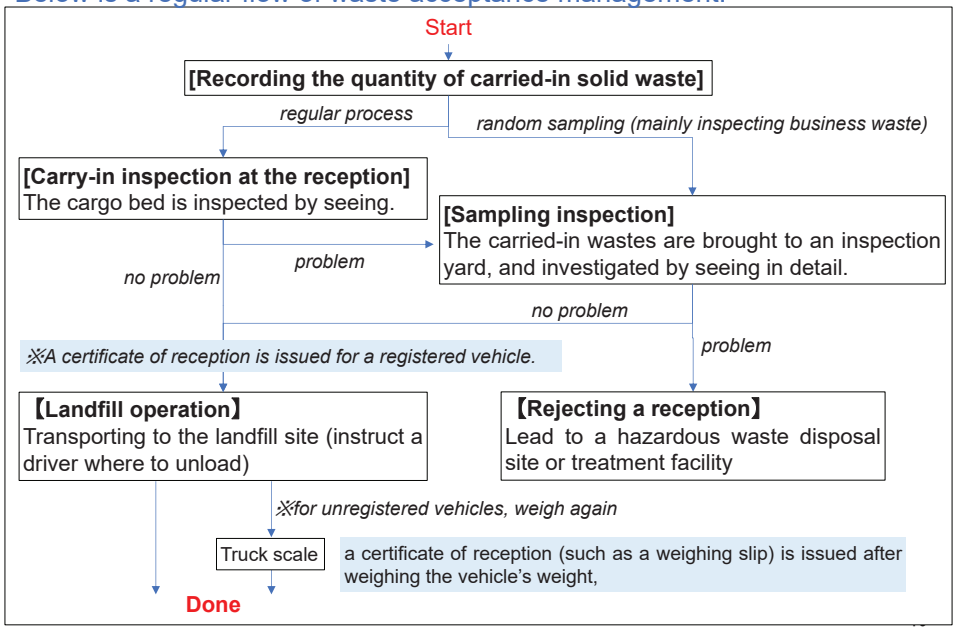
2) Waste Acceptance Criteria

The following waste should be unaccepted in the landfill.

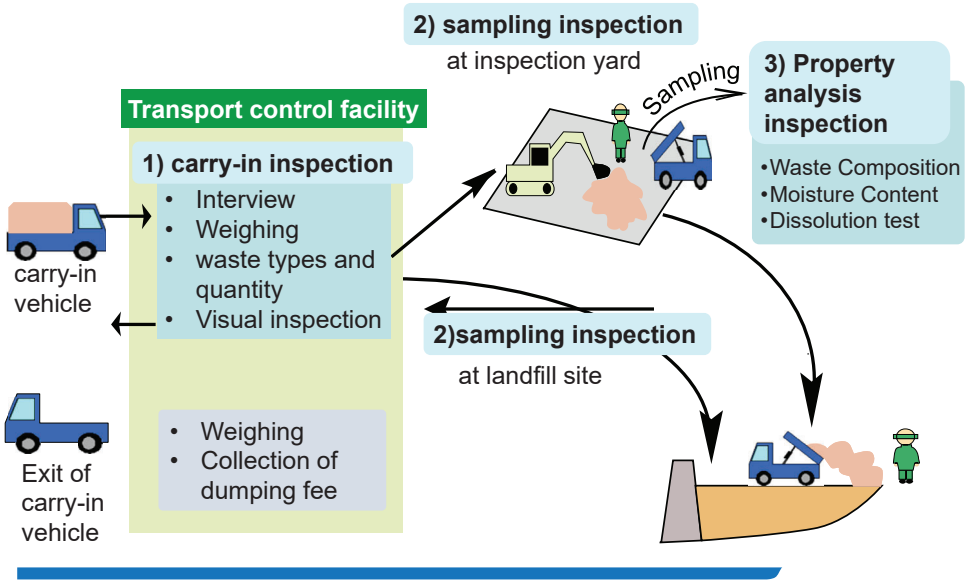
classification	exemplification
(1) Industrial waste	Cinders, sludge, wood waste, construction waste, waste plastic, rubber waste, mineral scraps, soot and dust, waste oil, waste acid, etc.
(2) Toxic and noxious substances	Parts using PCBs included in the following Scrapped air conditioners, TVs, microwave 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.

3.1.3 Acceptance Management Flow

Below is a regular flow of waste acceptance management.



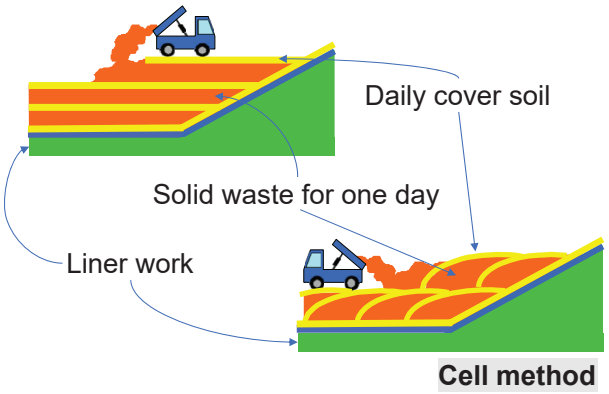
3.1.4 Acceptance Test



4) Landfilling Method

There are two kinds of landfilling methods.

Sandwich method



Cell method

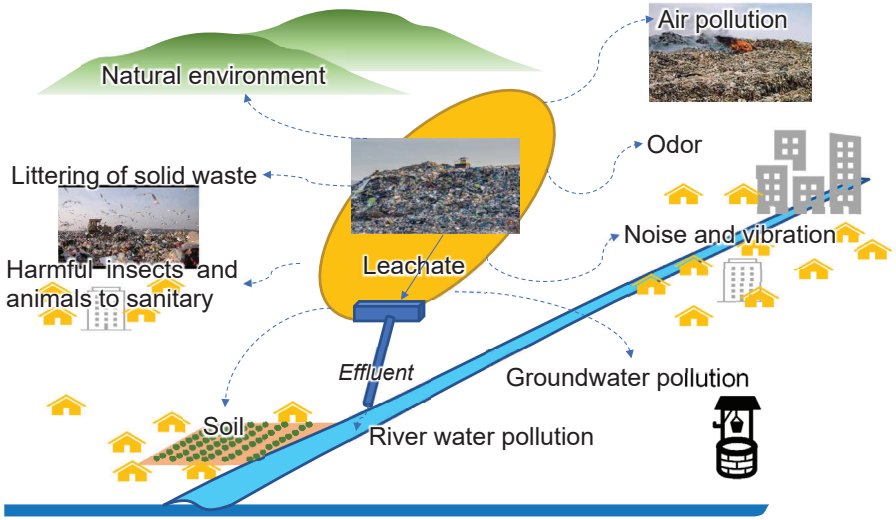
The cell method is better in terms of environmental and safety management.

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	○	×	△	○	×	○	◎

3.4 What is Environments Management?

Landfill activities influence the surrounding environment.

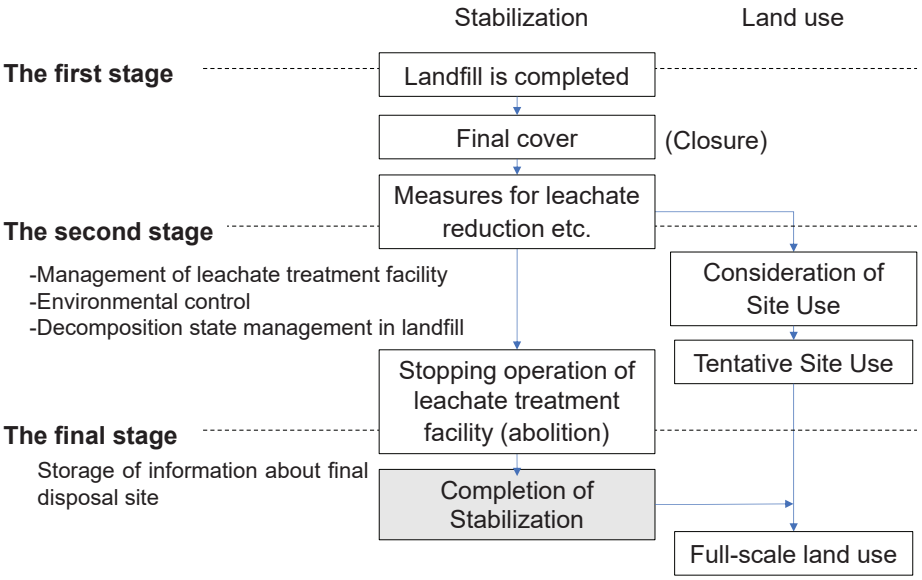


3.4.6~11 Surrounding Environmental Management

Measuring each environmental item outside the landfill site.

Measurement item		Frequency
3.4.6 River water	pH, BOD, COD, SS, T-N, Ca2+, 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

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



Scenery of trainings

PROPOSED STRATEGIES TO ATTAIN FINANCIAL SUSTAINABILITY OF SOLID WASTE MANAGEMENT IN MAPUTO CITY

THE PROJECT FOR CAPACITY DEVELOPMENT TO REALIZE INTEGRATED SOLID WASTE MANAGEMENT IN MAPUTO CITY

DSMAS + JICA Project Team

MATERIAL PREPARED ON JUNE 2022

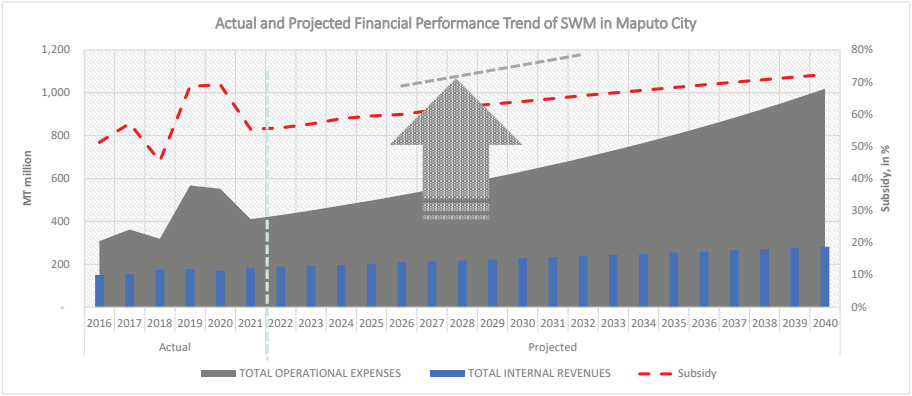
OVERARCHING PRINCIPLE

EQUITABILITY

Revenue enhancement without raising fees;
Cost optimization without sacrificing operations.

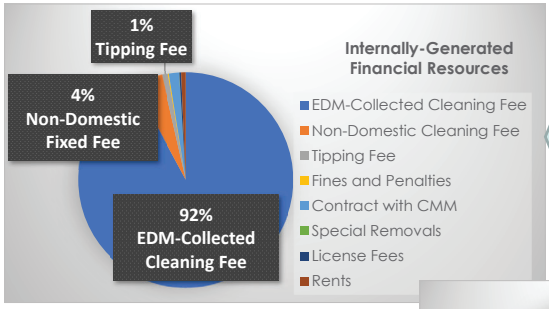
Attaining financial sustainability will be based on measures that will correct current systems, provide mechanisms that would ensure transparency and fairness in transactions; and in so doing, encourage better participation and more responsible attitude towards solid waste management from the general public of Maputo City.

BASELINE FORECAST



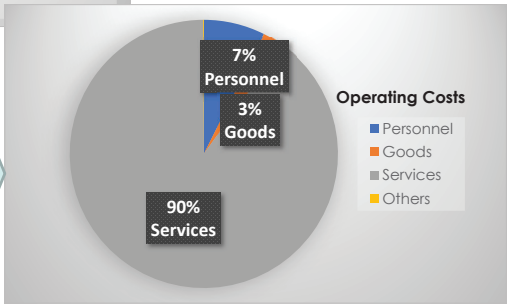
- **Without intervention in revenue enhancement and cost-mangement** that are duly **supported** by **strong legislation or policy**, the SWM sector will continue to be heavily subsidized over the years, exceeding **70%** in 2040
- **Scenario will be much worse** as the sector plans to invest in capital-intensive technology over time
- Costs may potentially **shift to double in about 5 years** in anticipation of landfill in Katembe.

STRATEGIES WILL TOUCH ON....



1. Unit pricing for CLEANING FEE via EDM
2. Correct payment system for FIXED FEE on NON-DOMESTIC WASTE GENERATORS
3. Diligent collection of TIPPING FEE from ALL non-domestic waste disposal at Hulene

1. 90% of operating cost is on services, of this, 99% is on OTHER SERVICES or major service contracts!
2. Key is contracts management and service provision monitoring
3. A diligent procurement method that involves evaluation of bids using benchmarks established by SWM operations experts
4. Establishment of templates to guide bids evaluators



REVENUE ENHANCEMENT: Cleaning Fee Structure

As much as it is unrelated to SWM cost and waste generation, the present fee structure is socially unjust.

Current cleaning fees collected by EDM

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

Survey results show statistically significant positive correlation between waste generation and electricity consumption.

Higher electricity consumption indicates greater economic activities translating to more waste generation.

Cost of managing waste is directly related to volume of waste generated by population, businesses and insitutions in the City. Everyone can contribute to supporting SWM through fair distribution of cost.

REVENUE ENHANCEMENT: Cleaning Fee Structure

By putting together three major factors in Maputo City in 2021:

Operating Cost of SWM* (in MT)

**Refers only to Goods and Services, Transfers*

Total Waste Generation (in kg)

Total Electricity Consumption (in kWh)

Derivation of unit cost of SWM for every unit of energy consumed in 2021

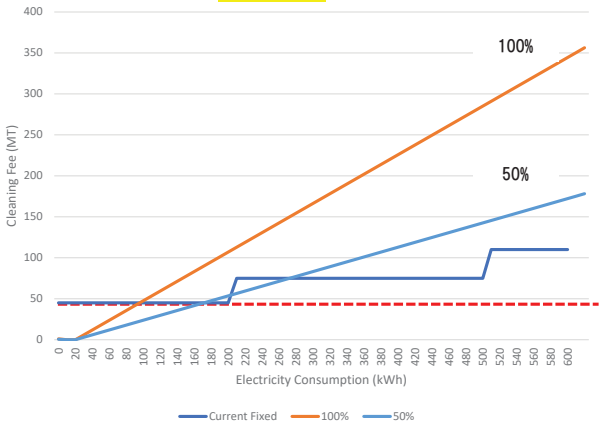
Domestic: MT0.59/kWh

Non-Domestic: MT1.21/kWh

Unit costs can be reviewed and revised every 3-5 years; may go up or down to reflect prevailing situation

REVENUE ENHANCEMENT: Cleaning Fee Structure

DOMESTIC WASTE GENERATOR or DOMESTIC EDM CONNECTION



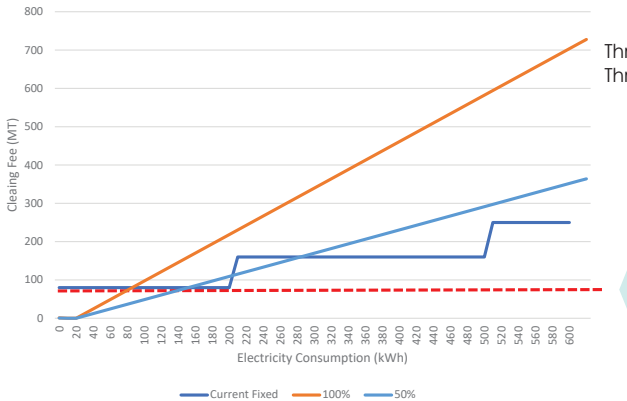
Average Domestic Consumption: 120.45 kwh/month

Threshold @100%: 75kWh
Threshold @ 50%: 150kWh

In truth, many people, including the wealthy, are paying only MT45 because of the limitations of the current system.

REVENUE ENHANCEMENT: Cleaning Fee Structure

NON-DOMESTIC WASTE GENERATOR OR COMMERCIAL EDM CONNECTION



Average Non-Domestic Consumption: 269.77 kwh/month

Threshold @100%: 65.5kWh
Threshold @ 50%: 131kWh

This still happens, but less occurrence because 60%-80% of commercial connections may be post-paid

REVENUE ENHANCEMENT: Non-Domestic Cleaning Tax and Method of Collecting It

Recorded/"collected" under PdS

1. Monthly printing and distribution of invoices manually by Supervisors
2. Payor goes to bank to pay
3. Payor provides PdS proof of payment
4. HIGH tendency of non-domestic waste generators NOT to pay
5. Low collection efficiency rate: 18%
6. 2021 revenue: MT8.2million

Based only on 10,000 entities registered in PdS

Through Annual Business Licensing

1. Collected annually (or biannually) as part of requirement to renew license to operate
2. Entity required to show contract with legitimate waste collection and transport company for the period
3. Lower transaction cost; significantly reduced fee
4. Wider revenue base: EVERY BUSINESS/INSTITUION pays
5. Potential revenue: MT59 million!

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

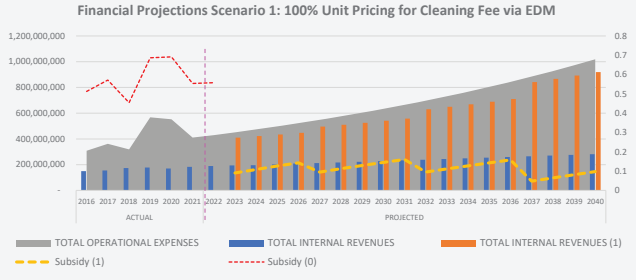
Actual Survey and data simulation results

Proposed fixed cleaning fee collected from non-domestic waste generators

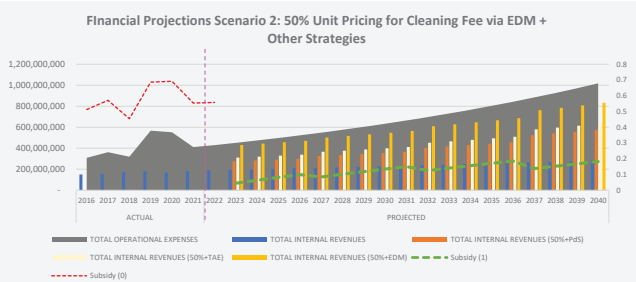
Category	Waste Generation per day	Corresponding Monthly Cleaning Tax
A	**Mora than 300 kg or 850 liters**	**MT 2,600**
B	**Up to 300 kg or 850 liters**	**MT 1,300**
C	Up to 200 kg or 500 liters	**MT 650**
D	Up to 100 kg or 250 liters	**MT 325**
E	Up to 25 kg or 50 liters	**MT 162**

Still based only on 10,000 entities registered in PdS! Potential for radical improvement in this revenue is high with better information on non-domestic sector.

Possible Cost-Recovery Scenarios



Average subsidy: **11%**
Pro: 1. Highly efficient collection system
2. Highly transparent
3. No need for fixed fee from non-domestic waste generators
Con: 1. High-impact of cleaning fee on electricity bill (up to 10% for domestic; >20% for commercial)



Best-case average subsidy: **12%**
Pro: 1. Highly efficient collection system
2. Highly transparent
3. Reasonable impact on electricity bill
Con: 1. Fixed fee from non-domestic waste generators needed
2. Need for strong collab with EDM

CRITICAL ACTIVITIES/INSTITUTIONAL LINKAGE SUPPORT REVENUE ENHANCEMENT

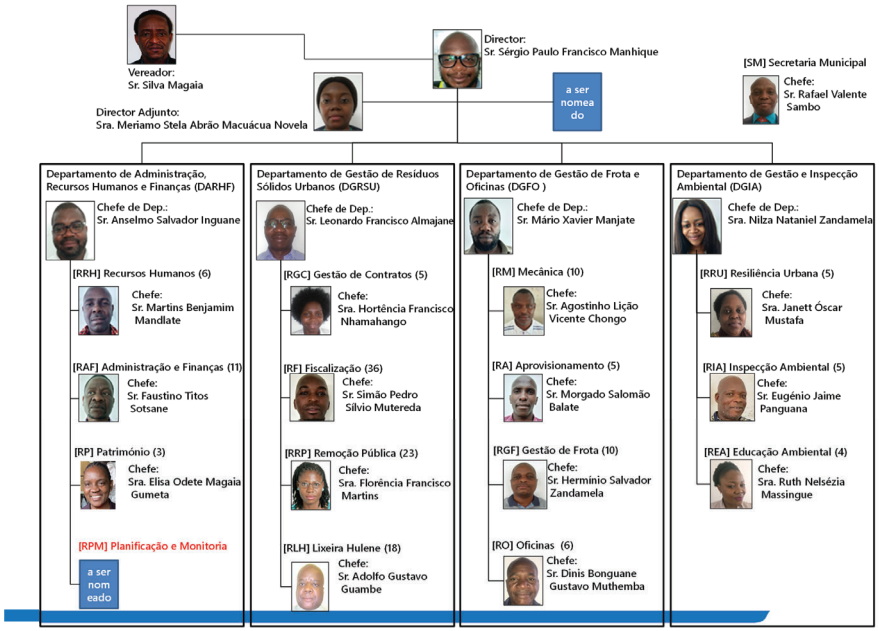
- Stronger efforts in public information dissemination: MESSAGING WILL be very important
- Strong collaboration among CMM Business Registration/Revenue Sections, DSMAS and EDM especially on information-sharing/data integration

Thank you

Plan for DSMAS Organizational Reform & Human Resources Development

December 2022

DSMAS Organizational structure



Recommendation on DSMAS organizational reform

- Concept:
  Strengthening contract management function and planning & monitoring function.

1. Enhancing RGC (Contract Management Section)
   Contract management for 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.
2. Re-creation of Proof of Service (PdS) section
   Responsible for the management and operation of the PdS system, which is an important management tool of business waste generators (including the collection of cleaning taxes).

Recommendation on DSMAS organizational reform

3. Realizing RPM (Planning and Monitoring Section)
   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.
4. Enhancing REA (Environmental Education Section)
   Responsible for coordination and liaison with related actors for the promotion of recycling, in addition to various environmental education and awareness activities.
5. 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.

Recommendation on DSMAS organizational reform

6. Optimizing RRP (Public Removal Section)
   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.
7. Creation of Katembe landfills management section
   Assuming Katemebe will be operated by private service providers, a contract management section for landfill operation will be necessary.

Human Resources Development

- DSMAS staff list with current position & affiliation was prepared.
- The project team intend to develop DSMAS human resources database by integrating information on:
  - Background education
  - Work experience
  - History of training
- The database will be utilized to examine staff relocation among the sections, on-the-job and off-the job trainings program for DSMAS staff.

Updating CMM Ordinances & Resolutions concerning to SWM

- The project team is working on identifying and analyzing policy gaps to realize the measures in the M/P such as:
  - All businesses, generating even less than 25 kg/day of waste, should not discharge it into CMM containers.
  - Distinguish WCSPs for municipal waste & business waste.
  - All waste trucks must pay the tipping fee at Hulene.
  - To avoid free-riding of business on CMM collection service.
  - To avoid unpayment of business waste tipping fee.

Updating CMM Ordinances & Resolutions concerning to SWM

- Revise cleaning fee tariff collected through EDM.
- Change collection system of business waste cleaning tax.
  - To improve financial sustainability of SWM service.
- Clearly state each actor's responsibility for source separation and recycling promotion.
- Establish a platform for promotion of recycling and awareness raising.
- Support association of waste pickers
  - To reduce waste disposal & promote 5Rs.

Thank you

Public Awareness and Environmental Education

Output 6

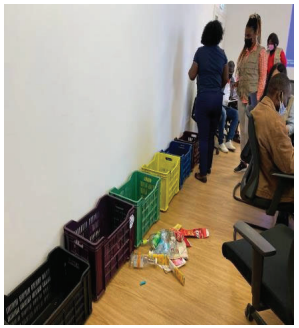
Contents of Presentation

I. Waste Segregation

- ❑ 7 Workshops were held to train staff in waste segregation, with about **201 participants**
- ✓ 1 in Maputo City Hall attended by 18 people;
- ✓ 5 in DSMAS attended by 172 people;
- ✓ 1 in Matola Municipality attended by 11 people.

Workshop - CMM

Workshop - DMAS



Workshop - Matola

II. Training on Eco-Points Operation

- ❑ **12 responsible for the eco-points were indicated**

Identified problem: Inadequate use of eco-points installed at DMAS.

Solution: Appointment of staff to ensure that the segregation is done according to the type of waste to be separated for recycling.

III. Activities at Primary Schools

Major actions achieved at <u>5 schools</u>:

- **Creation of Environmental Clubs -** which aims to raise awareness of children on environmental problems and their respective solution through good environmental practices, **about 184 children attended**;
- **Launch of SPO GOMI Competition** - which consists of a selective collection technique developed in Japan that incorporates elements of sport, **about 65 children participated**;
- **Eco Picture Diary** - aims to awaken children to identify environmental problems, through free drawings, **it involved about 70 children**.

3.1. Environmental Clubs

Theoretical

Practical

Primary Schools of 7 de Setembro, Filipe Samuel Magaia, 9 de Agosto and Combantes de Libertação Nacional

3.2. SPO GOMI Competition Primary School of 25 de Junho

56.24 kg of waste was collected and subsequently delivered to a recycling company.

3.3. Eco-Picture Diary

Primary Schools of 9 de Agosto and Combatentes de Libertação Nacional

IV. “Bairro Mais Limpo” Contest

- Community integration in MSWM, involving neighbourhood residents, with the support of JICA.

✓ Distribution of dissemination material;
✓ Monitoring;
✓ Awarding



4.1. Awarding Ceremony of “Bairro Mais Limpo” Contest

The ceremony was led by H.E. Maputo City Mayor, with the participation of JICA experts.


Maputo City Hall

V. Other Activities

- Planting and Exhibition Fairs




Primary School of 9 de Agosto, Expo FACIM and PGR

V. Other Activities

Seminars with organizations and institutions that promote Environmental Education

- MINEDH, DPPRNMA, UP, Neighbourhood Secretariats, Repensar, Sérgio Gago Foundation, among others.



VI. Summary: Achievements
Output 6 (Environmental Education)

- **Major Achievements:**
  - Launch of SPO-GOMI Activity;
  - Activities at Primary Schools;
  - Waste Segregation workshops at CMM and in Matola.
  - Distribution of dissemination and awarding material of "Bairro mais Limpo" Contest.

VI. Summary: Way Forward
Output 6 (Environmental Education)

- **Way Forward:**
  - Continue with school activities: environmental clubs, eco-picture diary, SPO-GOMI, seminars, study visits and exhibition of reusable material;
  - Bairro mais Limpo contest, 2023 edition;
  - Continue with seminars with organizations and institutions that promote Environmental Education.

Khanimambo!

Muito Obrigada!

- ありがとう
- Arigatō

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

AGENDA of the 6th Joint Coordination Committee Meeting

- Date: 17 July 2023 (Monday)
- Time: 13:00 to 16:00
- Venue: DSMAS meeting room
- Agenda:

Time	Agenda	Presenter/in-charge
12:30-13:00	*Registration/Preparation*	DSMAS/JET
13:00-13:10 (10 min)	Introduction of participants	Mr. Martins Mandlate Chief of Section, DSMAS
13:10-13:20 (10 min)	Opening remarks by CMM	Mr. Silva Magaia Councilor, CMM
13:20-13:25 (5 min)	Opening remarks by JICA	Mr. Otsuka Chief representative of JICA Mozambique office
13:25-13:30 (5 min)	Opening remarks by Embassy of Japan	Mr. Jukuhara First Secretary, Embassy of Japan
13:30-13:40 (10 min)	Introduction of Maputo Model - Overall-	Mr. Sérgio Manhique Director, DSMAS
13:40-13:50 (10 min)	Introduction of Maputo Model - Master Plan Preparation & Monitoring-	Ms. Meriamo Stela Novela Deputy Director, DSMAS
13:50-14:05 (15 min)	Introduction of Maputo Model - Waste Collection & Transportation Improvement-	Mr. Simão Pedro Chief of Section, DSMAS
14:05-14:15 (10 min)	Introduction of Maputo Model - Promotion of Recycling -	Ms. Rute Massinge Chief of Section, DSMAS
14:15-14:30	*Break*	
14:30-14:40 (10 min)	Introduction of Maputo Model - Sanitary Landfill Guideline & Training -	Mr. Leonardo Almajane Head of Department, DSMAS
14:40-14:55 (15 min)	Introduction of Maputo Model - Financial Management -	Mr. Faustino Titos Tsotsane Technician, DSMAS
14:55-15:05 (10 min)	Introduction of Maputo Model - Organizational & Institutional Management -	Ms. Linda Technician, DSMAS
15:05-15:15 (10 min)	Introduction of Maputo Model - Environmental Education & Awareness raising -	Ms. Nilza Zandamela Head of Department, DSMAS
11:15-15:25	Dissemination Plan of Maputo Model	Mr. Sergio Manhique

(10 min)		Director, DSMAS
15:25-15:35 (10 min)	Modification of PDM	Mr. Hosono Chief Advisor, JET
15:35-15:50 (25 min)	Overall discussion	Mr. Martins Mandlate Chief of Section, DSMAS
15:50-16:00 (10 min)	Closing remarks by CMM	Mr. Silva Magaia, Councilor, CMM

- End of document -

Maputo Model

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

July 2023

Table of Contents

Introduction

- The ‘Maputo Model’ compiles the knowledge and lessons learned from the experience in improving its integrated solid waste management in Maputo City.
- It covers comprehensive components of solid waste management;
  - Masterplan formulation and implementation monitoring,
  - Waste collection & transportation improvement,
  - Recycling promotion,
  - Landfill operation & management,
  - Financial management improvement,
  - Organizational & institutional management, and
  - Environmental education & awareness raising promotion.
- It is expected the ‘Maputo Model’ will be a reference for other municipalities in Mozambique in improving solid waste management in municipalities.

History of Solid Waste Management in Maputo City

Rapid urbanization and population growth in Maputo City

1997	Solid Waste Management (SWM) Regulation

Suitable SWM system was required due to various actors

2007	SWM Master Plan (M/P) with cooperation by GTZ

Capacity shortage of Hulene Dump Site

2013 -	New Landfill Project in Mathlemele, Matola (not completed)

JICA Technical Cooperation Project (Phase 1, 2013 - 2017)

2017	Draft Revised M/P (approved in 2018 with modification)

- Hulene Dump Site started its operation in 1973
- Waste collection by private large contractors
- Primary waste collection by Micro Enterprises
- Trial on recyclables collection and composting by social inclusion of waste pikers
- Charging of Waste Fee through electric bill of EDM
- Establishment of Office for Environmental Education
- Tragic collapse of Hulene Dump site in February 2018
- Another location for next landfill in Katembe

Implementation of MP and continuous improvement of SWM system

2019 -	JICA Project (Phase 2)	2021 -	WB Urban Transformation Project (PTUM)	2018 -	MOEJ Technical Assistance (Hulene)

1. Master Plan

Formulation of Master Plan

Principle

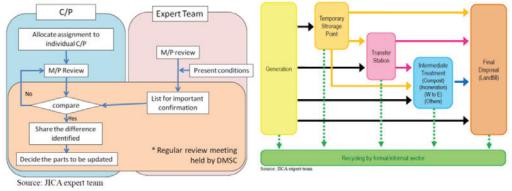
- ✓ Government Decree 94/2014 “Regulation on Urban Solid Waste Management” stipulates the formulation of “Integrate Urban Solid Waste Management Plan” in its Article 8, together with minimal requirements for the contents of the plan in its Annex 1.

Guidelines

- ✓ Upon above principle, JICA Technical Cooperation Project (Phase 1: 2013-2017) support CMM/DSMAS to develop the Guideline for Preparation of the Master Plan for the Integrated Management of Municipal Solid Waste.
- ✓ In addition, MTA also issued “Methodological Guide for the Elaboration of Integrated Management Plans of Urban Solid Waste” in 2020.

Formulation Procedures

- ✓ In Maputo, through JICA Project, Joint review to check the gap between the existing plan and actual situations to re-formulate the Master Plan, from the views on an appropriate waste flow to be proposed.



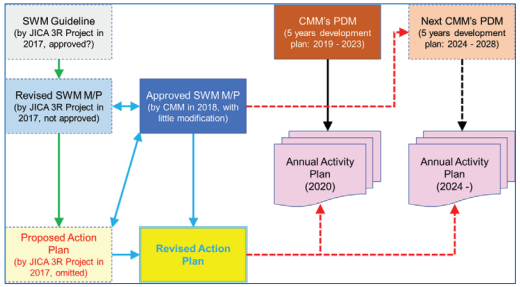
Reference: The Master Plan for Urban Solid Waste Management in Maputo City

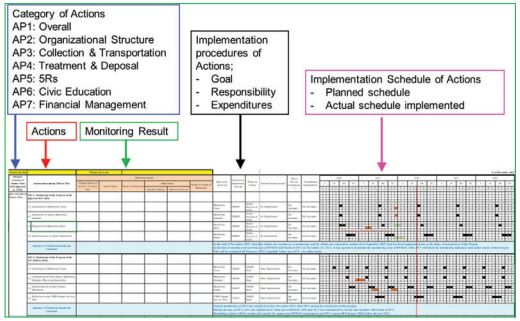
Action Plan for Master Plan

In order for CMM/DSMAS to steadily realize the M/P, “Action Plan” which stipulates the detail and practical actions to be implemented in the first five (5) years is developed with the following contents.

- ✓ Category of Actions
- ✓ Detail Actions
- ✓ Implementation procedures such as goal, responsible organization and necessary expenditures
- ✓ Implementation Schedule

Action Plan should be the basis for the contents of CMM annual activity plan under 5 years development plan (PDM)

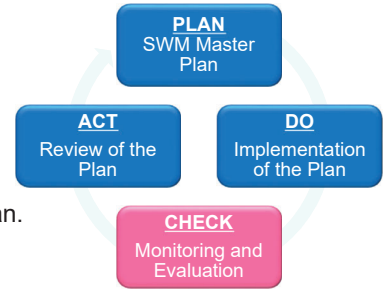




Reference: Action Plan of the Master Plan

Monitoring of Master Plan

- In line with PDCA (Plan, Do, Check, Act) cycle, Master Plan will be regularly and continuously monitored to verify the progress of implementation of activities proposed in the Plan, as well as Action Plan.
- Therefore, in Master Plan, 1) expected result, 2) monitoring indicators, and 3) means of verification are proposed.



Component 1. DMSC Capacity and Institutional Organization
Indicator: 1. Organizational Structure is Updated and Approved; 2. Organizational Structure is operationalized
Component 2: USWM (Collection, Transport, Degree of Service Coverage, final Disposal, Recycling, etc.)
Indicator: 1. Degree of coverage of cleaning services, 2. Quantity of USW discharged at the final destination (Ton / day), 3. Citizens’ Level of satisfaction
Component 3: Financial Management of USWM (Contract Management, Revenue, Costs, Cost Coverage)
Indicator: 1. Ratio of Price / Tons. Degree of cost coverage. 3. Percentage relation between income and costs

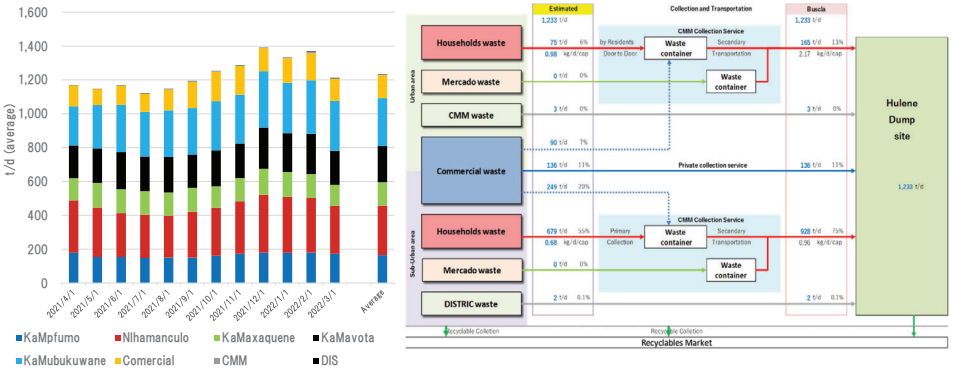
- Due to no target values were set on above monitoring indicators, Master Plan monitoring system is also prepared under JICA Project so that CMM/DSMAS can monitor the progress of Master Plan with quantitative evaluation.

Reference: Monitoring System of the Master Plan

2. Waste Collection & Transportation

Waste Amount & Waste Flow Analysis

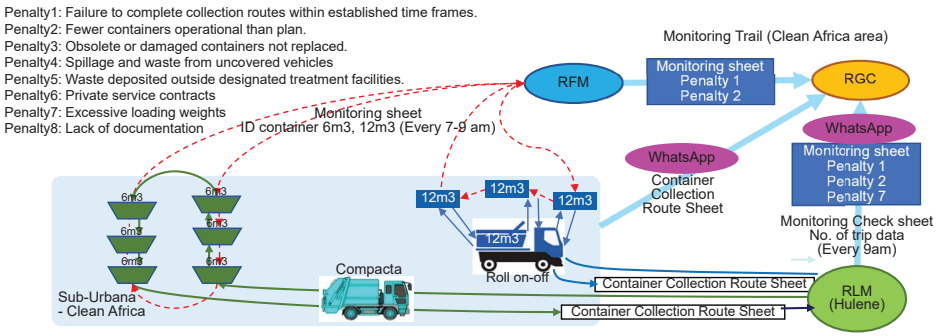
- The data from April 2021 to March 2022, when the truck scale was in operation, the actual average amount of waste received at the Hulene Dumping Site was calculated at 1,233 t/day.
- It is estimated that about 30% of total municipal waste of business waste is mixed with household waste based on the waste flow analysis for the entire Maputo City.



Reference: Plan for Improvement of Waste Collection & Transportation Service

Monitoring of Secondary Waste Collection

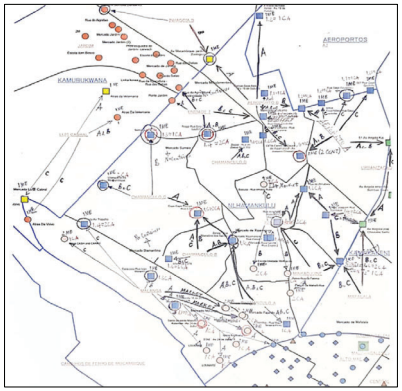
- The monitoring trial for WCSP's waste collection and transportation service was conducted by DSMAS to improve contract management of WCSPs.
- As a result of the monitoring, various issues were identified such as lack of container & collection route management, collection of empty containers, more than two-time collections per day for some containers, inappropriate weighbridge management, insufficient internal information sharing, uninformed change of container location & equipment by WCSP, etc.

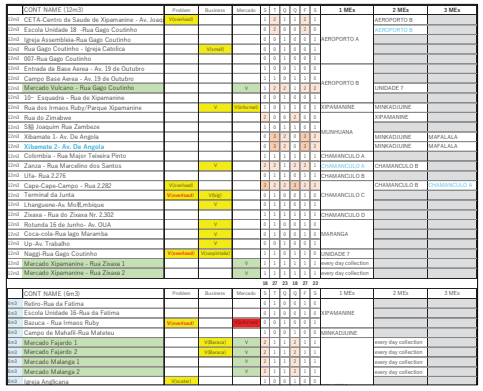


Reference: Plan for Improvement of Waste Collection & Transportation Service

Survey on Primary Waste Collection

- A survey was conducted to understand MEs' collection routes, container usage, etc., to ensure effective and efficient primary waste collection by MEs and secondary waste collection by WCSPs in harmonized manner.
- As a result of the survey, various issues were identified such as use of the same container by multiple MEs, possibility of collecting empty containers, geographical issues, and mixing of business waste, etc.





Reference: Plan for Improvement of Waste Collection & Transportation Service

Waste Collection Improvement Plan

- Based on the problems identified in the above-mentioned activities, the three (3) strategies were established for appropriate contract management and monitoring of the waste collection and transportation service.
- Measures to be implemented by DSMAS for each strategy are organized.
- PDCA cycle is important for the implementation of these strategies.

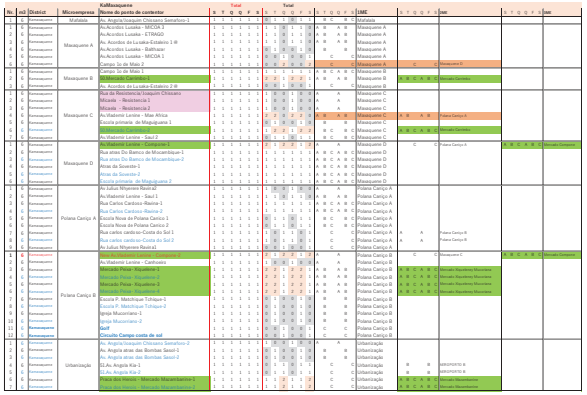
Appropriate waste collection and transportation contract and monitoring management

1: Waste Collection and Transportation Information Management	Container Information Management
	Waste collection route management
	Data management
	Information sharing
2: Waste Collection and Transportation Monitoring Management	Weighbridge Data Management
	MEs & SPs Waste Collection and Transportation Monitoring
	Understanding the problem
3: Waste Reduction	Business Waste Management
	Market Waste Management

Implemented by PDCA

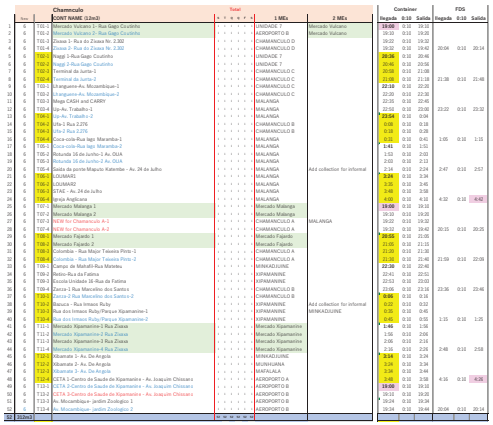
Waste Collection Information management

- The waste container lists and maps (Google Maps, QGIS, and paper-based maps) were developed for effective and efficient implementation of contract supervision and monitoring of WCSPs
- Information management such as updating waste container lists including waste container location and capacity, MEs' collection route, etc. shall be continued by DSMAS.



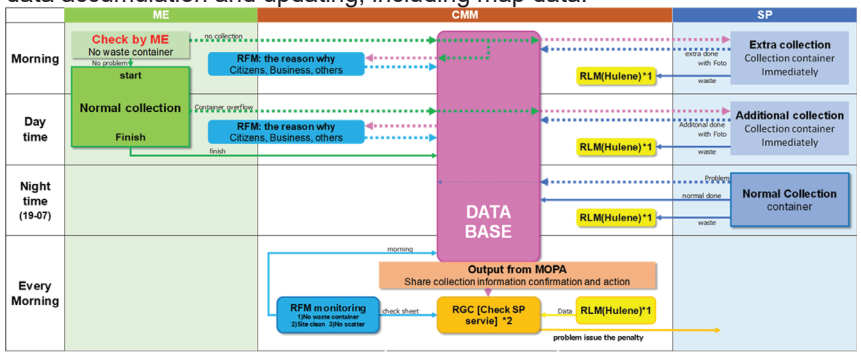
Waste Collection Route Management

- Waste collection route plan including the list of MEs' waste containers and collection routes for each district was prepared.
- These information should be presented in the TOR for WCSPs, and contract management of primary and secondary waste collection shall be performed.



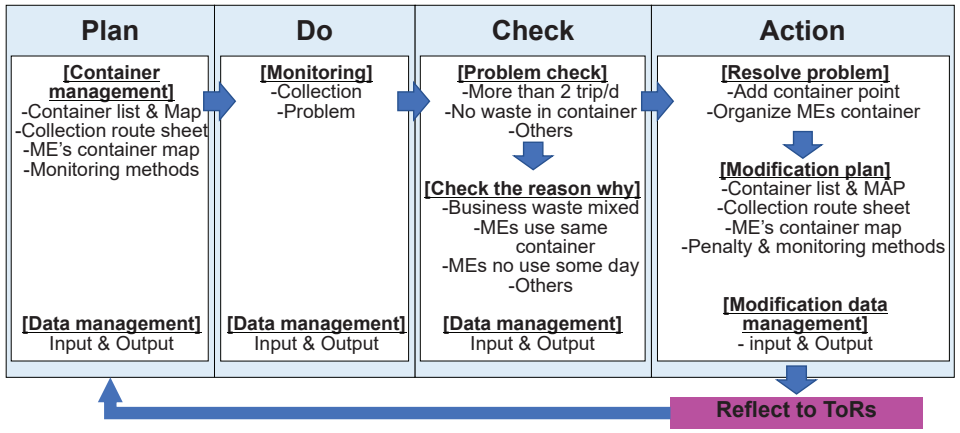
ICT for Waste Collection Service Management

- It will be more efficient if MEs and WCSPs will send daily waste collection & transportation performance information to DSMAS, and DSMAS will compare and analyze that information so that each actor can monitor and check each other's service operations.
- It is desirable to use the ICT system as a monitoring system for waste collection and transportation services by DSMAS from the standpoint of certainty and efficiency of data management, including data input and output, data accumulation and updating, including map data.



PDCA Cycle Operation

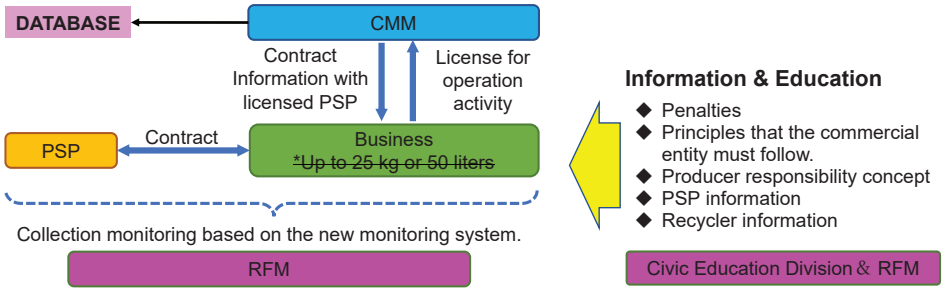
- It is important to implement PDCA-cycle operations in waste collection service contract management.
- Procedures of PDCA activities in WCSP management is summarized in the figure below.



Reference: Plan for Improvement of Waste Collection & Transportation Service

Business Waste Management

- Considering CMM's expenditures for waste collection, it is necessary that business waste to be collected by the licensed PSP contracted with each business waste generator.
- The future business waste management shall be implemented as follows:
  - Eliminate the current 25 kg limit that businesses can discharge their waste into public waste containers.
  - Require all businesses to have contract with licensed PSPs as the condition of obtaining or renewing business operation licenses.
  - Information, education and communication activity should be provided by REAS and RFM when business licenses are issued or renewed. Furthermore, RFM's inspection in the field should be strengthened.

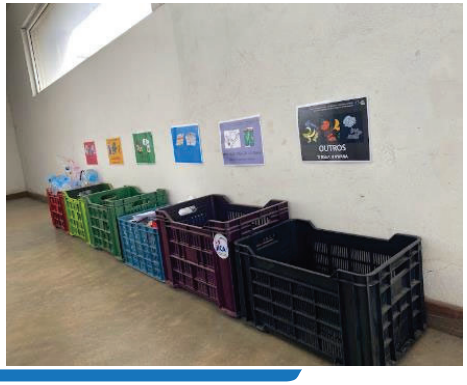


Reference: Plan for Improvement of Waste Collection & Transportation Service

3. Recycling

Source Separation of Recyclable Waste

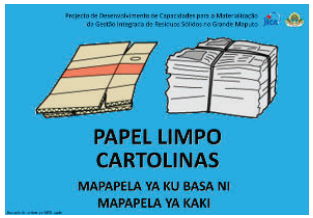
- A pilot project to introduce source separation of recyclable waste as well as hazardous waste was launched in some CMM offices and Matola City office.
- The recyclable bins and baskets for source separation were designed and procured.
- DSMAS aims to expand its practice to other CMM facilities, business offices and households in future, by utilizing the experiences and lessons learned from the pilot project.



Reference: Manual on Introduction of Source Separation

Recyclable Waste Signboards

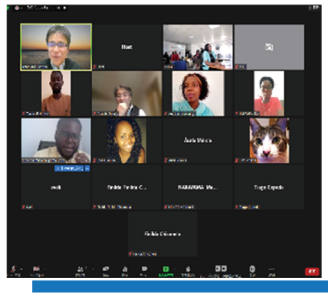
- The signboards for each type of recyclable and waste which are 1) Plastic, 2) Paper, 3) Metal, 4) Glass, 5) Hazardous and 6) Others was prepared.
- The signboards described in Portuguese and Changana with illustration and unified color-coding are available for other municipalities.



Reference: Manual on Introduction of Source Separation

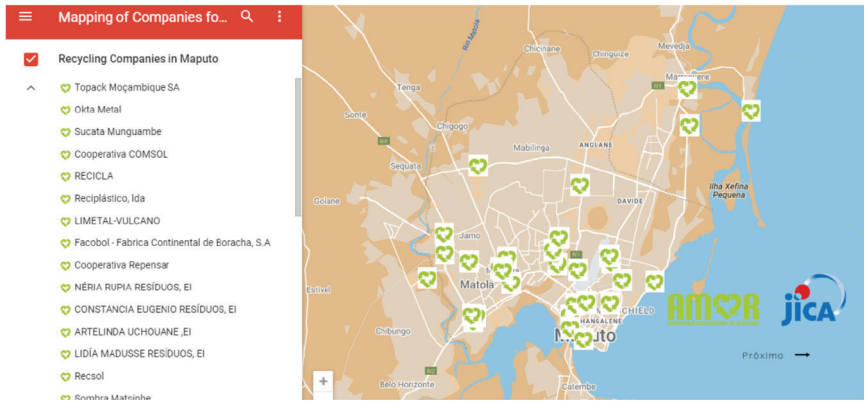
Networking of Recycling Actors

- Maputo City is holding Recycling-related Actors Networking Meetings with participation of DSMAS, MTA, MINEDH and other concerned governmental organizations, NGOs and private companies active in recycling and environmental education fields.
- It aims to encourage networking, information sharing, collaboration and task demarcation among the recycling-related actors to promote recycling and awareness raising activities in the city.



Recycling Situation Survey

- A survey was conducted to investigate recycling-related actors in and around Maputo City and it succeeded to identify 38 recyclers.
- The identified recyclers' names, contacts, location, handling recyclable items, etc. were registered and a "Recycler Map" was developed.
- DSMAS will continue to facilitate networking of the recyclers and promote recycling activity.



Reference: Recycling Actor Map and Database in Maputo City

Resolution on Source Separation & Recycling

- The draft resolution on the promotion of source separation and recycling was developed. It is expected to be utilized as a reference for other municipalities.
  - Chapter 1: General Provisions
    - Article 1. Purpose
  - Chapter 2: Recyclable Waste Items, Color-coding, Container
    - Article 2. Recyclable waste items
    - Article 3. Color coding of recyclable waste
    - Article 4. Container of recyclable waste
  - Chapter 3: Obligations and responsibilities of waste generators
    - Article 5. Obligations of the Maputo Municipal Council
    - Article 6. Obligations of business waste generators
    - Article 7. Responsibility of citizens
  - Chapter 4: Obligation and responsibilities of recycling-related actors
    - Article 8. Obligations of the licensed waste collection service providers
    - Article 9. Obligations of the registered recycling companies and NGOs
  - Chapter 5: Composting
    - Article 10. Promotion of organic waste composting
  - Chapter 6: Recycling platform and association
    - Article 11. Promotion of recycling platform and association

Reference: Draft Resolution on the Promotion of Source Separation and Recycling

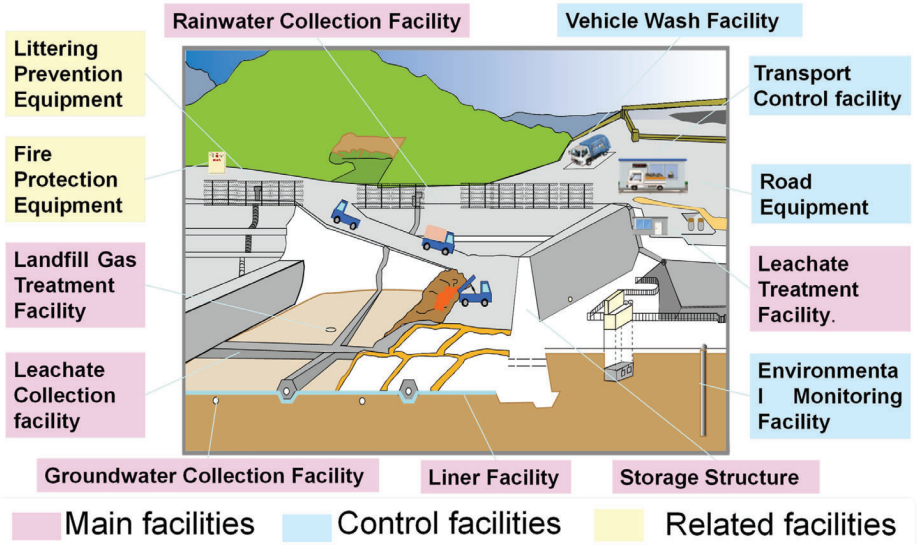
4. Landfill

Guideline on Operation & Management of Sanitary Landfill

- The Guideline on Sanitary Landfill Operation & Management was developed.
- It is expected to utilize the guideline in nation wide as reference for landfill operation in Mozambique.
- The contents of the guideline are as follows:
  1. Management of Landfill for Municipal Solid Waste
  2. Functions and Facilities of Landfills
     - Landfill Structure,
     - Main Facilities,
     - Administrative Facilities,
     - Related Facilities.
  3. Management of Landfills
     - Transport Control,
     - Landfill Operation,
     - Facility Management,
     - Environmental & Safety Management
  4. Site management after landfilling completion

Reference: Guideline on Sanitary Landfill Operation & Management

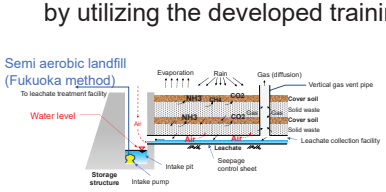
Standard Facilities of Sanitary Landfill

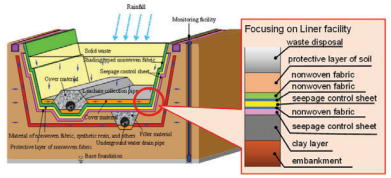


Reference: Guideline on Sanitary Landfill Operation & Management

Training on Landfill Operation & Management

- Training material of “Guideline on Sanitary Landfill Operation & Management” was developed and trainings were provided for DSMAS, MTA and Matola City officers.
- It is expected MTA and DSMAS will provide trainings to other municipalities by utilizing the developed training material.



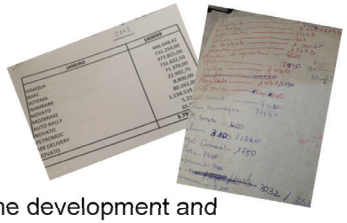


Reference: Training Material of “Guideline on Sanitary Landfill Operation & Management”

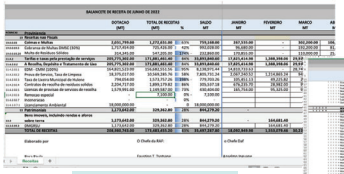
5. Financial Management

Revenue & Expenditure Analysis

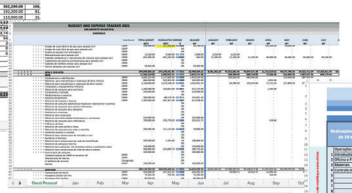
- In Phase 1, collection and analysis of basic financial data had been very challenging
  - Report formats were not uniform; some were just handwritten records
  - Some calculations were done manually and not in a spreadsheet file; many errors were found
  - There were no diligent records-keeping



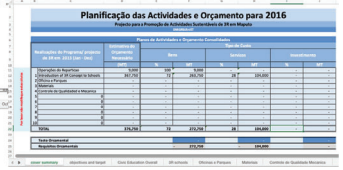
- Some of the first essential activities included the development and introduction of workable templates, which continue to be used:



Revenue Tracker



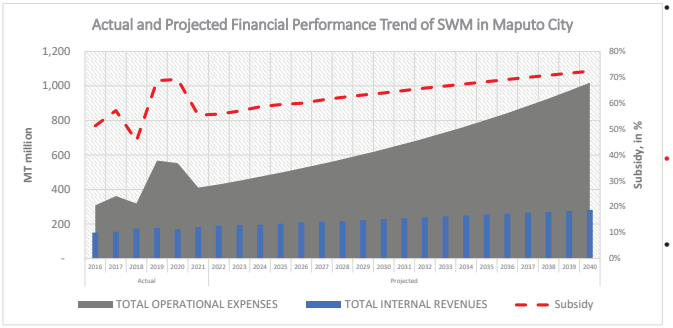
Budget and Expense Tracker



Budget and Activity Planning Template

Financial Sustainability Strategy

- The strategy is anchored on the principle of **equitability** where the responsibility of SWM is shared equitably among citizens
- Raising revenues without increasing fees; Optimizing costs without sacrificing operations.
- Sustainability attained through:
  - correcting current systems,
  - providing mechanisms that would ensure transparency in transactions, and
  - ensure fairness in the distribution of the cost of SWM.



- Financial trend shows that without intervention in revenue enhancement and cost-mangement the sector will continue to be heavily subsidized, exceeding **70%** in 2040
- **Scenario will be much worse** as the sector plans to invest in capital-intensive technology over time
- Costs may potentially **shift to double in about 5 years** in anticipation of landfill in Katembe.

Cleaning Fee Collection through Electricity Charge

Current cleaning fees collected by EDM

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

Current SWM fee structure charged via electricity bill is (1) unrelated to SWM cost and waste generation, and (2) it is socially unjust.

Survey conducted by Project on 400+ businesses showed statistically significant positive correlation between waste generation and electricity consumption. Based on cost of SWM operations, electricity consumption, and waste generation, the appropriate fee was derived (2021 figures):

TOTAL COST OF SWM OPERATIONS,
Less PERSONNEL: **MT374.6 million**

TOTAL WASTE GENERATION: **448.2 million kg**

Domestic: **274.8 million kg**
Non-Domestic: **173.4 million kg**

TOTAL ELECTRICITY CONSUMPTION
Domestic: **386.761 million kWh**
Non-Domestic: **119.440 million kWh**

Unit Operating Cost of SWM* =

MT0.84/kg

*Refers only to Goods and Services, Transfers

Derivation **of unit cost of SWM** for every unit of energy consumed in MT/kWh

Waste Gen per Energy Consumed =

Domestic: 0.71 kg/kWh
Non-Domestic: 1.45 kg/kWh

Domestic: **MT0.59/kWh**

Non-Domestic: **MT1.21/kWh**

Unit costs can be reviewed and revised every 3-5 years; may go up or down to reflect prevailing situation

Cleaning Tax for Business Waste Generators

Recorded/"collected" under PdS

1. Monthly printing and distribution of invoices manually by Supervisors
2. Payor goes to bank to pay
3. Payor provides PdS proof of payment
4. HIGH tendency of non-domestic waste generators NOT to pay
5. Low collection efficiency rate: 18%
6. 2021 revenue: MT8.2million

Based only on 10,000 entities registered in PdS

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

Through Annual Business Licensing

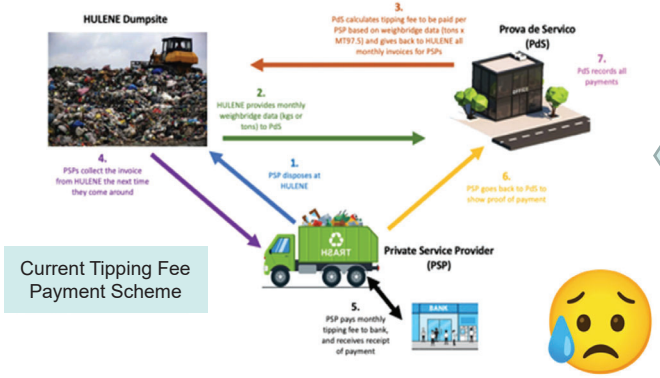
1. Collected annually (or biannually) as part of requirement to renew license to operate
2. Entity required to show contract with legitimate waste collection and transport company for the period
3. Lower transaction cost; significantly reduced fee
4. Wider revenue base: EVERY BUSINESS/INSTITUION pays
5. Potential revenue: MT62 million!

Proposed fixed cleaning fee collected from non-domestic waste generators

Category	Waste Generation per day	Corresponding Monthly Cleaning Tax
A	**More 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**

Still based only on 10,000 entities registered in PdS! Potential for radical improvement in this revenue is high with better information on non-domestic sector.

Tipping Fee at Final Disposal Site



- Invoicing, paying, reporting and recording methods are confusing and troublesome.
- Low collection effciency of >MT2 million annually

Current Tipping Fee Payment Scheme

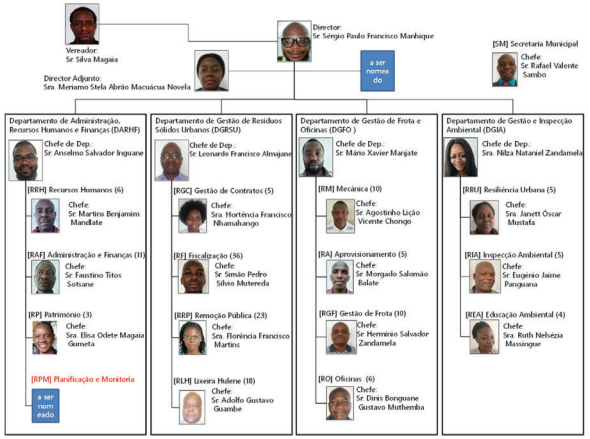
Strategy:

- *Point-of –sales (POS)* Payment for **ALL** users of Hulene dumpsite
- Use of mobile payment system: M-PESA, MKESH, e-MOLA, etc (QR code)
- Small, machine-generated receipt on the spot!
- Weighbridge records entry data including weight and truck information
- Potential revenue: M16million annually or 700% increase!

6. Organizational & Institutional Management

Organizational Structure Analysis

- It is important to prepare an organizational chart of the Directorate in charge of SWM and update it periodically.
- By analyzing the current organizational structure of DSMAS and its future operational needs, DSMAS's organizational development plan was prepared.



Organizational Structure of DSMAS

Legal & Institutional Analysis

- It is important to prepare a list of ordinance & resolution related to SWM in the city, manage those legal documents as database and update periodically.
- Gap analysis was conducted to identify necessity of legal reform to implement the SWM M/P in Maputo City.

Major Legislation related to SWM in Mozambique

No	Title	Ref.	Year
1	Constitution of the Republic		2014/2018
2	Legal Framework for the Implementation of Local Municipalities	2	1997
3	Legal Regime of Administrative Tutelage of the State that is Subject to Local Autarchies	7	1997
4	Legal Framework for the Finances and Assets of Local Authorities	11	1997
5	Environmental Law	20	1997
6	Regulation on Biomedical Waste Management	8	2003
7	Regulation on Environmental Inspection	11	2006
8	Regulation on Waste Management	13	2006
9	Regulation on Hazardous Waste Management	83	2014
10	Regulation on Urban Solid Waste Management	94	2014
11	Directive on Construction, Operation and Closure of Controlled Landfills	18	2004
12	Regulation on Management and Control of Plastic Bag	16	2015
13	Regulation on Extended Responsibility of Producers and Importers of Packaging	79	2018
14	Regulation on Environmental Quality Standards and Effluent Emission	67	2010
15	Regulation on Process of Environmental Impact Assessment	54	2015

Reference: Plan for Updating SWM Regulations in Maputo City

Human Resource Management

- It is important to prepare a staff database belonging to the directorate in charge of SWM in the city, that enables appropriate human resources management and capacity development of the staff.
- The DSMAS staff database was developed to include the following staff information such as:
  - Name, Gender, Age, Date of birth
  - Academic background, Field of study
  - Year of service, Scheduled retirement year
  - Section, Assigned Section, Position, Rank
  - Record of training
- DSMAS will improve staff management by utilizing the developed human resources database such as:
  - Balanced allocation of staff in each department/section
  - Staff transfers based on their expertise and backgrounds
  - Recruitment of staff according to workload and needs
  - Selection of appropriate trainees for various training programs

Reference: DSMAS Organization & Human Resources Development Plan

7. Environmental Education & Awareness-Raising

Training on Source Separation

- Training on source separation was conducted for DSMAS officers to learn how to segregate waste with color-coded baskets and signboard.
- At the beginning of the training, the facilitator explains why source separation is necessary, where the segregated waste goes, etc.
- The participants learn how to segregate the recyclables by separating the sample waste such as PET bottle, metal cap, glass bottle and used paper.
- At the end of the training, the participants exchange their opinions at Q&A session.
- Just locating recycle bins is not enough, training is necessary.
- Since this training program is very simple, any participants can be next facilitator.



Reference: Manual on Introduction of Source Separation

Cleaning-up Campaign (Bairro Mais Limpo)

- Bairro Mais Limpo is an inter-neighborhood (bairro) clean-up contest, by the initiative of Maputo Municipality.
- During several months of the contest, the neighborhoods implement cleaning on the streets or even drainages, planting trees, actions to combat erosion and environmental education, which are all evaluation criteria of the contest.
- Those activities should be implemented with active participation of the residents and continuously through the period.
- The winners are prized directly by the City Mayor. It is so proud to be honored at the beautiful ceremony.

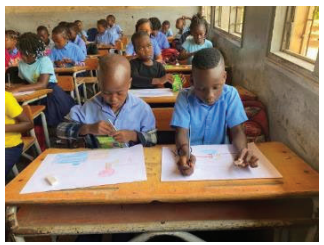
SPO-Gomi

- SPO-GOMI is a new technique of selective waste collection, developed in Japan, which incorporates elements of sport in which teams collect waste within a delimited perimeter and earn points according to the amount of collected waste.
- The activity can be conducted in any communities or public spaces as well as schools.
- The participants collect waste into the segregation bags.
- Thanks to their strong will to win other teams, the participants usually collect more waste than traditional cleaning activities.
- At the end of the competition, collected waste is handed over to recyclers.

Reference: Manual on SPO-Gomi Activity

Environmental Picture Diary

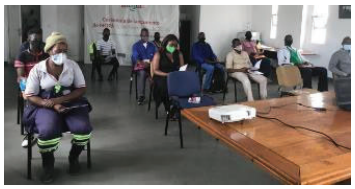
- Environmental Picture Diary is an activity in which school students freely express their thoughts on environmental issues in drawings and sentences.
- The children who took part in this activity showed that they have a vast knowledge of environmental issues as they drew pictures on different themes related to the environment, such as waste segregation at source, non-proliferation of waste, problem of marine waste, the need to preserve trees, air pollution and several other issues.
- It takes approximately 3 hours for the students to complete the drawings. Environmental picture diary can be conducted for three hours continuously in a single day, or it can be divided into two or three days.

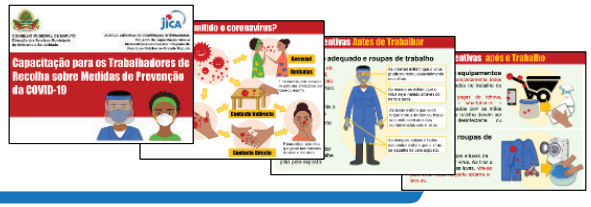


Reference: Manual on Environmental Picture Diary Activity

COVID-19 Prevention Measures

- Equipment for COVID-19 measures was offered to Maputo City.
- Personal Protective Equipment (PPE) such as masks, gloves, face shields, hand soaps, antiseptic liquid, as well was awareness raising material such as posters and leaflets were handed over at an official ceremony.
- Training on COVID-19 measures was conducted for 183 DSMAS staff, 46 microenterprises (934 workers), approximately 800 waste pickers and the communities.
- Training contents for the communities include the rules of wearing masks, how to dispose masks, how to wash hands, keeping social distances, promotion of online communication, etc.
- On the training for the waste collection workers, the instruction on wearing PPE and the measures to keep its cleanliness were introduced.





Reference: Training Manual on Prevention Measures of COVID-19

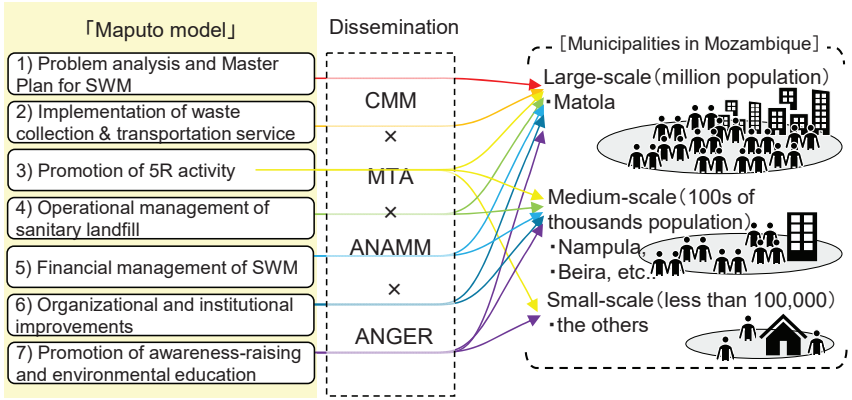
7. Dissemination Plan of Maputo Model

Municipalities' Guide to Using the Maputo Model

- For small scale municipalities
  (Municipalities of less than 100 thousand people)
  - It is recommended to start from applicable and feasible activities such as environmental education & awareness-raising, promotion of 5Rs.
- For medium scale municipalities
  (Municipalities of 100s thousands people such as Nampula, Beira)
  - It is encouraged to implement problem analysis for M/P formulation, waste container location map development, organizational structure preparation, revenue and expense monitoring for financial management as much as possible.
- For Large scale municipalities
  (Municipalities of 1 million people such as Matola)
  - It is advised to engage in integrated solid waste management by referring to the Maputo Model.
  - Municipalities should share their experiences and collaborate to improve integrated waste management.

Dissemination Structure

- CMM/DSMAS in cooperation and collaboration with MTA, ANAMM and ANGER will start masking efforts to disseminate the Maputo Model to other municipalities in Mozambique.
- It is expected sharing reference documents & materials, provision of training for municipal officers will be planed and implemented after the project



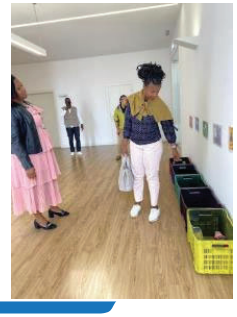
Action Plan for Dissemination of Maputo Model

- CMM/DSMAS
  - Support municipalities by sharing knowledge and experiences in improving ISWM in Maputo City.
  - Provide lectures & training to the municipalities and share documents and materials for ISWM with the municipalities.
- MTA
  - Technically and financially support municipalities in promoting ISWM in the municipalities.
  - Take initiative in promoting knowledge and experience sharing on ISWM among the municipalities.
  - Hold seminars and workshops to promote ISWM in the municipalities.
- ANAMM
  - Support networking of municipalities and related organizations to promote ISWM.
  - Hold seminars and workshops to promote ISWM in the municipalities.
- ANGER
  - Support networking of solid waste managers to promote ISWM.

Dissemination Activities in Matola City
- Knowledge Sharing Seminar -



Dissemination Activities in Matola City
- Source Separation of Recyclables -

Dissemination Activities in Matola City
- Environmental Awareness-raising -




Revision of Project Design Matrix (PDM)
Setting targets of Overall Goal

July 2023

JICA Project Team

PDM & PO

- Project Design Matrix (PDM)
  - A table summarizing activities, inputs, outputs, objectives, and other components of a project, together with their logical interrelationships.
- Plan of Operation (PO)
  - A planning chart showing implementation timing & duration for each activity on PDM.

Structure of PDM

Narrative Summary	Verifiable Indicator	Means of Verification	Important Assumption
Overall Goal What will be aimed at after the project purpose is achieved?	Standard for measuring project achievement	Data sources from which indicators are derived.	Conditions important for the project.
Project Purpose What should the project achieve within the project duration.			
Outputs How should the project achieve the Purpose.			
Activities What should be done concretely to achieve the Outputs?	**Inputs** Purpose, materials, equipment, facilities, and funds required by the project.		**Pre-conditions**

Structure of PDM

Narrative Summary	Verifiable Indicator	Means of Verification	Important Assumption
Overall Goal What will be aimed at after the project purpose is achieved?	Standard for measuring project achievement	Data sources from which indicators are derived.	Conditions important for the project.
Project Purpose What should the project achieve within the project duration.			
Outputs How should the project achieve the Purpose.			
Activities What should be done concretely to achieve the Outputs?	**Inputs** Purpose, materials, equipment, facilities, and funds required by the project.		**Pre-conditions**

History of revising PDM & PO

- PDM & PO (Ver.0) was attached in the Record of Discussions (R/D) for the Project as of July 2019.
- PDM & PO (Ver.1) was discussed and agreed in the 1st JCC meeting held in January 2020.
  - The modification was made mainly to set “objectively verifiable indicators” and their “means of verification” in accordance with the planned project activities.
- PDM & PO (Ver.2) was discussed and agreed in the 4th JCC meeting held in June 2022.
  - The modification was made mainly to set the target values of the indicators considering the assessment of current status and capacity of the C/Ps.
  - Adjustment on the project activities and extension of the project duration for 10 months were also made.
- It is necessary to revise PDM (as Ver.3) to set targets of Overall Goal.

Overall goal

(a goal to be achieved after the project)

Integrated solid waste management (ISWM) is established in a sustainable manner in Maputo City and the ‘Maputo model’ is disseminated to other cities.

Indicators

1. MSW collection rate increases from 95% to 97%. (SDG 11.6.1)
2. MSW recycling rate increases from 1.7% to 5%. (SDG 12.5.1)
3. The concept of the ‘Maputo model’ is disseminated inside/ outside Mozambique.

1. MSW collection rate

- The current MSW generation was estimated to be 1,304 t/day, and the amount of collected MSW was estimated to be 1,234 t/day, from which the current MSW collection rate was calculated to be 95%.
- The target value of MSW collection rate after the project was set at 97% considering improvement of MSW collection in Katembe and Kanyaka Districts and expanding collection service coverage area in Albazine and Costa do Sol Bairros.
- DSMAS will need to conduct MSW amount & composition survey to update the MSW waste generation unit, and continue analyzing the truck cale data to obtain MSW waste collection amount.

2. MSW recycling rate

- The current MSW generation was estimated to be 1,304 t/day, and the amount of recycled MSW was estimated to be 22.7 t/day, from which the current MSW recycling rate was calculated to be 1.7%.
- The target value of MSW recycling rate after the project was set at 5% considering improvement of networking of recycling-related actors and installation of a MRF after closure of the Hulene Dumping Site.
- DSMAS will need to continue the recycling situation survey to identify recycling actors, their handling recyclable items and amount of recovered recyclables.

3. Dissemination of the Maputo Model

- DSMAS will provide trainings, lectures, workshops and seminars to other municipalities in cooperation with MTA, ANAMM and ANGER.
- DSMAS should take initiative in holding coordination meetings with MTA, ANAMM and ANGER, implement and keep records of the 'Maputo model' dissemination activities.

Thank you

Outputs of the Project

[Project Purpose]

Capacity for implementing ISWM is enhanced based on the M/P, and the capacity development experience is summarized under the name of 'Maputo model'

- Output 1: Analyzing current issues & challenges of SWM
- Output 2: Waste collection & transportation service
- Output 3: Minimizing waste generation and promoting 3Rs
- Output 4: Landfill operation and management
- Output 5: Financial, organizational and institutional capacity
- Output 6: Public awareness and environmental education
- Output 7: Compiling 'Maputo model' and its dissemination

Project outline

- Project period
  from November 2019 to October 2023
- Relevant government agencies
  - Counterpart agency
    DSMAS/CMM
  - Coordination agency
    MTA(DINAB and FNDS), Matola City
  - Cooperation agency
    ANAMM, MINEDH, ANGER
- Target area
  - Maputo City
  - Matola City (Outputs 4 & 7)

Appendix 1-3
Capacity Assessment Sheets

Capacity Assessment Sheet for Output 1 (Capacity for analyzing current issues and challenges of SWM)

Date: 22 May 2023

Name: Ms. Stela

Component	Category	No.	Required Capacity to be Developed	Present Capacity					Reasons for Evaluation	Key Points for Further Improvements
				1	2	3	4	5		
Understanding the current situation on SWM in Maputo City	I	1	DSMAS officers can explain the current situation of SWM and MSW flow in Maputo City.			BL		EL	The staff improved their understanding of the current MSWM situation and system through project activity.	More effort will be necessary to grasp MSW flow especially on recycling and illegal dumping.
	I	2	DSMAS officers can explain the planned measures for SWM improvement in the M/P.		BL		EL		The staff improved their understanding of the M/P through the Output 1 activity.	It is necessary to continue A/P and M/P monitoring.
	O	1	The latest MSW flow is summarized and periodically updated in DSMAS.				BL	EL	The amount of collected and disposed waste is periodically monitored and the recycling situation was surveyed.	It is necessary to continue to obtain reliable data on the amounts of recycling and illegal dumping.
	O	2	The M/P is kept available for all the DSMAS staff.		BL		EL		The M/P was printed and distributed to the concerned DSMAS staff.	It is necessary to prepare the summary of M/P and share it among the stakeholders.
Preparing the Action Plan (A/P) for the M/P	I	3	DSMAS officers can explain the relationship between the M/P, A/P, and the M/S.		BL			EL	The staff improved its understanding through the Output 1 activity.	It is necessary to continue A/P and M/P monitoring and revise the M/P.
	I	4	DSMAS officers can identify the priority issues and challenges of SWM in Maputo City based on the M/P.			BL		EL	The staff understands the priority issues and challenges based on the M/P.	
	O	3	DSMAS prepares the 5 years A/P for the M/P			BL		EL	DSMAS prepared the A/P for the M/P and conducted a review and updating.	Ditto.
	O	4	DSMAS reviews the A/P annually and updates it as necessary.			BL		EL		

Establishing the Monitoring System (M/S) for the M/P	I	5	DSMAS officers can explain the items required for the monitoring plan of the M/P.			BL		EL	The staff improved their understanding of the monitoring plan for the M/P.	Ditto
	I	6	DSMAS officers can explain the progress of the M/P implementation and its performance.				BL EL		The staff conducted M/P monitoring but still need more practice.	
	O	5	DSMAS prepares the monitoring plan for the M/P.		BL			EL	The monitoring plan for the M/P was prepared.	It is necessary to prepare the monitoring plan for the M/P.
	O	6	DSMAS implements M/P monitoring.		BL			EL		
	O	7	DSMAS can take necessary action to implement the M/P based on the monitoring results.				BL EL		DSMAS can identify necessary action to implement the M/P, but its implementation is not sufficient.	It is necessary to take necessary action to implement the M/P.

Category; I: Individual Capacity, O: Organizational capacity
Rating scale; 5: Excellent, 4: Very good, 3: Good, 2: Fair, 1: Poor
BL: Baseline, EL: Endline

Capacity Assessment Sheet for Output 2 (Capacity for waste collection and transportation service)

Date: 24 May 2023

Name: Mr. Almanjane

Component	Category	No.	Required Capacity to be Developed	Present Capacity					Reasons for Evaluation	Key Points for Further Improvements
				1	2	3	4	5		
Understanding the current situation of the waste collection service providers (WCSPs) and their contracts	I	1	RGC/RFM officers can explain the current system of waste collection service and its service providers in Maputo City.				BL	EL	The staff can explain the current system of waste collection service and how DSMAS is monitoring & supervising the WCSPs' service performance.	The challenge is to enforce the monitoring and supervision of waste collection services.
	I	2	RGC/RFM officers can explain how DSMAS is monitoring & supervising the WCSPs' service performance.				BL	EL		
	O	1	The list of WCSPs, their contracts, and reports are kept in DSMAS.		BL			EL	The relevant documents are organized in DGRSU/RGC.	More systematic management of information and data in DSMAS is necessary.
	O	2	The monitoring & supervision reports on WCSP's service are kept in DSMAS.		BL			EL		
Developing a plan to optimize the waste collection & transportation service in Maputo City	I	3	RGC officers can identify issues and challenges of DSMAS for improving waste collection service. (Household waste collection)		BL		EL		Issues and challenges in household waste collection were analyzed in detail.	The challenge is to implement the waste collection and transportation service improvement plan.
	I	4	RRP officers can identify issues and challenges of DSMAS for improving waste collection service. (Bulky waste and illegal dumping waste collection)		BL		EL		Issues and challenges in illegal dumping waste collection were analyzed.	
	I	5	RAF/Proof of Service officers can identify issues and challenges of DSMAS for improving waste collection service. (Business waste collection)			BL		EL	Issues and challenges in business waste collection were analyzed.	
	O	3	DSMAS prepares a draft plan to optimize waste collection & transportation service in Maputo City.		BL			EL	The waste collection & transportation service improvement plan was prepared.	
	O	4	DSMAS studies the possibility of introducing a waste transfer system to transport the waste		BL			EL	The necessity of a transfer station was	

			to the new Mathlemele landfill.						studied in the waste collection & transportation service improvement plan.	
Examination of a revision of contracts between CMM/DSMAS and WCSPs for improving waste collection service	I	6	RGC officers can identify points to be revised in the contracts with WCSPs for improving the monitoring & supervision of WCSP's performance. (Urban area & secondary collection in the suburban area)		BL			EL	RGC identified points to be revised in the contracts with WCSPs for improving the monitoring & supervision of WCSP's performance.	The challenge is to draft TOR for the next contracts with WCSPs through the waste collection & transportation service improvement plan.
	I	7	RGC officers can identify points to be revised in the contracts with WCSPs for improving the monitoring & supervision of WCSP's performance. (Primary collection in the suburban area)		BL			EL		
	O	5	DSMAS proposes a revision of contracts with WCSPs on household waste collection in the urban area and suburban area (primary & secondary).		BL		EL		Recommendations on the revision of contracts with WCSPs were proposed in the waste collection & transportation service improvement plan.	
	O	6	DSMAS proposes a revision of the assessment procedures of business WCSPs and their service licenses for improving the collection of cleaning tax.		BL	EL			Recommendations on the revision of the assessment procedures of business WCSP were proposed.	The challenge is to establish a business waste management system including the cleaning tax collection.
Investigation of monitoring & supervision system of waste collection service by utilizing ICT	I	8	RFM/RRP officers can explain the MOPA system and the current situation of its application in DSMAS.			BL EL			The staff understands the MOPA system, but it could not be activated.	It is necessary to install an ICT system that facilitates the monitoring and supervision of waste collection services.
	I	9	RAF/Proof of Service officers can explain the assessment procedures of service licenses for business WCSPs and the procedures to collect cleaning tax for business waste			BL	EL		Recommendations on the revision of the assessment procedures of business WCSP were	The challenge is to establish a business waste management system including the

			generators.						proposed.	cleaning tax collection.
	O	6	DSMAS applies the MOPA system for improving the monitoring & supervision of waste collection services.	BL EL					The MOPA system could not be applied and functional in DSMAS.	It is necessary to install an ICT system that facilitates the monitoring and supervision of waste collection services.
	O	7	DSMAS improves the collection of cleaning tax for business waste generators.		BL		EL		The strategy was revised to collect cleaning tax through an annual business license.	It is necessary to apply the proposed strategy in the waste collection & transportation service improvement plan.

Category; I: Individual Capacity, O: Organizational capacity
Rating scale; 5: Excellent, 4: Very good, 3: Good, 2: Fair, 1: Poor
BL: Baseline, EL: Endline

Capacity Assessment Sheet for Output 3 (Capacity for minimizing waste generation and promoting 3R)

Date: 23 May 2023

Name: Ms. Rute

Component	Category	No.	Required Capacity to be Developed	Present Capacity					Reasons for Evaluation	Key Points for Further Improvements
				1	2	3	4	5		
Planning an appropriate source separation method in Maputo City	I	1	REA officers can explain the type of recyclable waste that is currently recovered and recycled in Maputo City.			BL		EL	The staff improved their understanding of recyclable waste items and how they can be recycled in the city.	It is necessary to continue periodic surveys as the recycling market situation will change over time.
	I	2	REA officers can explain how such recyclable waste is currently recovered and recycled in Maputo City.			BL		EL		
	I	3	REA officers can explain the type of hazardous waste that is potentially discharged from households.		BL		EL		The staff has improved their understanding of the hazardous waste in municipal solid waste.	It is necessary to examine practical systems to remove hazardous waste from MSW.
	I	4	REA officers can explain the national policy for minimizing waste generation.			BL		EL	The staff can conduct lectures on the national policy on the 5Rs.	It is necessary to continue the dissemination of the policy and regulations.
	O	1	DSMAS proposes a draft regulation on a source separation in Maputo City.		BL		EL		The draft regulation was prepared.	It is necessary to realize the regulation on source separation in Maputo City.
	O	2	DSMAS proposes a system to segregate hazardous MSW.	BL	EL				Segregation of hazardous waste was practiced in the source separation PP.	It is necessary to examine and practice a practical system to remove hazardous waste from MSW.
Implementing the pilot project on source separation	I	5	REA officers can plan a recycling activity in collaboration with the recycling-related actors.			BL		EL	It was conducted in the source separation PP.	It is necessary to expand the source separation practice in the city.
	I	6	REA officers can instruct the residents and business entities on how to segregate waste in				BL	EL	Lectures and training on source separation	

			households/offices.						have been conducted in the course of awareness-raising activity.	
	I	7	REA officers can assess the performance of recycling activities in Maputo City by comparing it with the targets in the M/P.	BL		EL			The recycling situation in the city was surveyed and the recycling amount was grasped.	It is necessary to continue data collection regarding recycling activities.
	O	3	DSMAS develops materials to disseminate and instruct source separation methods to households/offices.			BL	EL		Dissemination and instruction materials on source separation were developed.	It is necessary to expand the source separation practice in the city by utilizing the developed materials.
	O	4	DSMAS keeps a record of the amount of recovered recyclable waste by collecting data from recycling-related actors.	BL		EL			DSMAS collected data on the amount of recovered recyclable waste in Maputo City.	It is necessary to continue data collection regarding recycling activities.
Networking among recycling-related actors in Mozambique	I	8	REA officers can identify the NGOs and private companies involved in recycling activities in and around Maputo City.				BL	EL	The staff can identify active recycling NGOs and companies in Maputo City and explain their activities.	It is necessary to continue networking with recycling-related actors.
	I	9	REA officers understand the activities of each recycling-related actor in and around Maputo City.				BL	EL		
	O	5	The list of the recycling-related actors and information on their activities are kept and periodically updated in DSMAS.			BL EL			The relevant information is kept by persons in charge but not shared and organized in DSMAS.	It is necessary to establish a system to organize and keep relevant documents in DSMAS.
	O	6	DSMAS organizes recycling forums biannually by inviting recycling-related actors.					BL EL	DSMAS frequently organizes workshops and seminars with recycling-related actors.	The workshops and seminars should be utilized as an opportunity to collect relevant information and data and to discuss measures to promote recycling activity.

Examination of an incentive mechanism for promoting 3R (regulation, tax exemption, subsidy, etc.)	I	10	REA officers can explain the potential incentive mechanism to promote 3R.				BL EL		The staff can propose an incentive mechanism to promote the 5Rs.	It is necessary to provide more incentives for recycling-related actors.
	O	7	DSMAS proposes a regulatory and incentive mechanism to promote 3R.		BL		EL		DSMAS drafted a resolution on the promotion of source separation and proposed an incentive mechanism.	A regulatory and incentive mechanism to promote the 5Rs needs to be implemented.

Category; I: Individual Capacity, O: Organizational capacity
Rating scale; 5: Excellent, 4: Very good, 3: Good, 2: Fair, 1: Poor
BL: Baseline, EL: Endline

Capacity Assessment Sheet for Output 4 (Capacity for operation and management of sanitary landfill)

Date: 22 May 2023

Name: Ms. Stela

Component	Category	No.	Required Capacity to be Developed	Present Capacity					Reasons for Evaluation	Key Points for Further Improvements
				1	2	3	4	5		
Preparing a guideline on the operation & management of sanitary landfill	I	1	DGRSU/RLM officers can explain standard facilities consisting of a sanitary landfill.			BL	EL		The staff has received training on sanitary landfill operation and management but still needs more practice.	It is necessary to continue improving the understanding of the structure and operation of sanitary landfills through the WB project.
	I	2	DGRSU/RLM officers can explain the standard operation procedures of sanitary landfill management.		BL	EL				
	O	1	DSMAS develops a guideline on the operation and management of sanitary landfills in coordination with FNDS and Matola City.		BL		EL		The guideline on the operation and management of sanitary landfills was prepared.	
Conducting a training course on landfill operation & management for landfill workers	I	3	DGRSU/RLM officers can give a lecture on landfill operation and management for workers.		BL	EL			The staff can conduct training but still needs more practice.	Ditto.
	I	4	DGRSU/RLM officers can conduct on-site training on landfill operation and management for landfill workers.		BL	EL				
	O	2	DSMAS develops training materials for the training course on sanitary landfill operation & management.	BL			EL		The training materials on the operation and management of sanitary landfills were prepared.	Ditto.

Category; I: Individual Capacity, O: Organizational capacity

Rating scale; 5: Excellent, 4: Very good, 3: Good, 2: Fair, 1: Poor

BL: Baseline, EL: Endline

Capacity Assessment Sheet for Output 5 (Capacity for financial, organizational, and institutional management in SWM)

Date: 24 May 2023

Name: Mr. Tsotsane, Mr. Martins

Component	Category	No.	Required Capacity to be Developed	Present Capacity					Reasons for Evaluation	Key Points for Further Improvements
				1	2	3	4	5		
Proposing a financial plan for ensuring cost recovery of SWM.	I	1	RAF officers can explain the operational procedures for budget planning and revenue & expenditure monitoring in DSMAS.			BL	EL		The staff has improved their understanding of the operational procedure of financial management.	It is necessary to train the new RAF staff to understand the financial operational procedure.
	I	2	RAF officers can promote the cleaning tax reform proposed in the M/P.				BL EL		The financial sustainability strategy was prepared.	It is necessary to approve the strategy in CMM.
	O	1	DSMAS applies budget planning and revenue & expenditure monitoring system introduced in the 3R project.		BL		EL		It is applied. The interviews with each department for budget planning were conducted.	It is necessary to further strengthen coordination among the departments in DSMAS to establish the budget planning and monitoring system.
	O	2	DSMAS proposes a financial plan for ensuring the cost recovery of SWM following the M/P.			BL	EL		The financial sustainability strategy was prepared.	It is necessary to approve the strategy in CMM.
Proposing an organizational & human resource development plan for CMM/DSMAS.	I	3	RRH staff can explain the organizational structure of DSMAS with the chart and can identify issues and challenges for further improvements.		BL		EL		The staff can explain the organizational structure of DSMAS and can identify issues and challenges.	It is necessary to realize the DSMAS organizational development plan.
	O	3	The organogram and list of officers in each section are kept and updated in DSMAS.		BL		EL		The organogram and list of officers in each section are well managed in DSMAS.	More systematic management of information and data in DSMAS is necessary.
	O	4	DSMAS sets clear job descriptions for each department/section and sets an annual work plan for each officer.		BL		EL		The roles of each department/section are stipulated and the	

									performance of staff is evaluated.	
	O	5	DSMAS proposes its organizational & human resource development plan.		BL		EL		DSMAS organizational & human resource development plan was prepared.	It is necessary to implement the measures following the plan.
Proposing a plan for updating the ordinances & regulations related to SWM.	I	4	RRH/DGRSU officers can explain the current legislation related to SWM in Maputo City and Mozambique.		BL	EL			The relevant legislation on SWM was studied and the policy gap was analyzed.	It is necessary to revise the CMM ordinances/resolutions following the plan.
	I	5	RRH/DGRSU officers can identify policy gaps between the current legal system and the institutional framework necessary to realize the M/P.		BL	EL				
	O	6	The current legislation related to SWM in Maputo City and Mozambique is kept available for all the DSMAS staff.			BL	EL		The relevant information is managed in DSMAS.	More systematic management of information and data in DSMAS is necessary.
	O	7	DSMAS proposes a plan for updating the ordinances and regulations related to SWM.		BL		EL		The plan for updating the ordinances and regulations related to SWM was prepared.	It is necessary to revise the CMM ordinances/resolutions following the plan.

Category; I: Individual Capacity, O: Organizational capacity
Rating scale; 5: Excellent, 4: Very good, 3: Good, 2: Fair, 1: Poor
BL: Baseline, EL: Endline

Capacity Assessment Sheet for Output 6 (Capacity for raising public awareness of the environment including waste issues)

Date: 23 May 2023

Name: Ms. Nilza

Component	Category	No.	Required Capacity to be Developed	Present Capacity					Reasons for Evaluation	Key Points for Further Improvements
				1	2	3	4	5		
Analyzing the current situation and issues on 3R awareness-raising activities in Maputo City .	I	1	I can explain the current situation of 3R awareness-raising activities in Maputo City.			BL	EL		The staff can explain the current situation of awareness-raising activities in the city.	It is necessary to enhance material production for awareness-raising activities.
	I	2	I can identify potential partners (governmental agencies, NGOs, schools, community organizations, etc.) in conducting the 3R awareness-raising activities.			BL		EL	REA has increased partners in conducting awareness-raising activities.	It is necessary to continue networking with the partners.
	O	3	We collaborate with other divisions in DSMAS to identify the issue to be tackled as the civic education division.			BL		EL	REA collaborated with RRP for the cleaning-up campaign and RFM for instruction to business waste generators.	It is necessary to continue collaborative activity with other divisions in DSMAS.
	O	4	We understand the other partners' awareness-raising activities.		BL			EL	REA enhanced networking with other actors and understanding of their activities.	It is necessary to continue networking and collaborating with the partners to identify the specific potential area for cooperation and avoid overlapping.
	O	5	We have an annual plan and implement awareness-raising activities based on the plan.				BL	EL	REA can prepare more clear annual operation plan and follows it.	The annual operation plan needs to be improved by reflecting on the lessons learned from the conducted activities.
	O	1	The records of 3R awareness-raising activities are kept in DSMAS.				BL	EL	REA makes reports on the conducted activities.	
	O	2	DSMAS in cooperation with the education		BL		EL		DSMAS conducted	It is necessary to

			division in CMM, MTA, and MINEDH organizes a working group for 3R awareness-raising.						collaborative awareness-raising activities with MTA and MINEDH.	continue coordination meetings with relevant divisions/ministries.
Formulating program and producing materials for 3R awareness-raising activities.	I	3	I can plan and prepare 3R awareness-raising activities.			BL		EL	The staff enhanced experience in planning and preparing related activities.	
	O	3	DSMAS formulates a program for 3R awareness-raising activities in cooperation with partner organizations and agencies.		BL		EL		DSMAS conducted collaborative awareness-raising activities with MTA and MINEDH.	It is necessary to continue coordination meetings with relevant divisions/ministries.
	O	4	DSMAS develops materials for 3R awareness-raising activities.				BL EL		REA has developed several materials.	It is necessary to utilize the existing materials and prepare new materials.
Implementing 3R awareness-raising activities.	I	4	I can implement, monitor and supervise 3R awareness-raising activities in collaboration with partner organizations and agencies.			BL		EL	The staff has enhanced experience implementing related activities.	It is necessary to continue coordination meetings with relevant divisions/ministries.
	I	5	I can assess the performance of 3R awareness-raising activities and withdraw the lesson learned from the activities.			BL	EL		The staff enhanced their capacity to assess the performance of related activities and withdraw the lesson learned.	It is necessary to continue the assessment of related activities and discuss the lesson learned periodically.
	O	5	DSMAS in collaboration with the partner organizations and agencies implements 3R awareness-raising activities.		BL		EL		DSMAS conducted collaborative awareness-raising activities with MTA and MINEDH.	Regular coordination meetings with the partners, continuous improvement of activities, and fundraising for activities will be the next challenge.
	O	6	DSMAS in cooperation with the partner organizations and agencies establish a sustainable system including fundraising to implement 3R awareness-raising activities in Maputo City.		BL		EL			

Category; I: Individual Capacity, O: Organizational capacity
Rating scale; 5: Excellent, 4: Very good, 3: Good, 2: Fair, 1: Poor
BL: Baseline, EL: Endline

Capacity Assessment Sheet for Output 7 (Capacity for summarizing the experiences of realizing ISWM in Maputo city and disseminating to other cities)

Date: 22 May 2023

Name: Ms. Stela

Component	Category	No.	Required Capacity to be Developed	Present Capacity					Reasons for Evaluation	Key Points for Further Improvements
				1	2	3	4	5		
Summarizing the experiences of realizing ISWM in Maputo City as the 'Maputo model'.	I	1	DSMAS officers can explain the experiences of realizing ISWM in Maputo City.			BL		EL	The experience in DSMAS was summarized in the Maputo model.	The challenge is the dissemination of DSMAS's knowledge and experience to other municipalities.
	I	2	DSMAS officers can summarize a part of the experiences of realizing ISWM in Maputo City.				BL	EL		
	O	1	DSMAS prepares reports and manuals on its operation and practice of SWM improvements.		BL		EL		Reports and manuals for SWM improvement were compiled as reference materials for the Maputo model.	
	O	2	DSMAS summarizes the experiences of realizing ISWM in Maputo City as the 'Maputo model'.	BL			EL		The experience in DSMAS was summarized in the Maputo model.	
Preparing a dissemination plan of the 'Maputo model' to the central and local governments in coordination with MITADER.	I	3	DSMAS officers can explain the current situation and issues of SWM in other cities in Mozambique.		BL		EL		The staff understands the current situation of SWM in some cities. DSMAS frequently received visits from some cities and shared its knowledge and experience.	It is necessary to develop the SWM database nationwide with an initiative of MTA and ANAMM.
	I	4	DSMAS officers can identify the experiences of DSMAS that will contribute to improving SWM in other cities in Mozambique.			BL EL			The staff can identify some experiences useful for other cities such as primary collection by MEs, 3R, and awareness-raising activities.	It is necessary to have more intensive consultations with other municipalities to identify useful DSMAS experience.

	O	3	DSMAS in collaboration with MTA prepares a dissemination plan of the 'Maputo model'.			BL	EL		The dissemination plan with the demarcation of roles was discussed with MTA and ANAMM, and it was summarized as a part of the Maputo model.	It is necessary to implement dissemination activities in collaboration with MTA and ANAMM.
	O	4	DSMAS in coordination with MTA and other relevant agencies examines the demarcation of roles to disseminate the 'Maputo model'.	BL	EL					
Starting dissemination activities of the 'Maputo model' by conducting pilot activities in Matola City and holding a national seminar on ISWM.	I	5	DSMAS officers can lead a pilot activity to introduce the experiences of realizing ISWM in Maputo City to other cities in Mozambique.		BL		EL		The staff gave lectures and lead a pilot activity to introduce the experiences of realizing ISWM in Maputo City to Matola City.	
	I	6	DSMAS officers can give lectures and make presentations to disseminate the experiences of realizing ISWM in Maputo City to other cities in Mozambique.		BL		EL			
	O	5	DSMAS in collaboration with Matola City conducts pilot activities to introduce 'The Maputo model'.		BL		EL		Some pilot activities to introduce the Maputo model were conducted with Matola City.	It is necessary to promote collaborative activities on SWM with Matola City.
	O	6	DSMAS in cooperation with MTA and other relevant agencies holds a national seminar to disseminate the 'Maputo model'.		BL		EL		A national seminar to disseminate the Maputo model was held in July 2023.	It is necessary to promote the dissemination of the Maputo model in cooperation with MTA, ANAMM, and ANGER.

Category; I: Individual Capacity, O: Organizational capacity
Rating scale; 5: Excellent, 4: Very good, 3: Good, 2: Fair, 1: Poor
BL: Baseline, EL: Endline

Appendix 1-4

JICA Project Brief Note

(Volumes 1~3)

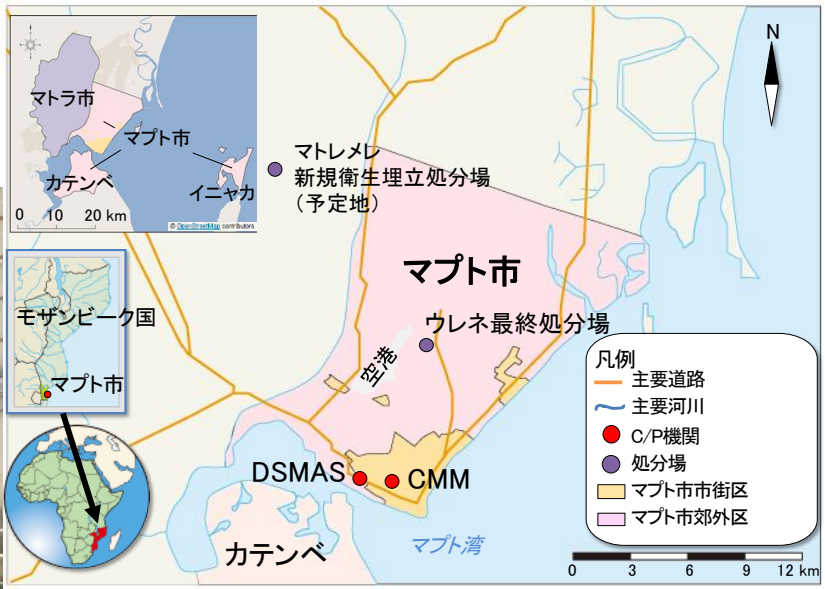
JICA プロジェクトブリーフノート

モザンビーク国 マプト大都市圏統合的廃棄物管理能力向上プロジェクト

― 廃棄物管理マスタープランに基づく各種施策の実施能力強化と経験共有を目指して ―

2020 年 4 月

プロジェクト開始時のマプト市長表敬訪問



プロジェクト対象地域図

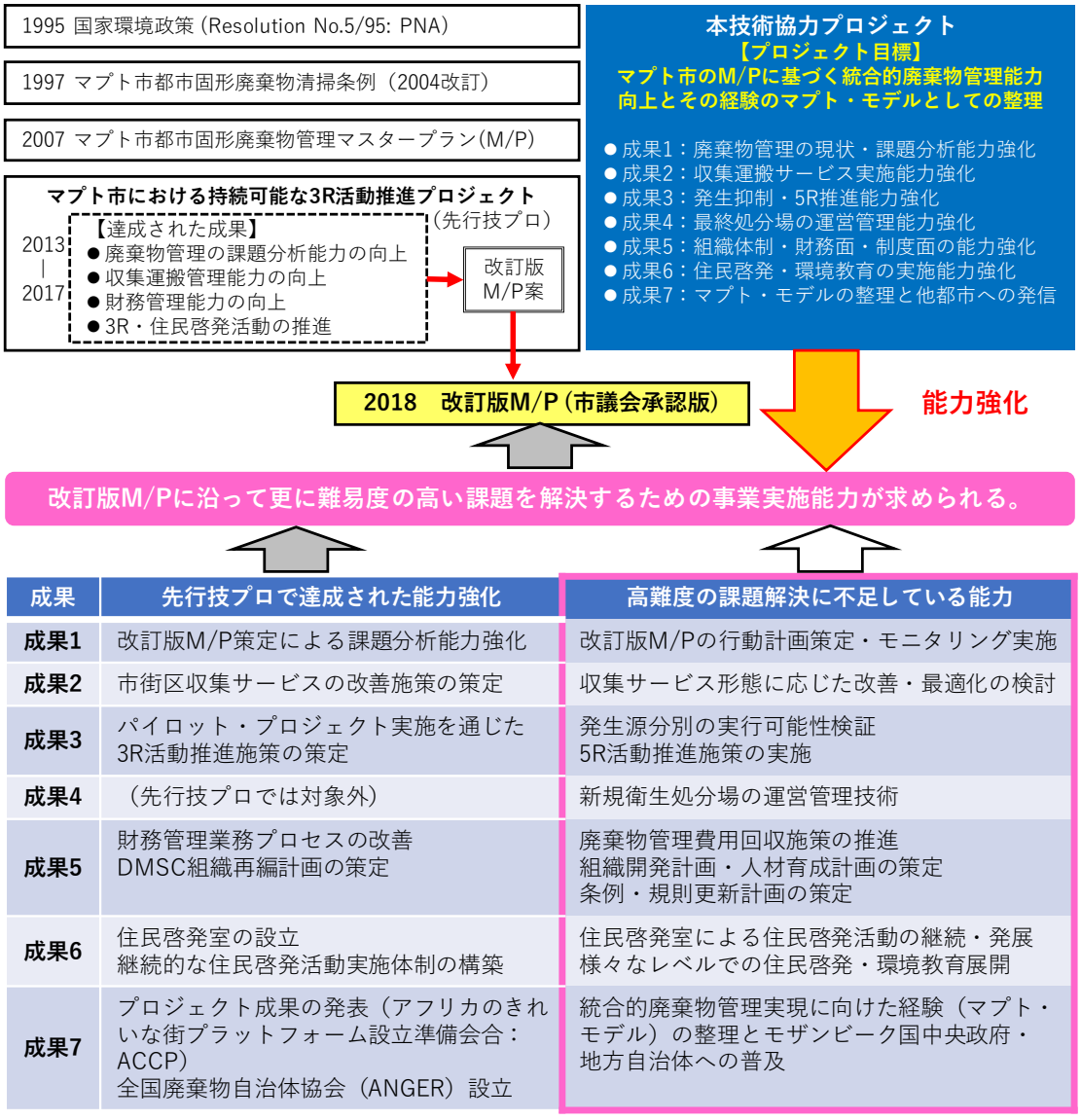
1. プロジェクトの背景

モザンビーク国の「国家環境政策」、「環境法」等の基本法令に基づき、マプト市役所（CMM）は「都市固形廃棄物の清掃条例」（1997 年制定、2004・2006 年改正）を定め、廃棄物管理に取り組んできた。2007 年にはドイツ国際協力公社の支援により「マプト市における都市固形廃棄物管理マスタープラン」（以下、「M/P」）を策定し、同 M/P に基づいた収集運搬能力の向上や財務体制の改善等において成果が得られたが、組織面・技術面の廃棄物管理能力の不足により適正な廃棄物管理の達成には至らなかった。

このため JICA は、2013 年 3月から約 4 年半にわたって「マプト市における持続可能な 3R 活動推進プロジェクト」（以下、「先行技プロ」）を実施し、旧マプト市廃棄物管理・墓地局（DMSC）（現マプト市環境・廃棄物管理局（DSMAS））との協働で、改訂版 M/P 案の作成、収集運搬能力及び財政管理能力の向上、3R 及び住民啓発活動の推進に係る一連の活動を実施し、DSMAS の能力強化に貢献してきた。

CMM/DSMAS は、上記一連のプロジェクトによる能力向上の成果を発揮し、2018 年に承認された改訂版 M/P に沿って各種施策を実施してく必要がある。しかしながら、更に難易度の高い課題を解決するための事業実施能力は依然として不足していることから、JICA はモザンビーク国政府の要請を受けて、本技術協力プロジェクトを実施することとした。

本プロジェクトの背景と期待される能力強化を図 1 に整理した。



成果	先行技プロで達成された能力強化	高難度の課題解決に不足している能力
成果1	改訂版M/P策定による課題分析能力強化	改訂版M/Pの行動計画策定・モニタリング実施
成果2	市街区収集サービスの改善施策の策定	収集サービス形態に応じた改善・最適化の検討
成果3	パイロット・プロジェクト実施を通じた3R活動推進施策の策定	発生源分別の実行可能性検証 5R活動推進施策の実施
成果4	（先行技プロでは対象外）	新規衛生処分場の運営管理技術
成果5	財務管理業務プロセスの改善 DMSC組織再編計画の策定	廃棄物管理費用回収施策の推進 組織開発計画・人材育成計画の策定 条例・規則更新計画の策定
成果6	住民啓発室の設立 継続的な住民啓発活動実施体制の構築	住民啓発室による住民啓発活動の継続・発展 様々なレベルでの住民啓発・環境教育展開
成果7	プロジェクト成果の発表（アフリカのきれいな街プラットフォーム設立準備会合：ACCP） 全国廃棄物自治体協会（ANGER）設立	統合的廃棄物管理実現に向けた経験（マプト・モデル）の整理とモザンビーク国中央政府・地方自治体への普及

図１　本プロジェクトの背景と期待される能力強化

2. プロジェクトの目的

「プロジェクト・デザイン・マトリックス」に基づき各種活動を実施することにより、期待される成果を発現しプロジェクト目標を達成することを目指す。

プロジェクト・デザイン・マトリックスの概要は以下に示すとおりである。

【上位目標】　マプト市において持続可能な方法による統合的廃棄物管理が構築され、その経験がマプト・モデルとして他都市に普及する。

【プロジェクト目標】　マプト市において廃棄物管理マスタープラン（M/P）に基づく統合的廃棄物管理の実施能力が向上し、同能力強化の経験がマプト・モデルの名のもと整理される。

【期待される成果】

・成果１：　マプト市における廃棄物管理の現状及び課題を分析する能力が強化される。
・成果２：　廃棄物収集・運搬サービスの実施能力が強化される。
・成果３：　廃棄物発生量の抑制及び 5R（Rethink, Refuse, Reduce, Reuse, Recycle）推進に係る能力が強化される。
・成果４：　最終処分場の運営管理に係る技術的な能力が強化される。
・成果５：　廃棄物管理に係る組織体制・財政面・制度面が強化される。
・成果６：　廃棄物問題や環境教育を含む住民啓発を様々なレベルで実施するための能力が強化される。
・成果７：　マプト市の統合的廃棄物管理実現に向けた経験がマプト・モデルとして整理され他都市へ発信される。

3. プロジェクト対象地域

本プロジェクトの主な対象地域はマプト市である。但し、最終処分場の運営管理に関する活動（成果 4）は、隣接するマトラ市内に建設が予定されているマトレメレ新規処分場での実施を想定する。また、マプト・モデルの発信に係る活動（成果 7）は、マトラ市を優先普及対象地域とする。

4. プロジェクト関係機関

- カウンターパート（C/P）機関
  マプト市役所環境・廃棄物管理局（DSMAS）
- 本プロジェクト全般を通じた連絡調整を行う「連携機関」
  土地環境省（MITA）環境総局（DINAB）・国家持続可能開発基金（FNDS）、マトラ市
- 本協力成果を国内他都市に普及する際に連携する「協力機関」
  教育人間開発省（MINEDH）、全国廃棄物自治体協会（ANGER）

5. プロジェクト期間

2019 年 11 月～2022 年 11 月（37 か月）

6. プロジェクトの実施方針

本プロジェクトにおける各成果活動の実施方針は以下のとおりである。

成果 1：M/P の行動計画とモニタリング・システムの策定を通じて、現状・課題分析能力を強化する

先行技プロで策定した「アクション・プラン」を活用し、改訂版 M/P（市議会承認版）の「行動計画」を作成する。改訂版 M/P 策定時から現在までのマプト市の廃棄物管理を取り巻く現状・課題の変化を踏まえて「アクション・プラン」を見直し、改訂版 M/P の「行動計画」として取り纏める。

また、DSMAS による改訂版 M/P の実施モニタリングに着手するため、改訂版 M/P（市議会承認版）に示された「モニタリング・システム」を具体化する。「モニタリング・システム」で不足しているモニタリング方法・頻度・実施責任主体や達成目標を検討し、「行動計画」に沿って改訂版 M/P の進捗状況及び目標達成度を把握するためのモニタリング・システム確立を支援する。

行動計画及びモニタリング・システムの確立に係る作業イメージを図 2 に示す。

写真 1　廃棄物管理セミナーの開催
（2019 年 12 月 18 日）

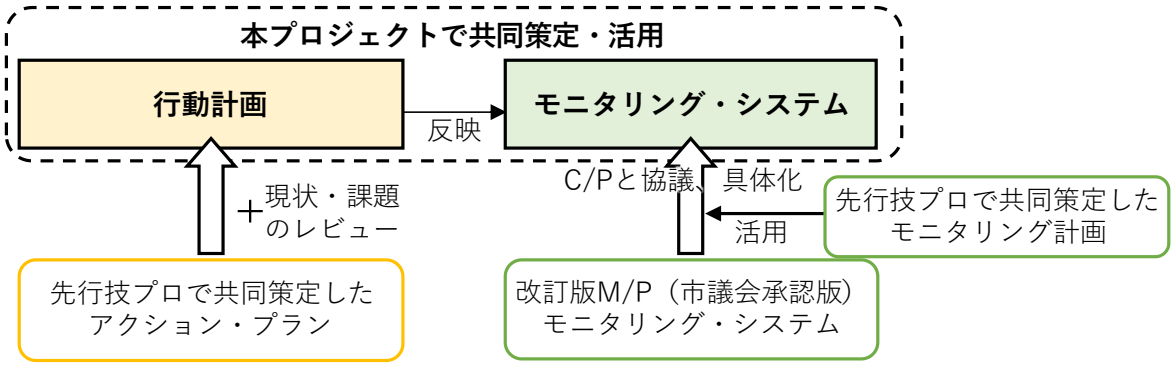


図 2　行動計画及びモニタリング・システムの作成・確立イメージ図

成果 2：サービス分類に応じた改善策を検討し、廃棄物収集サービスの改善計画を作成する

マプト市では、収集対象ごみ・担当地区によって廃棄物収集サービスの内容、現状・課題、廃棄物収集業者（WCSP）との契約状況等が異なることから、各廃棄物収集サービスについてDSMASが直面している課題を分析し、抽出された各課題の改善策を検討する。

図3に示すとおり、委託収集サービスである家庭ごみの市街区収集（①）及び郊外区一次・二次収集（②・③）、事業系ごみ収集（④）、粗大ごみ・不法投棄ごみ収集（⑤）のそれぞれについて課題分析と改善策検討を行い、マプト市全体の廃棄物収集サービスの最適化に向けた計画案として取り纏める。

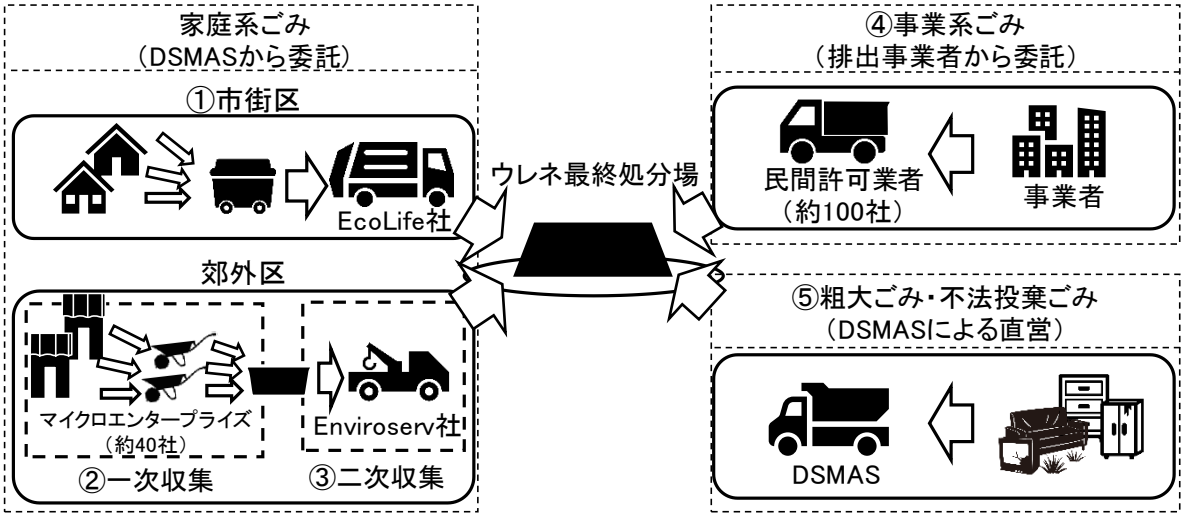


図3　マプト市の廃棄物収集サービス実施体制

写真2　市街区の収集

写真3　郊外区の一次収集

成果 3：リサイクル関連アクターと連携し、発生源分別の実行可能性を検証するための PP を実施する

マプト市では、市街区・郊外区ともに現時点で組織的な分別収集システムは導入されておらず、未だ排出者のごみ分別の必要性や実施手法に対する理解は低い。また、現在の DSMAS の財政能力を鑑みれば、廃棄物収集費用の大幅な増額を伴う分別収集システムを採用することは難しい。さらに、主に市街区ではリサイクル NGO・企業が資源ごみの回収活動に取り組んでいるものの、市民の認知度は未だ低く、既存のリサイクル・ルートが十分に活用されていない。

このため改訂版 M/P では、リサイクル活動に従事する NGO や民間企業ら関連アクターと連携し、資源ごみを既存のリサイクル・ルートに乗せることで、リサイクル量の増加と最終処分量の削減を推進する方針を優先的施策に掲げている。

上記を踏まえ、市街区においてリサイクル関連アクターと連携した発生源分別パイロット・プロジェクト（PP）を実施し、PP を通じて発生源分別手法の実行可能性を検証する（図4参照）。また、PP の結果を踏まえて、マプト市で更にリサイクル活動を推進するためのインセンティブ・メカニズムを検討する。

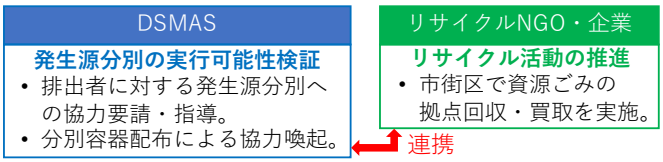


図 4　発生源分別 PP での関連アクターとの連携

写真 4　現地 NGO によるガラス瓶の回収拠点

成果 4：新規衛生埋立処分場の運営管理に係る技術指導を柔軟に計画・実施する

隣接するマトラ市に建設予定のマトレメレ新規衛生埋立処分場で活用可能な「最終処分場管理ガイドライン」を作成し、これを基に「運営管理研修」を行う。ガイドライン作成と研修実施に際しては、以下の事項に留意する。

- マトレメレ新規処分場の施設整備計画・運営管理計画の詳細について情報収集し、これを踏まえたガイドライン作成を行う。
- マトレメレ新規処分場建設工事の進捗状況を随時把握し、これを踏まえて運営管理研修の実施時期・内容を検討する。
- 韓国輸出入銀行によるマトレメレ処分場の運営管理に関する支援や、日本国環境省によるウレネ最終処分場の安全性向上に関する支援との整合性や重複回避に留意して連携する。

成果 5：DSMAS の主体性と自立発展性を重視した組織・財務・制度面の能力強化を図る

● 組織体制

CMM/DSMAS のオーナーシップを最大限に尊重しつつ、改訂版 M/P に示された各種施策を実施し、統合的廃棄物管理を実現するための「組織開発計画」と、これを踏まえた「人材育成計画」の策定を支援することで、DSMAS の組織面の能力強化を図る。

● 財務管理

財務管理業務は、DSMAS の廃棄物管理業務の基礎となる重要な活動であることから、先行技プロで導入を支援した財務管理に係る業務プロセス改善の定着を図る。

また、改訂版 M/P で示された方針に沿って、廃棄物管理に係る費用を可能な限り回収するための「コスト・リカバリー計画」の策定を支援する。

● 法制度

CMM が統合的廃棄物管理を実施する上で必要となる制度的枠組を検討し、現在の法制度とのポリシー・ギャップを埋めるための「マプト市条例・規則更新計画」の策定を支援することで、DSMAS の制度面の能力強化を図る。

写真 5　財務課との現状把握・課題分析に係る打合せ

成果 6:廃棄物管理に多様な主体を巻き込むために、持続的なネットワーク・支援システムを構築し、住民啓発活動や環境教育を推進する

住民啓発と環境教育の目的は、マプト市民に清潔な街づくりを実現するための責任の一端が自分たちにあることの自覚と、廃棄物管理の担い手としての行動を促すことにある。具体的には、マプト市が抱える廃棄物問題への関心と理解を高め、ごみのポイ捨てを止める、ルールに従ってごみを捨てる、5R 行動を取るなどの行動変容を促すことが必要である。人々の意識や行動を変えるには長い年月と多大な努力を要する。CMM/DSMAS は社会の隅々まで影響を与えること（社会的インパクト）を目指した住民啓発・環境教育活動を持続的な方法（持続可能性）で実施する能力を強化する必要がある。

CMM/DSMAS のスタッフが直接的に影響を与えることができる人の数は限られている。社会的インパク

トを生み出すために、NGO、コミュニティ・リーダー、環境意識の高い市民、小中学校、大学など、環境及び廃棄物問題に積極的に取り組む可能性のある主体との有機的で実践的なネットワークを形成し、市民に対する「影響者」として彼らを技術、情報、資金面で支援するシステムを構築する（図 5 参照）。

CMM/DSMAS が既に実施している活動や確立しているネットワークを最大限に生かしつつ、それらを見直し、改善を図る。さらに、プロジェクト終了後もネットワーク・支援システムが持続的に運用されるために必要な要件を、人材/組織、財政、法制度の観点から検討し、成果 5 のワーキング・メンバーと連携して、条例・規則の更新及び組織開発計画に反映する。

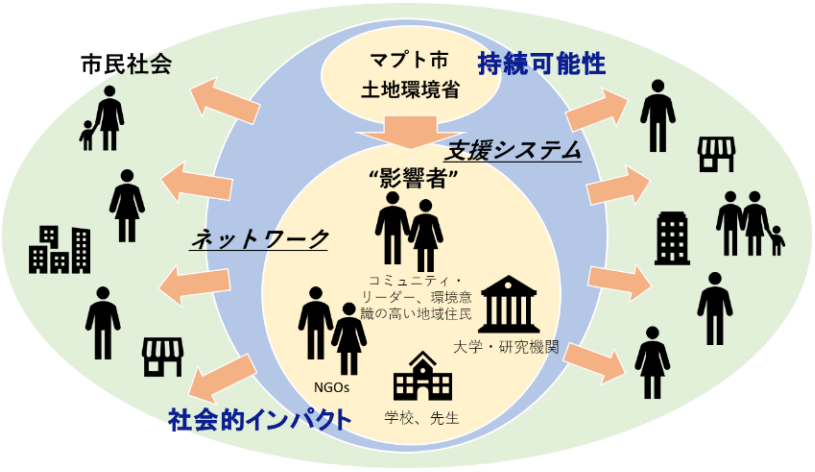


図 5　住民啓発・環境教育に係るネットワーク・支援システムの概念図

写真 6　地域住民に対する啓発活動への協力の呼びかけ

成果 7：「マプト・モデル」を論理的・包括的に整理し、国内他都市への普及計画を策定する

DSMAS による統合的廃棄物管理の実現に向けた能力強化の経験を、①課題分析及び M/P 策定、②組織体制・制度強化、③収集・運搬サービス実施、④5R 活動推進、⑤住民啓発・環境教育推進、⑥最終処分場運営管理、⑦財務管理強化の 7 構成で、「マプト・モデル」として整理する。

また、人口規模や経済レベル等が異なるモザンビーク国内他都市では、その特性に応じて「マプト・モデル」を部分的に取り入れることが妥当な場合も想定されることから、各都市に適したコンポーネントを切り出して活用できるよう、「マプト・モデル」の整理方法を工夫し、想定される適用例を提示する。さらに、「マプト・モデル」を国内他都市へ普及する際の、DSMAS、MITA、ANGER らの適切な役割分担を検討し、「マプト・モデル」の普及計画に取り纏める。「マプト・モデル」の整理・普及のイメージを図 6 に示す。

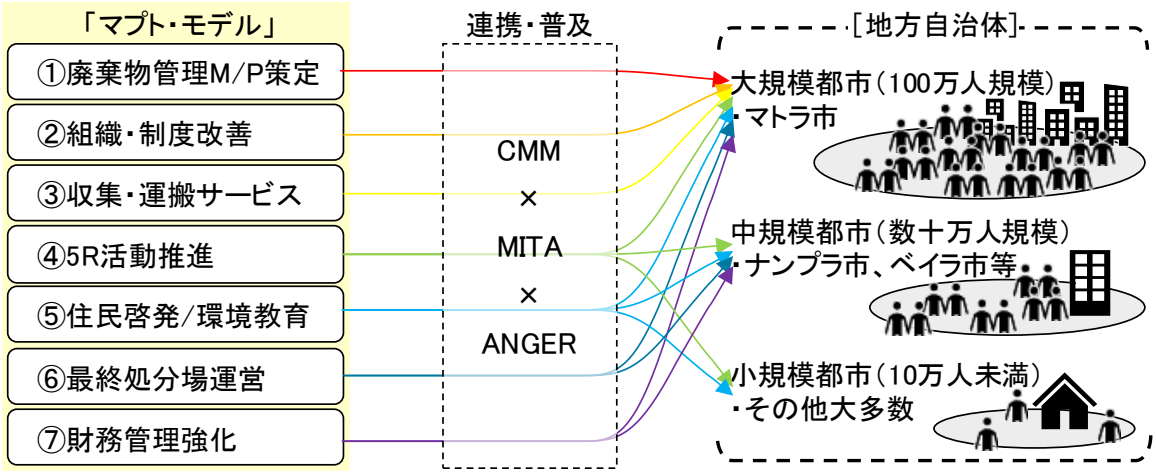


図 6　「マプト・モデル」の整理・普及の概念図

JICA プロジェクトブリーフノート（第 2 号）

モザンビーク国 マプト大都市圏統合的廃棄物管理能力向上プロジェクト

― 廃棄物管理マスタープランに基づく各種施策の実施能力強化と経験共有を目指して ―

2022 年 1 月

第 3 回合同調整委員会会議（2021 年 6 月）

マトラ市への経験共有セミナー（2021 年 5 月）

1. プロジェクト進捗概要

本プロジェクトは 2019 年 11 月に開始し、これまで約 2 年間に渡ってプロジェクト活動を実施してきた。プロジェクト期間は 2023 年 11 月までを予定しており、プロジェクト活動の前半が終了したことになる。

COVID-19 感染拡大の影響で、2020 年 4 月から 2021 年 4 月まで JICA 専門家チームはモザンビーク国への渡航が叶わず、遠隔でのプロジェクト運営を余儀なくされたが、プロジェクト・チーム内や関係機関とのオンライン会議等を活用し、プロジェクト活動を遂行してきた。

プロジェクト期間前半の主な成果は以下の通りである。

- マプト市における固形廃棄物管理（SWM）マスタープラン（M/P）の行動計画（A/P）及びモニタリング・システム（M/S）の策定　【成果 1】
- 廃棄物収集・運搬サービスの現状と課題に関する詳細な調査、および廃棄物収集サービスの監督・監視・監理を改善するための活動　【成果 2】
- 発生源分別パイロット・プロジェクト（PP）の計画・準備・開始　【成果 3】
- 衛生埋立処分場の運営・管理に関するガイドラインの構成・内容の検討　【成果 4】
- DSMAS 財務管理の現状と課題に関する詳細な調査、および廃棄物管理に係る財務管理を改善するための活動　【成果 5】
- 廃棄物管理セクターにおける市民教育戦略の策定、および COVID-19 感染予防対策活動　【成果 6】
- マプト・モデルの構成・内容、および普及活動の検討　【成果 7】

本ブリーフノートでは、成果 1、成果 2、成果 3、成果 5 に関する活動の進捗状況を報告する。

2. 成果 1：M/P の行動計画とモニタリング・システムの策定による現状・課題分析能力強化

M/P の行動計画の策定

前述の通り、DSMAS と JET は以下の共同作業を通じて M/P の行動計画（Action Plan：A/P）を策定した。

i. 既往関連資料の確認と比較

- マプト市廃棄物管理 M/P（2018 年承認版），
- 先行技プロ（JICA マプト 3R プロジェクト）

で作成支援した M/P 案及びその行動計画
- マプト市 5 か年開発計画(PDM: 2019－2023)
- マプト市年間活動計画（Annual Activity Plan：2019 年度版、2020 年度版）

ii. 資料確認結果を踏まえた協議

iii. A/P の定義及び様式の確認

iv. 改訂版 A/P の策定

行動計画（A/P）における諸行動は次の 7 分野に整理されている。

- 行動 1 (AP1: マスタープラン全体関連)
- 行動 2 (AP2: 組織構造の検証)
- 行動 3 (AP3: 廃棄物収集運搬)
- 行動 4 (AP4: 廃棄物の中間処理及び最終処分)
- 行動 5 (AP5: 5R 促進)
- 行動 6 (AP6: 住民啓発)
- 行動 7 (AP7: 財務管理)

各分野の行動はいくつかのサブ行動で構成されており、それぞれ「達成すべき目標」「実施責任部門」「担当者」「関連部門」「活動直接経費の有無」「経費処理担当部門」及び「実施スケジュール」が設定されている。

この改訂 A/P では、例えばカテンベ地区での新規衛生埋立処分場の建設といった、現行 M/P が承認された 2018 年時点では想定されていなかった幾つかの項目が追加されている。A/P の進捗状況は半期ごとにモニタリングを行い、その結果はマプト市の年間活動計画（Annual Activity Plan）の内容に反映される。

M/P のモニタリング・システムの策定

上述の A/P では、M/P のモニタリングに係る行動も、そのモニタリング・システムの策定を含めて計画されている。このモニタリングは M/P で提案されている事業や活動の進捗を把握する極めて重要な行動であり、M/P で設定している目標の達成度が確認される。2018 年にマプト市が承認した既往の M/P と、2017 年に JICA マプト 3R プロジェクトを通じて作成された M/P 案では、モニタリングに対する記載内容が異なっていたことから、それらの比較検証を注意深く実施した。

M/P のモニタリングを容易に行うため、そのモニタリング・システムでは、2017 年の M/P 案での提案されているように具体的な数値目標を設定することで DSMAS と JET は合意した。したがって、モニタリング・システムは基本的には 2017 年 M/P 案で提案されていたシステムに沿った形で策定されたものの、その数値目標については、CMM に承認されている 2018 年 M/P（承認版）を踏襲することとしている。

A/P に従って M/P は毎年 1 回モニタリングされ、表 1 に示すモニタリング指標に対する数値目標の達成度を確認することとなっている。

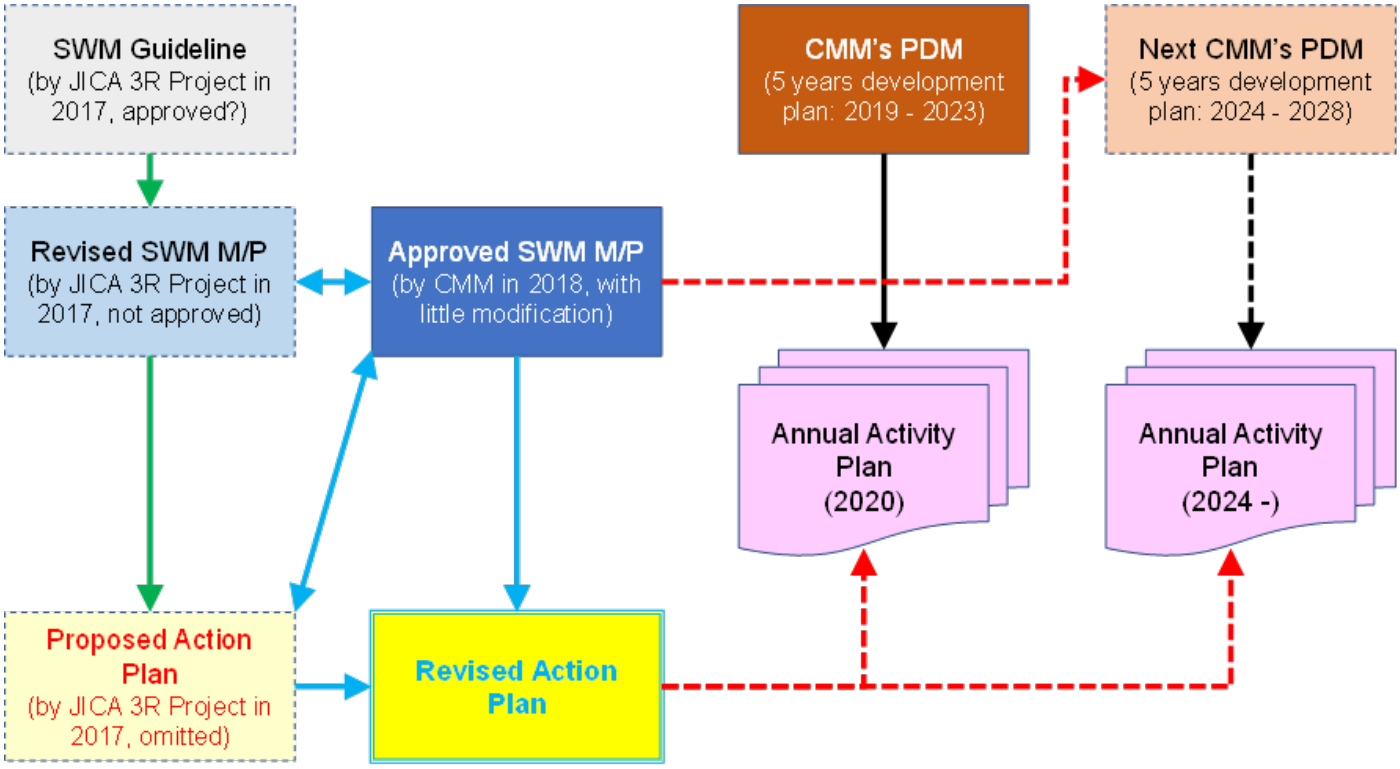


図 1: 改訂版行動計画（A/P）と他の関連計画・資料との関係

表 1: M/P モニタリング指標

No.	指標
DSMAS の組織再編	
1.1	DMGRSUS の設立
1.2	DAF の再編
1.3	継続的能力向上
廃棄物収集運搬	
2.1	市街区での収集事業者による日平均廃棄物収集量（トン/日）
2.2	郊外区での 2 次輸送事業者による日平均廃棄物輸送量（トン/日）
2.3	カテンベ区での 1 次収集導入地区数
廃棄物中間処理及び最終処分	
3.1	最終処分場での日平均廃棄物受入量（トン/日）
3,2	資源回収施設（MRF）での日平均リサイクル資源回収量（ton/day）
3.3	最終処分場での日平均廃棄物埋立量（トン/日）
5R 促進	
4,1	市街区でのリサイクル資源年間回収量（トン/年）
4,2	郊外区でのリサイクル資源年間回収量（トン/年）
4,3	5R 関係者によるワークショップの開催
住民啓発	
5.1	教育施設における 5R 基本原則の紹介・導入
5.2	重点地域における住民啓発キャンペーンの実施
財務管理	
6.1	廃棄物管理費用の自己負担率
6.2	サービス証明関連収入の目標徴収率
6.3	清掃税の目標徴収率

3. 成果 2：廃棄物収集サービス改善のための廃棄物収集サービス業者（WCSP）の契約管理

大規模 WCSP の契約管理業務手順の検討

プロジェクト開始当初の計画では、現状把握・課題分析の結果を踏まえて廃棄物収集運搬サービスの改善計画案を策定し、これに基づいて大規模 WCSP との収集サービス委託契約管理業務の見直しを検討する予定であった。

しかしながら DSMAS は現在、2020 年 5 月に締結された大規模 WCSP との収集サービス委託契約に基づいて、新たな廃棄物収集運搬体制への移行作業を実施している。そのため、改善計画案の策定に先立って大規模 WCSP との収集サービス委託契約の契約管理業務の改善を支援し、この活動の結果得られる教訓を廃棄物収集運搬サービスの改善計画案に反映することとした。

プロジェクト・チームで検討・整理した、大規模 WCSP 契約管理業務の基本的な手順は図 2 に示す通りである。

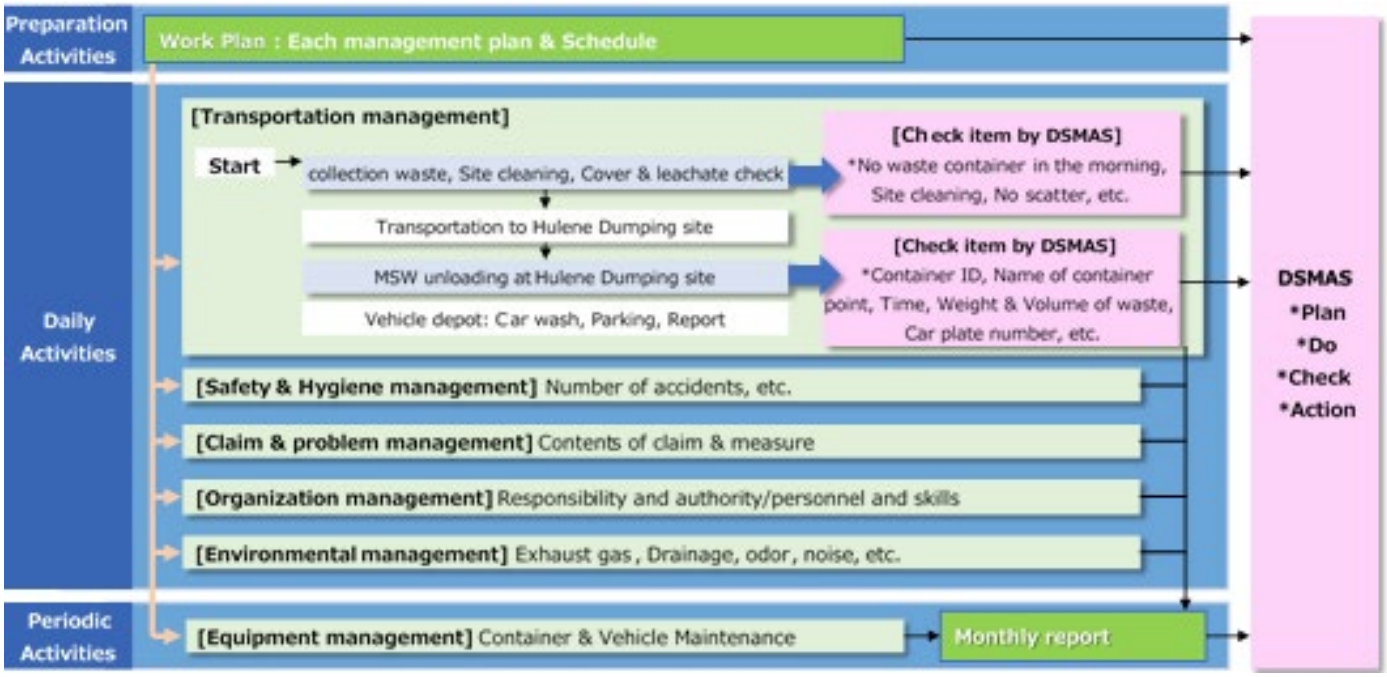


図 2：DSMAS による廃棄物収集サービス委託契約の管理業務手順

大規模 WCSP の契約管理改善活動

廃棄物収集サービス委託契約に係る入札図書の TOR には、選定された大規模 WCSP が契約後に実施すべき手続きが示されているが、CMM による大規模 WCSP の選定・契約手続きの長期化に加えて COVID-19 感染拡大の影響もあり、上記の手続きが十分に実施されないまま各大規模 WCSP による収集サービスが既に実施されている。

このためプロジェクト・チームは、DSMAS が契約書に沿って大規模 WCSP に対する契約管理を実施するために必要な業務内容とその手順を検討した。大規模 WCSP の契約管理改善に係る活動内容は表 2 に示す通りである。

プロジェクト・チームが整理した活動内容に沿って、大規模 WCSP にワークプランの提出を求め、提出されたワークプランの内容を精査するとともに現地確認を行った。また契約書に規定された罰則の内容を踏まえて、処分場課（RLM）による最終処分場での監視結果、並びに監視課（RFM）によるごみ収集コンテナでの監視結果を WhatsApp を通じて契約管理課（RGC）に報告し、これを RGC が取りまとめ確認するという DSMAS による WCSP 契約管理モニタリング体制を検討した。（図 3）

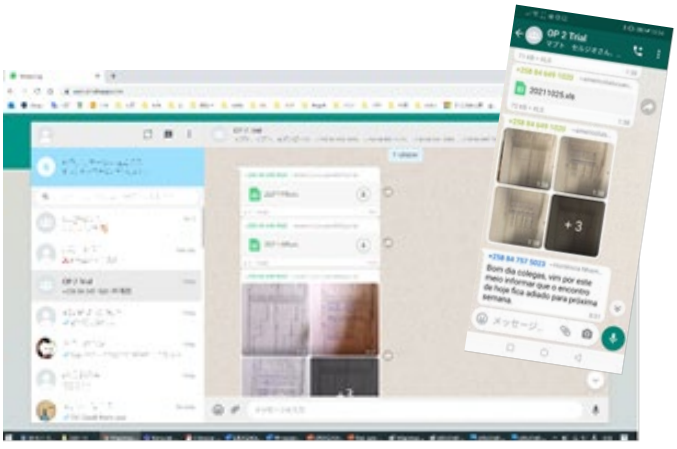
現在プロジェクト・チームは、Clean Africa 社が収集を担当している Nlhamanculo 地区および Katembe 地区においてトライアル・モニタリングを毎日実施している。

本モニタリングの過程で、多くの 12 m^3 コンテナでは 1 日 2 回のごみ収集が実施されており、中には十分なごみが入っていないコンテナまで複数回の収集がされていることが確認されている。また、ごみ収集が実施されていない収集コンテナの存在、処分場トラックスケールにおけるデータの入力ミス、現場監視用バイクの燃料不足などの理由による RFM によるモニタリングの不実施など、様々な問題が確認され DSMAS 内で課題が共有されつつある。

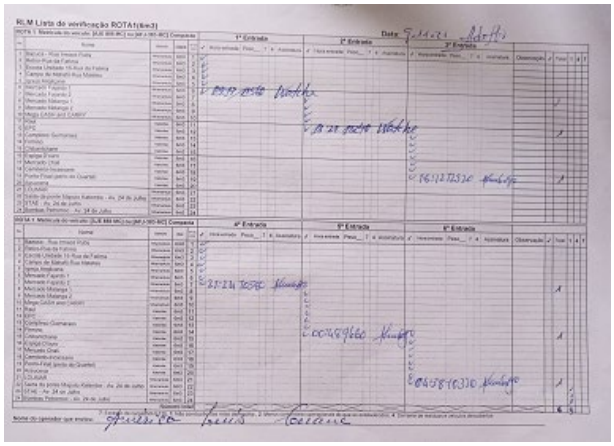
表 2　WCSP 契約管理に係る活動内容

契約管理項目	契約管理の業務内容
1. Work plan の記載内容検討	・ 契約書 TOR の整理と確認 ・ 契約書 TOR に沿った Work plan の提出指示
2. WCSP が提出する Work plan の内容確認	・ Work plan の精査と追加質問
3. Work Plan 実施状況の現地確認	・ RFM によるコンテナ位置、収集ルート、収集機材や機材 ID 等の現地確認
4. 罰則管理の検討	・ 罰則条項の確認と運用方法の検討
5. モニタリング・システムの検討	・ RLM による処分場でのデータ監視項目と報告書式の策定 ・ RFM による現場モニタリング項目と報告書式の策定
6. WCSP が提出する月報書式の検討	・ 月報様式の検討と作成
7. 苦情管理の検討	・ （第 2 期に実施予定）

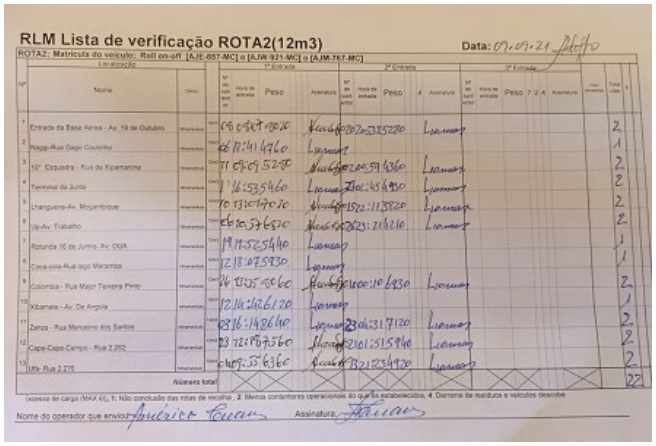
監視課（RFM）によるごみ収集コンテナの現場確認



WhatsApp を用いた監視結果の報告・共有



契約管理課（RGC）のモニタリング・シート



契約管理課（RGC）のモニタリング・シート

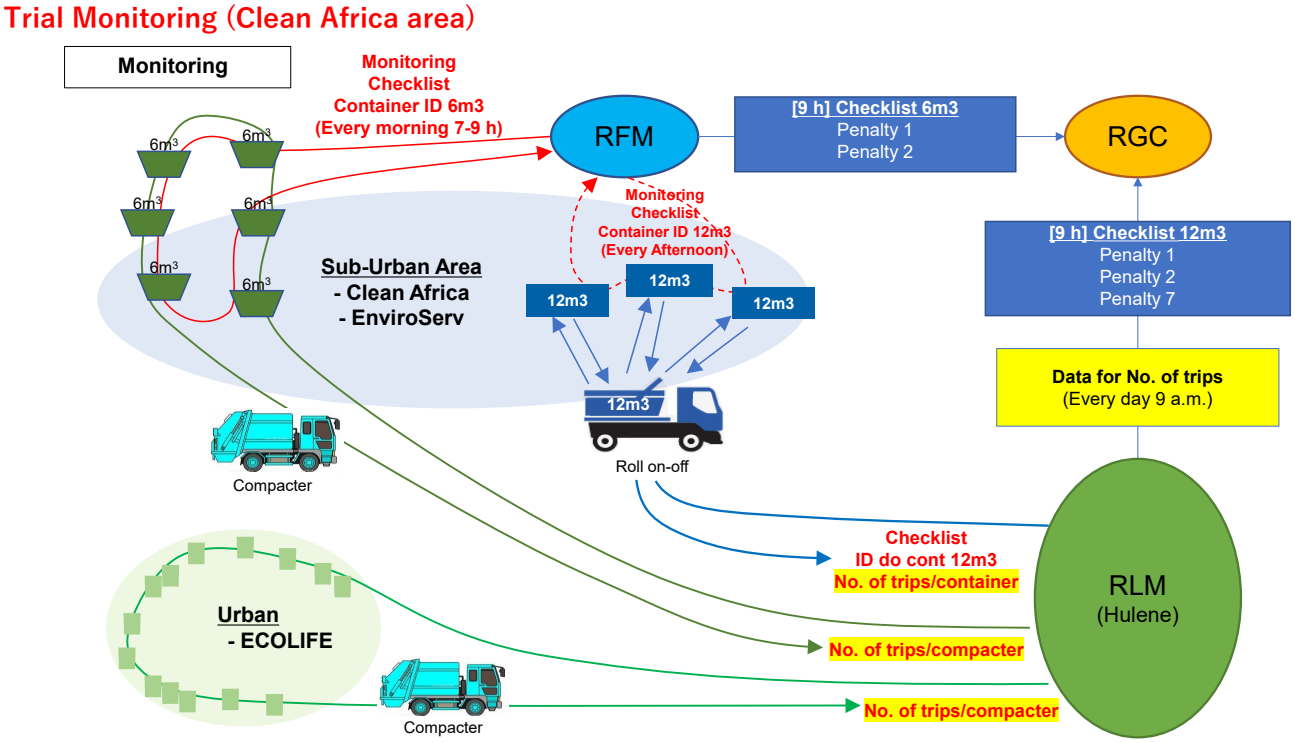


図 3：DSMAS による廃棄物収集サービスのモニタリング業務手順

4. 成果 3：発生源分別パイロット・プロジェクトの計画・準備・開始

発生源分別パイロット・プロジェクトの計画

M/P では、廃棄物処分量を削減するため 5R 活動を推進する施策を掲げ、以下の 4 つの基本アプローチを設定している。

i. 5R 活動を推進するための制度的枠組みを確立する。

ii. 全ての廃棄物排出者に対する 5R に関する啓発活動を推進する。

iii. リサイクル関連アクターと協力して、都市部での 5R 活動を推進する。

iv. DSMAS の主導で、郊外部での 5R 活動を推進する。

上記の M/P で示された基本アプローチに基づき、また現在のマプト市におけるリサイクル活動の状況を考慮し、現在プロジェクト・チームは DSMAS 事務所、他の CMM 事務所、および関連組織事務所において発生源分別パイロット・プロジェクト（PP）の導入を試みている。発生源分別 PP の計画概要は表 3 に示す通りである。

DSMAS は本 PP で得られた教訓を活かして、プロジェクト終了後に発生源分別活動を民間事業所や家庭に拡大することを目指している。

表 3：発生源分別パイロット・プロジェクトの計画概要

項目	内容
目的	・ 将来的にマプト市内の事業所や家庭に拡大することを目的に、プロジェクト関連事務所において発生源分別の実行可能性を検証する。
対象施設	発生源分別 PP を導入する対象施設は、以下の政府機関事務所を候補としてプロジェクト・チームで更に検討して選定する。 ・ DSMAS 事務所 ・ CMM 本庁舎など他の CMM 事務所 ・ KaMpfumu、Kamavota、Kalhamankulo、Kamaxaquene、Kamubucuana 地区の各事務所 ・ マトラ市役所 ・ 土地環境省（MTA）事務所
ごみ排出者	・ 対象事務所で勤務する職員
対象ごみ	・ 有価資源ごみ（紙類、プラスチック類、金属類、ガラス類） ・ 有害ごみ（乾電池、蛍光管）
実施方法	・ DSMAS が、対象事業所の職員に PP 内容を説明するとともに協力を要請し、ごみの分別方法を指導・訓練する。 ・ DSMAS が、分別用ごみ箱を対象事業所に提供する。 ・ 対象事業所の職員が、対象ごみを分別し分別用ごみ箱に排出する。 ・ DSMAS が、分別された資源ごみを収集・運搬するトラックを手配し、既存のリサイクル施設に搬入する。 ・ DSMAS が、対象事業所と協力して回収された対象ごみ量をモニタリングする。 ・ DSMAS が、モニタリング結果に基づいて PP のパフォーマンスを評価する。

DSMAS 事務所における発生源分別の実践

2021 年 6 月に DSMAS 事務所で発生源分別 PP を開始し、現在プロジェクト・チームは PP の定着を目指して活動を実施している。

PP 開始周知、発生源分別の実践、分別された資源ごみ量のモニタリングなど、発生源分別 PP の実施風景を写真に示した。これと並行してプロジェクト・チームは、分別資源ごみを引き取り可能な既存リサイクル関連アクターの特定調査を実施している。

DSMAS における 2021 年 10 月までの分別資源ごみのモニタリングデータは表 4 に示す通りである。

表 4：DSMAS 事務所の分別資源ごみ量（kg）

月	プラ	紙	金属	ガラス	有害
Jun-21	7.8	14.5	1.2	15.1	0.0
Jul-21	1.3	5.4	0.0	0.0	2.6
Aug-21	3.1	7.5	0.0	0.0	0.0
Sep-21	0.0	2.5	0.0	0.0	0.0
Oct-21	3.1	17.1	1.1	0.0	0.0
Total	15.3	46.9	2.4	15.1	2.6

DSMAS 職員への発生源分別 PP の周知

DSMAS 事務所での発生源分別の実践

分別された資源ごみ量のモニタリング

マプト市内のリサイクル施設（Valor Plastico 社）

5. 成果 5：財務・組織・制度に係る管理能力の強化

マプト市廃棄物管理おける財務管理の現状レビュー、分析、評価

2013 年から 2017 年に実施された JICA マプト 3R プロジェクトで導入された、標準化テンプレートを用いた財務データ記録システムの改善により、現在の DSMAS 財務管理状況の把握は以前に比べ困難な作業ではなくなった。タイムリーで完全なデータ収集を妨げる障害は依然として存在するものの、人事財務部（DAHRF）の財務管理課（RAF）と JET との間での情報共有は良好になってきている。

マプト市廃棄物管理に係る財務管理において本成果活動が焦点を当てるのは、a）DAHRF と RAF の組織内連携、b）財務運営改善に向けたテンプレートの更新と使用、c）目的志向の参加型予算編成、d）予算実績管理、e）適切な廃棄物処理料金の設定とその効率的な徴収、f）信頼性の高いデータベース作成、の 6 点である。

マプト市廃棄物管理に係るコスト・リカバリー改善方策の検討

プロジェクト・チームの財務管理改善に係る最初の活動の一つは、M/P に示された提言、特に廃棄物管理の費用回収に関する提言をレビューすることであった。図 4 は、マプト市廃棄物管理セクターが長年にわたって必要としてきたマプト市（CMM）補助金のレベルを示しているが、マプト市の廃棄物管理収入がセクターの資金需要を大幅に下回ってきたことが窺える。

廃棄物管理セクターの資金不足という長年の問題に対処するためには、鍵となる 2 つの内部収入が存在する。これは、モザンビーク電力公社（EDM）が管理する「電気料金請求書を通じて徴収されるごみ処理料金」と、家庭以外の大規模ごみ排出者に課される「事業系ごみ処理料金とその徴収方法」である。

家庭からのごみ処理料金の徴収は、各家庭が電力料金の支払いにおいてプリ・ペイド（前払い）方式、ポスト・ペイド（後払い）方式のいずれを採用しているかに関わらず、ごみ処理料金が電気料金に自動的に含まれているため比較的容易である。ただし、現在のごみ処理料金は電力消費量に応じて低・中・高の 3 段階で設定されているが、JICA マプト 3R プロジェクトで実施した分析の結果、現在の家庭系ごみ処理料金体系は貧困層に対してより負担感を強いる料金設定となっている可能性が窺えた。

同様の状況は、事業者からのごみ処理料金徴収においても確認された。このため M/P では、まず事業者のごみ発生量と電力消費量の関係を推計し、次にマプト市の廃棄物管理費用を算定することで、より公平で公正なごみ処理料金が提案されている。

M/P で提案されたシンプルかつ率直なごみ処理料金体系は、DARFH 部長や RAF 職員に好意的に評価され、廃棄物管理セクターの費用回収を達成する可能性があるという点で推進すべき施策であることが合意された。

一方、事業活動の副産物として大量の廃棄物を排出している企業は、電力消費量に応じたごみ処理料金に

加えて、廃棄物排出量の推定値に応じた清掃税が課せられている。JICA マプト 3R プロジェクトの技術支援により、事業系ごみ排出者の登録および清掃税請求業務や、事業の種類・規模に応じた清掃税徴収額の算出などが支援・強化され、事業系廃棄物の清掃税収が 2.3 倍に向上した。しかし、DSMAS は未だ多数の事業系ごみ排出者から適切な清掃税を徴収できていない。このため M/P では、民間の事業系ごみ収集サービス業者を通じて事業系ごみ清掃税を徴収（請求および支払）するシステムを導入することが提案されている。

本プロジェクトでこの施策を推進するため、成果 2 活動と連携して更に検討を進める予定である。

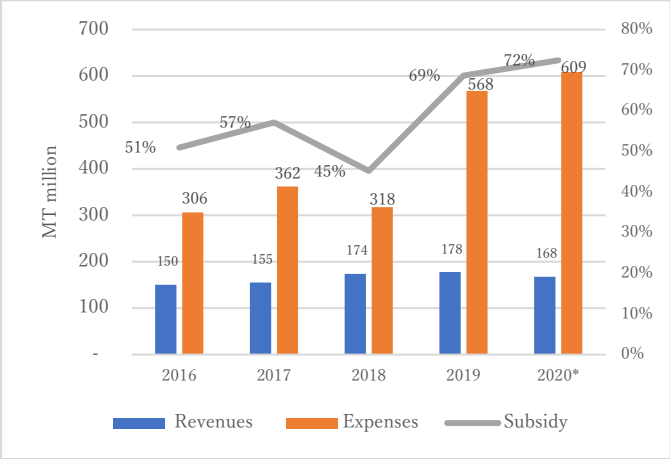


図 4: マプト市廃棄物管理セクターの内部収入と資金需要

マプト市廃棄物管理に係る組織・制度の現状レビュー、分析、評価

DSMAS は、旧 DMSC の廃棄物担当部署と旧都市計画局の環境管理担当部署で構成される部局である。マプト市役所（CMM）の行政組織再編は 2019 年 2 月に承認され、DSMAS は 2019 年 8 月より上記の組織体制で運営を開始した。この DSMAS の再編は M/P で提案された施策に沿ったものであり、CMM は M/P の組織改善施策を部分的に実現したと評価できる。

本プロジェクトの開始にあたり、主要 C/P となる DSMAS 各部課の部長・課長を確認し、C/P 体制図を作成した。プロジェクト・チームは、DSMAS の組織変更や人事異動があった際に必要に応じ C/P 体制図を継続的に更新している。プロジェクト・チームは今後、DSMAS 各部署の組織構造や職務内容が M/P で示された組織開発計画の方向性と合致しているかという観点で分析・評価を行い、その結果と提言を本プロジェクトで策定する組織開発計画案に反映する予定である。

またプロジェクト・チームは現在、廃棄物管理に関するモザンビーク国の法律・規制、並びにマプト市の条例・規則の調査・分析を進めている。プロジェクト・チームは今後、M/P に示された様々な施策を実施するために必要な制度的枠組みを検討し、その結果と提言を本プロジェクトで策定する条例・規則更新計画案に反映する予定である。

6. 今後のプロジェクト活動方針

プロジェクトの後半期では、これまでの活動で把握されたマプト市廃棄物管理に係る現状・課題認識を踏まえ、引き続き課題解決・改善に向けた活動を進めていく。各成果に関する今後の活動方針は以下のとおりである。

成果 1 活動では、M/P 行動計画（A/P）の進捗状況と M/P 指標の達成度を確実にモニタリングし、M/P の実現に向けた取り組みを継続していく。この際、上位計画である「マプト市年間活動計画」、及び「マプト市 5 か年開発計画」に M/P 施策が適切に反映されることが肝要であり、M/P とマプト市関連計画との整合性確保にも注力していく。

また、M/P 策定時点からの大きな状況変化として、マトレメレ処分場建設事業の遅延と、世銀支援によるカテンベ処分場整備計画の推進が挙げられる。これらの状況変化や施策変更を随時 A/P に反映し、M/P 中間レビュー報告書を取りまとめる。

成果 2 活動では、引き続き DSMAS による WCSP 契約管理業務の改善を図り、得られた知見・教訓を「収集運搬改善計画」に取りまとめる。加えて、収集運搬サービス管理における情報通信技術（ICT）の活用、新規処分場の供用を想定した廃棄物運搬計画、並びに事業系ごみ排出者・収集業者の管理方策についても検討していく。

成果 3 活動では、DSMAS 事務所での発生源分別 PP の定着を図るとともに、CMM や関連機関の事務所に拡大展開を図っていく。またリサイクル関連アクターとの定例会合を開催し、ステークホルダーと共にマプト市における 5R 活動の推進方策を協議し、発生源分別の規則化や経済的インセンティブの付与など、

CMM/DSMASによるリサイクル推進施策を検討していく。

成果 4 活動では、引き続きマトレメレ処分場建設、カテンベ処分場建設、ウレネ処分場閉鎖に係る各事業の進捗状況を随時把握し、これを踏まえてモザンビーク国で初めて供用される衛生埋立処分場で利用されることを想定した「衛生埋立処分場運営・管理ガイドライン」を作成し、これを用いた関係機関職員向けの研修を企画・実施する。

成果 5 活動では、財務管理面では引き続き M/P に掲げられたコスト・リカバリー施策の実現に向けて現行の清掃税の改定を検討するとともに、特に徴収率が低い事業系ごみ清掃税の徴収改善に向けた活動に注力する。また組織面・制度面では M/P 施策を実現するために必要となる DSMAS 組織体制やＣMM条例・規則を検討し、「組織開発計画・人材育成計画」、「条例・規則更新計画」として取り纏める。

成果 6 活動では、コロナ禍による現地活動の制約を踏まえて環境教育・啓発活動計画を見直し、発生源分別 PP における分別排出の指導・啓発や、環境 NGO らと連携した環境教育・啓発活動の推進体制構築に向けたネットワーキング会合の開催等に注力していく。

成果 7 活動では、上記の各成果活動で得られた知見・教訓を「マプト・モデル」として取り纏め、マトラ市において試行的普及活動を実施し、これらを踏まえてマプト市の廃棄物管理改善の取組・経験をモザンビーク国内他都市に普及していく方策を検討する。またプロジェクト終了時には全国セミナーを開催し、「マプト・モデル」の内容や普及方策について関係各機関と協議する。

JICA プロジェクトブリーフノート（第 3 号）

モザンビーク国 マプト大都市圏統合的廃棄物管理能力向上プロジェクト

― 廃棄物管理マスタープランに基づく各種施策の実施能力強化と経験共有を目指して ―

2023 年 5 月

地区対抗清掃活動「Bairro Mais Limpo」の表彰式（2022 年 11 月）

マプト市・マトラ市・土地環境省・地方自治体連合との合同調整会議（2023 年 2 月）

1. プロジェクト概要

本プロジェクトは 2019 年 11 月に開始し、2023 年 10 月に現地活動を終了する予定である。プロジェクト・チームは、これまで約 3 年半に渡ってプロジェクト活動を実施してきた。

本プロジェクトでは、以下に示す「プロジェクト・デザイン・マトリックス（PDM）」に基づき、期待される成果を発現しプロジェクト目標を達成するために各種活動を実施した。

COVID-19 感染拡大の影響で、プロジェクト・チームは 2020 年 4 月から 2021 年 4 月まで遠隔でのプロジェクト運営を余儀なくされ、その後も様々な活動実施上の制約や困難に直面したが、チーム内や関係機関とのオンライン会議等を活用し、プロジェクト活動を遂行してきた。

本ブリーフノートでは、プロジェクト活動の主要な成果を概説した。

【上位目標】　マプト市において持続可能な方法による統合的廃棄物管理が構築され、その経験がマプト・モデルとして他都市に普及する。

【プロジェクト目標】　マプト市において廃棄物管理マスタープラン（M/P）に基づく統合的廃棄物管理の実施能力が向上し、同能力強化の経験がマプト・モデルの名のもと整理される。

【期待される成果】

・成果 1：　マプト市における廃棄物管理の現状及び課題を分析する能力が強化される。
・成果 2：　廃棄物収集・運搬サービスの実施能力が強化される。
・成果 3：　廃棄物発生量の抑制及び 5R（Rethink, Refuse, Reduce, Reuse, Recycle）推進に係る能力が強化される。
・成果 4：　最終処分場の運営管理に係る技術的な能力が強化される。
・成果 5：　廃棄物管理に係る組織体制・財政面・制度面が強化される。
・成果 6：　廃棄物問題や環境教育を含む住民啓発を様々なレベルで実施するための能力が強化される。
・成果 7：　マプト市の統合的廃棄物管理実現に向けた経験がマプト・モデルとして整理され他都市へ発信される。

2. 成果 1 ：M/P 及び行動計画のモニタリング

行動計画（A/P）のモニタリング

DSMAS と JET の共同作業を通じて作成した M/P の行動計画（Action Plan：A/P）のモニタリング活動を、2022 年 7~8 月にかけて DSMAS 主導で以下のステップで実施した。

i. モニタリング様式の作成

行動計画（A/P）のエクセル・ファイルにモニタリング結果を記入する欄を追加した。モニタリング項目は 1)活動予定、2)進捗状況、3)進捗評価、4)考察、5)モニタリング担当者である。4)の考察では、進捗状況が予定よりも遅延している場合にその要因と遅延解消のために必要な対策を記入することとした。

ii. A/P モニタリング・ガイドラインの作成

モニタリング様式を用いた A/P のモニタリング方法を取りまとめたガイドラインを作成した。

iii. モニタリング・チームの編成

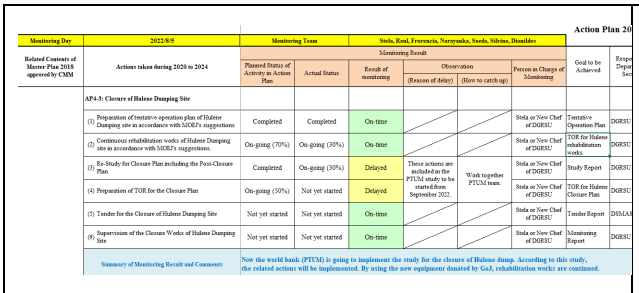
A/P の各分野を担当する職員と計画部門の職員で構成されるモニタリング・チームを編成し、モニタリング・ガイドラインの説明を行った。

iv. モニタリングの実施

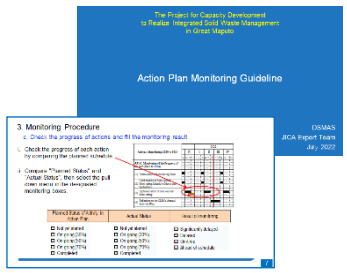
モニタリング・チーム全員で A/P の各項目の進捗状況を確認し、協議を行った。必要に応じて各分野の活動担当者を招聘した。モニタリング結果は簡潔に要約し、モニタリング様式に記録した。

v. モニタリング実施報告

モニタリング実施方法と実施結果をパワーポイント形式で取りまとめ、定例会議ならびに第 5 回 JCC 会合で DSMAS より報告した。



A/P モニタリング様式



モニタリング・ガイドライン

共同モニタリング

図 1：行動計画（A/P）のモニタリング様式、同ガイドライン、モニタリング実施状況

廃棄物管理 M/P のモニタリング

上述の A/P モニタリングと同様に、DSMAS と JET が共同で作成した M/P モニタリング・システムの各モニタリング指標に基づき、2022 年 10 月より DSMAS 主導でモニタリング活動を実施した。

各指標のモニタリング結果の途中経過は表 1 に示すとおりである。

表 1：M/P モニタリング結果（2022 年 10 月時点）

No.	指標	
DSMAS の組織再編		
1.1	DMGRSUS の設立	実施済
1.2	DAF の再編	実施済
1.3	継続的能力向上	整理中
廃棄物収集運搬		
2.1	市街区での収集事業者による日平均廃棄物収集量	165（トン/日）
2.2	郊外区での 2 次輸送事業者による日平均廃棄物輸送量	928（トン/日）
2.3	カテンベ区での 1 次収集導入地区数	6 地区
廃棄物中間処理及び最終処分		
3.1	最終処分場での日平均廃棄物受入量	1,233（トン/日）
3,2	資源回収施設（MRF）での日平均リサイクル資源回収量	0（ton/day）※MRF 未整備のため
3.3	最終処分場での日平均廃棄物埋立量	1,233（トン/日）
5R 促進		
4,1	市街区でのリサイクル資源年間回収量（トン/年）	※情報入手方法検討中
4,2	郊外区でのリサイクル資源年間回収量（トン/年）	
4,3	5R 関係者によるワークショップの開催	2 回以上実施済
住民啓発		
5.1	教育施設における 5R 基本原則の紹介・導入	※情報入手方法検討中
5.2	重点地域における住民啓発キャンペーンの実施	
財務管理		
6.1	廃棄物管理費用の自己負担率	※情報入手方法検討中
6.2	サービス証明関連収入の目標徴収率	
6.3	清掃税の目標徴収率	

廃棄物管理 M/P の中間レビュー

M/P は 2018 年の承認より 5 年が経過していることから、2023 年に中間レビューを行うことが計画されている。DSMAS の各分野担当者で構成するレビュー・チームが編成され、JET が提供したレビュー・ポイントを参照しつつ、現在 DSMAS 主導で中間レビューを実施している。レビュー結果はレビュー報告書として取りまとめ、提言内容は M/P 改訂に反映されることが期待される。

図 2：M/P 共同レビュー実施状況（2023 年 4 月）

3. 成果 2：都市ごみ収集運搬サービスの改善

現状と課題

i. ごみ量・ごみフロー解析

ウレネ処分場トラックスケールが継続稼働していた 2021 年 4 月~2022 年 3 月のデータを分析した結果、ウレネ処分場の平均受入ごみ量は 1,233t/日と試算された。また、マプト市全体の都市ごみフロー分析から、収集された都市ごみのうち約 30%程度が事業系ごみの混入である可能性が示唆された（図 3）。

ii. 2 次収集サービスのモニタリング

DSMAS による廃棄物収集サービス業者（WCSP）の契約管理を改善するため、WCSP が実施する都市ごみ収集運搬サービスの試行モニタリングを実施した。

モニタリングの結果、収集コンテナや収集ルートの管理不足、一部収集コンテナでの空コンテナ収集又は複数回収集、不適切なトラックスケール管理、不十分な組織内情報共有、WCSP によるコンテナ位置・機材変更連絡の不徹底など、様々な課題が確認された。

iii. 1 次収集サービスの実態調査

ME による 1 次収集と WCSP による 2 次収集を効果的かつ効率的に連携させるため、ME の収集ルートや収集コンテナ使用状況などを把握する実態調査を実施した。調査の結果、複数 ME による同一収集コンテナの使用、空コンテナ収集の可能性、地理的問題、事業系ごみの混入など、様々な課題が明らかになった。

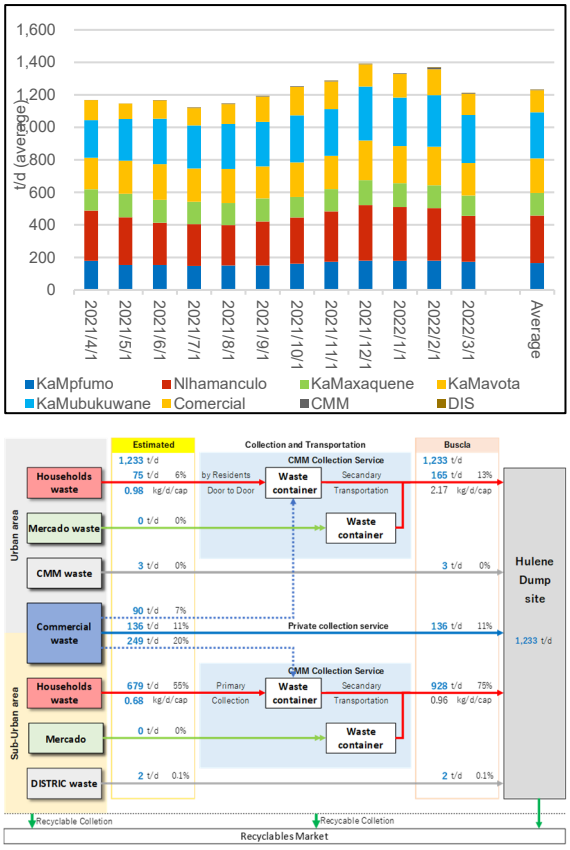


図 3：都市ごみ量・ごみフローの分析

都市ごみ収集運搬改善計画

上記で特定された課題を踏まえ、DSMAS による都市ごみ収集サービス委託契約管理に係る能力向上のための「都市ごみ収集運搬改善計画」を策定した。

本計画では、都市ごみ収集運搬サービスを適切に契約管理・監視するための 3 つの方針が掲げられ、各方針に対して DSMAS が実施すべき施策が整理されている（図 4）。また、これらの方針・施策を実行するためには PDCA サイクルの運用が重要であることが強調された。

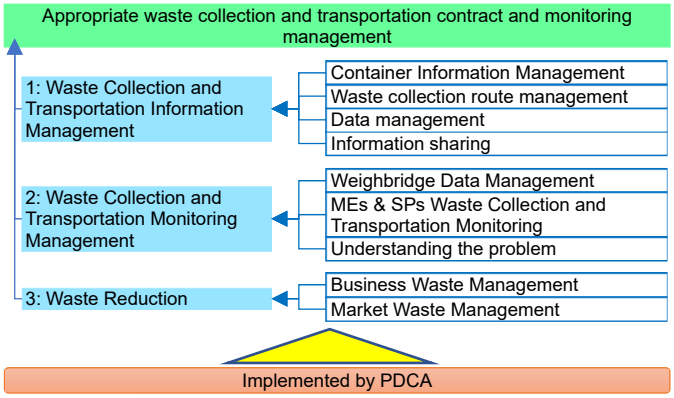


図 4：都市ごみ収集サービス適正管理・監視の方針

都市ごみ収集運搬サービスの適正な契約管理・監視に係る 3 つの方針と主な施策は以下のとおりである。

i. 方針１： 情報管理

都市ごみ収集情報管理

WCSP の監督・監視業務を効果的かつ効率的に実施するため、ごみ収集コンテナのリストと位置図（Google Maps、QGIS、紙ベースの地図）を作成した（図 5）。DSMAS は各収集コンテナの位置・容量、ME 収集ルート等の情報管理・更新を継続的に行う必要がある。

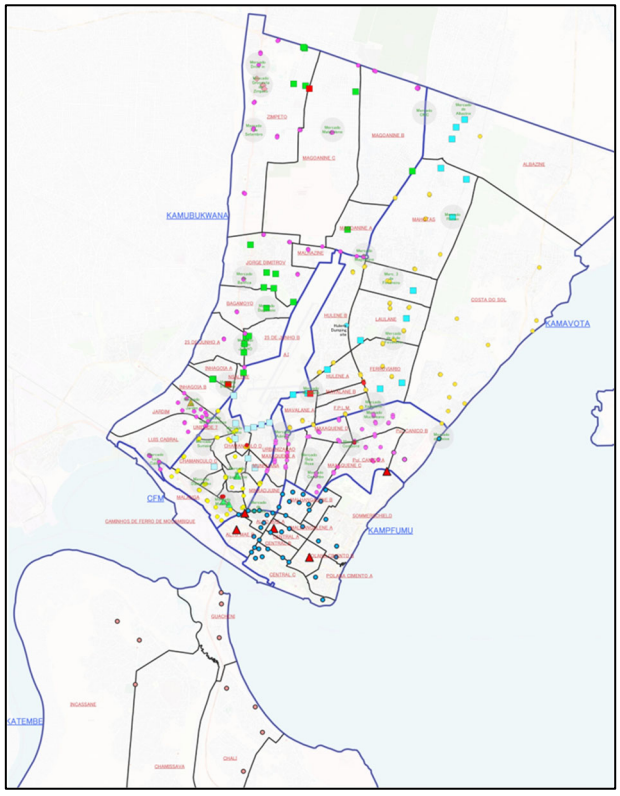


図 5：マプト市ごみ収集コンテナ位置図

都市ごみ収集ルート管理

郊外区の各地区において、ごみ収集コンテナ情報や ME 一次収集ルートを含む都市ごみ収集ルート計画を作成した（図 6）。

DSMAS は都市ごみ収集サービス委託業務の次期契約において、作成した都市ごみ収集ルート計画を TOR に含めて WCSP に提示し、1 次・2 次収集サービスの契約管理を行っていくことが望ましい。

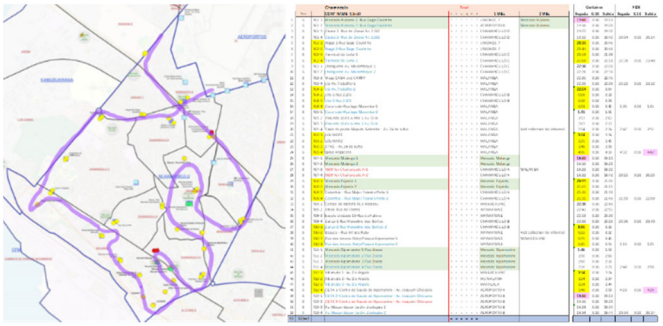


図 6：郊外区都市ごみ収集ルート計画の例

ii. 方針２： モニタリング管理

都市ごみ収集サービス管理のための ICT システム

効果的・効率的な都市ごみ収集サービス監理のため、ME と WCSP が日々の収集運搬業務の実施報告を DSMAS に送信し、DSMAS がこれらの情報を比較・分析することで、各主体が互いの業務実施を監視・確認できる ICT システムについて調査・検討した。

都市ごみ収集に係る各種管理データの入力・出力、地図を含むデータの蓄積・更新など、データ管理の確実性・効率性を向上させるため、DSMAS は図 7 に示す ICT を活用した都市ごみ収集運搬サービスのモニタリング・システムを導入することが望ましい。

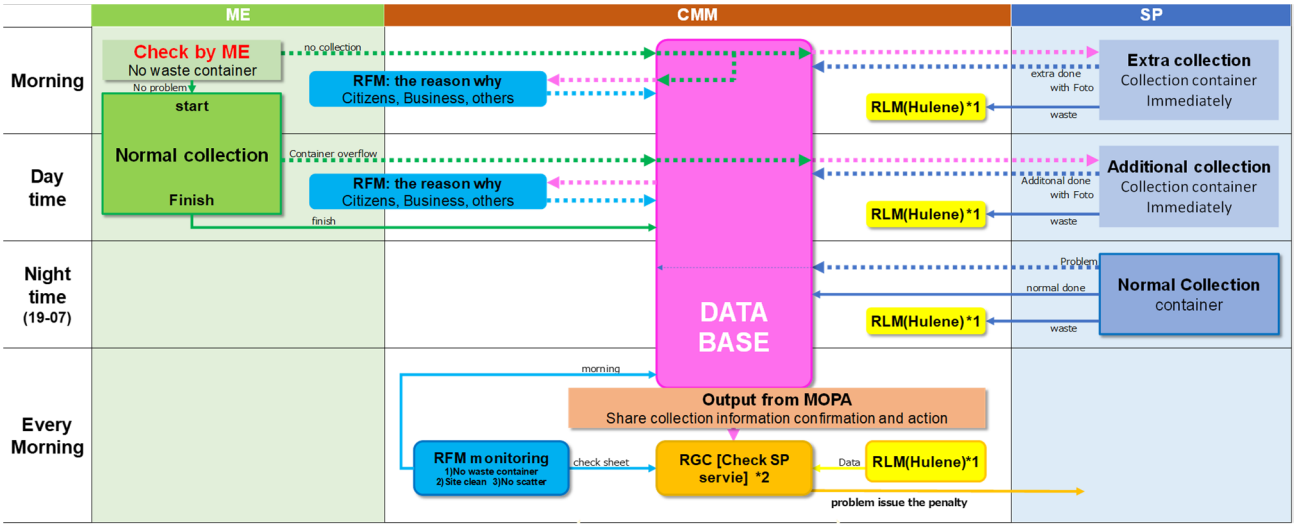


図 7：ICT を活用した都市ごみ収集運搬サービスの監視・監理フロー

iii. 方針 3： ごみ減量

事業系ごみ管理

CMM の都市ごみ収集サービス実施に対する支出を抑制するため、また事業系ごみの都市ごみ収集サービスへの混入を防ぐため、ごみ排出事業者の許可収集業者への事業系ごみ収集委託を徹底する必要がある。

このため、以下の事業系ごみ管理方針を整理した。

- 現行規則では、ごみ排出量が 25kg/日未満の事業者に対しては、都市ごみ収集コンテナへごみを排出することが許容されているが、この規則を撤廃する。
- 全ての事業者に対して、事業許可証を取得・更新する要件の一つとして、許可収集業者との事業系ごみ収集委託契約の締結を義務付ける。
- 事業許可証の取得・更新の際に、REA と RFM が事業系ごみ管理に係る情報提供、教育指導などのコミュニケーション活動を実施する。また、RFM の現場監視活動を強化する。

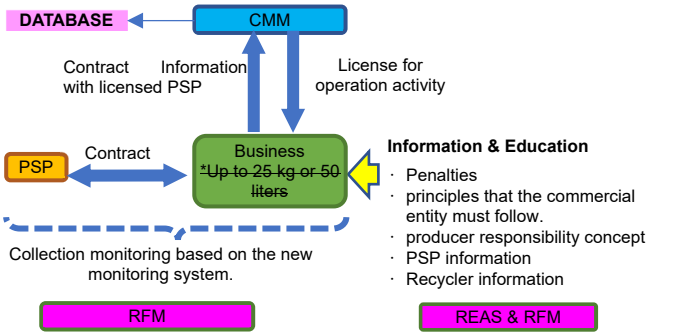


図 8：今後の事業系ごみ管理方針

iv. PDCA サイクルの運用

都市ごみ収集サービスの契約管理では、PDCA サイクルの継続的な運用が重要となる。DSMAS による WCSP 監督・監視業務における PDCA 活動の手順を図 9 に示すとおり整理した。

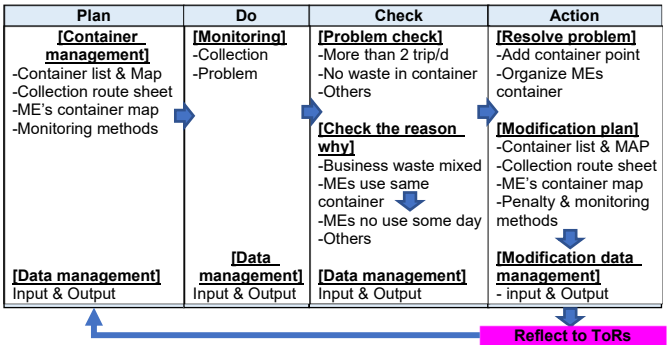


図 9：WCSP 管理業務における PDCA 活動

4. 成果 3：5R 活動の推進

発生源分別パイロット・プロジェクト

M/P に掲げられた 5R 活動推進のための基本アプローチとマプト市内のリサイクル活動の現状を踏まえ、資源ごみと有害ごみの発生源分別パイロット・プロジェクト（P/P）を DSMAS 事務所、CMM 本庁舎、マトラ市役所において開始した。

発生源分別 P/P の導入に際して、分別ごみ箱・簡易かごを設計・調達し、1)プラスチック、2)紙、3)金属、4)ガラス、5)有害ごみ、6)その他ごみの分別区分に応じた分別サインボードを作成した。

これまで約 2 年間に渡って発生源分別 PP を実践した結果、DSMAS は 300 kg 超（約 15 kg/月）の資源ごみ回収に成功した（図 10）。

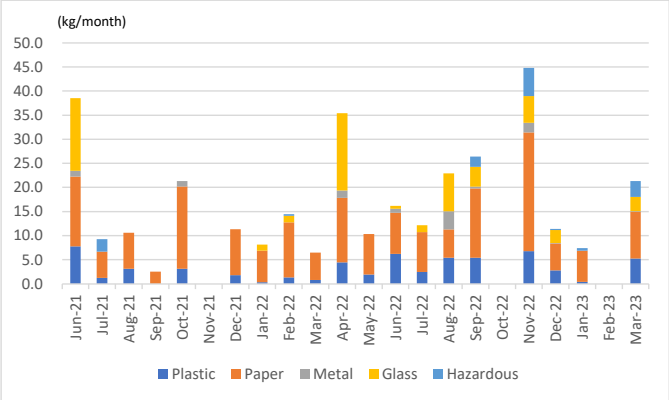


図 10：DSMAS での資源ごみ回収量モニタリング

発生源分別ごみ箱

発生源分別簡易かご

発生源分別サインボード

図 11：発生源分別ごみ箱・簡易かご・サインボード

DSMAS は、本プロジェクトで実施した発生源分別 P/P の経験・教訓を活かし、今後、他 CMM 施設や民間事業所、一般家庭へ発生源分別活動を展開していく意向である。

リサイクル関連アクターのネットワーキング

DSMAS は MTA・MINEDH などの関係政府機関、リサイクル・環境教育分野で活躍する NGO や民間企業の参加を得て、リサイクル関連アクター・ネットワーキング会合を定期的に開催している。本会合では、マプト市内でのリサイクル活動や環境教育・住民啓発活動を推進することを目的として、リサイクル関連アクター間のネットワーク構築、情報共有、協働及び役割分担を促している。

図 12：リサイクル関連アクター会合

また、プロジェクト・チームはマプト市近郊でリサイクル活動に従事する民間企業・NGO を調査し、合計 38 団体のリサイクル業者を特定した。特定されたリサイクル業者の名称、連絡先、所在地、取り扱い資源ごみ品目などの情報は、図 13 に示す「リサイクラ

ー・マップ」に登録した。

DSMAS は、今後もリサイクル関連アクターのネットワーク化や活動基盤整備を強化し、リサイクル活動の推進に努めていく。

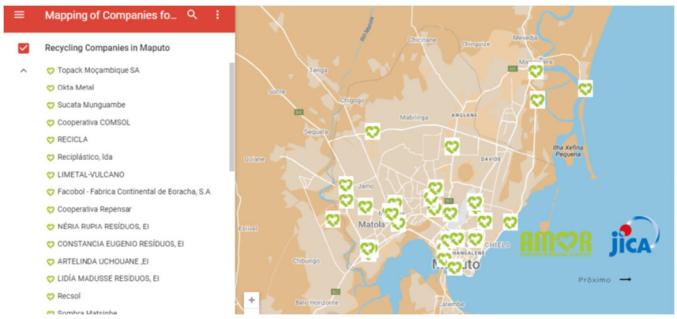


図 13：マプト都市圏のリサイクラー・マップ

5. 成果 4：衛生埋立処分場運営・管理ガイドライン

プロジェクト・チームは、モザンビーク国内関係機関に向けた技術参考資料として、「衛生埋立処分場の運営・管理ガイドライン」を作成した。ガイドラインの構成は表 2 に示すとおりである。

表 2：衛生埋立処分場運営・管理ガイドラインの構成

目次	構成・内容
1	都市ごみ衛生埋立処分場の概要
2	衛生埋立処分場の機能と施設構成
3	衛生埋立処分場の管理
3.1	廃棄物搬入管理
3.2	埋立作業管理
3.3	施設管理
3.4	環境管理
3.5	安全管理
4	埋立完了後の跡地管理
5	運営・管理様式

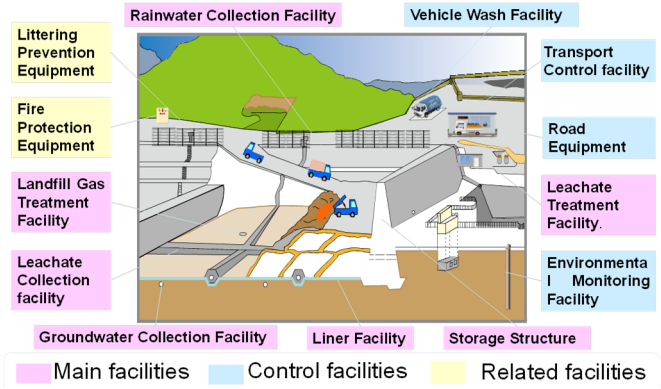


図 14：衛生埋立処分場の標準施設構成

また「衛生埋立処分場の運営・管理ガイドライン」のトレーニング資料を作成し、DSMAS、MTA 及びマトラ市の関係職員を対象に研修を実施した。今後 MTA、マプト市及びマトラ市は、本プロジェクトで作成したガイドラインとトレーニング資料を活用し、他自治体職員に研修を実施することが期待される。

図 15：衛生埋立処分場運営・管理に係る研修

6. 成果 5：財務・組織・制度に係る管理能力の強化

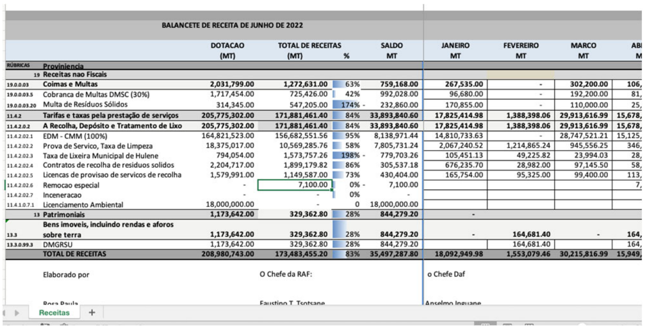
DSMAS 財務管理の分析・評価

2013-2017 年にかけて実施された JICA マプト 3R プロジェクトで導入した標準化テンプレートを用いた財務データ記録システムの改善により、現在の DSMAS 財務管理状況の把握は以前に比べ困難な作業ではなくなった。タイムリーで完全なデータ収集を妨げる障害は依然として存在するものの、人事財務部（DAHRF）の財務管理課（RAF）と JET との間での情報共有は良好になってきている。

マプト市廃棄物管理に係る財務管理において、本成果活動が焦点を当てたのは、a）DAHRF と RAF の組織内連携、b）財務運営改善に向けたテンプレートの更新と使用、c）目的志向の参加型予算編成、d）予算実績管理、e）適切な廃棄物処理料金の設定とその効率的な徴収、f）信頼性の高いデータベース作成、の 6 点であった。

図 16：サービス証明・処分料金システムに係る打合せ

本プロジェクトで開発した財務テンプレートは、年間活動実績・目標に対する月次報告を統合することができるため、RAF はその実用性を認識し、継続的に使用している。



	BALANCETE DE RECEITA DE JUNHO DE 2022								
RÚBRICAS		DOTACAO (MT)	TOTAL DE RECEITAS (MT)	%	SALDO MT	JANEIRO MT	FEVEREIRO MT	MARCO MT	ABI M
	Proviniencia								
19	Receitas nao Fiscais								
19.0.0.03	Coimas e Multas	2,031,799.00	1,272,631.00	63%	759,168.00	267,535.00	-	302,200.00	106,
19.0.0.03.5	Cobranca de Multas DMSC (30%)	1,717,454.00	725,426.00	42%	992,028.00	96,680.00	-	192,200.00	81,
19.0.0.03.20	Multa de Resíduos Sólidos	314,345.00	547,205.00	174%	- 232,860.00	170,855.00	-	110,000.00	25,
11.4.2	Tarifas e taxas pela prestação de serviços	205,775,302.00	171,881,461.40	84%	33,893,840.60	17,825,414.98	1,388,398.06	29,913,616.99	15,678,
11.4.2.0.2	A Recolha, Depósito e Tratamento de Lixo	205,775,302.00	171,881,461.40	84%	33,893,840.60	17,825,414.98	1,388,398.06	29,913,616.99	15,678,
11.4.2.02.1	EDM - CMM (100%)	164,821,523.00	156,682,551.56	95%	8,138,971.44	14,810,733.63	-	28,747,521.21	15,125,
11.4.2.02.2	Prova de Servico, Taxa de Limpeza	18,375,017.00	10,569,285.76	58%	7,805,731.24	2,067,240.52	1,214,865.24	945,556.25	346,
11.4.2.02.3	Taxa de Lixeira Municipal de Hulene	794,054.00	1,573,757.26	198%	- 779,703.26	105,451.13	49,225.82	23,994.03	28,
11.4.2.02.4	Contratos de recolha de residuos solidos	2,204,717.00	1,899,179.82	86%	305,537.18	676,235.70	28,982.00	97,145.50	58,
11.4.2.02.5	Licencas de provisao de servicos de recolha	1,579,991.00	1,149,587.00	73%	430,404.00	165,754.00	95,325.00	99,400.00	113,
11.4.2.02.6	Remocao especial	-	7,100.00	0%	- 7,100.00				7,
11.4.2.02.7	Inceneracao	-	-	0%	-				
11.4.1.0.7.1	Licenciamento Ambiental	18,000,000.00	-	0	18,000,000.00				
13	Patrimoniais	1,173,642.00	329,362.80	28%	844,279.20	-			
13.3	Bens imoveis, incluindo rendas e aforos sobre terra	1,173,642.00	329,362.80	28%	844,279.20	-	164,681.40	-	164,
13.3.0.99.3	DMGRSU	1,173,642.00	329,362.80	28%	844,279.20		164,681.40		164,
	TOTAL DE RECEITAS	208,980,743.00	173,483,455.20	83%	35,497,287.80	18,092,949.98	1,553,079.46	30,215,816.99	15,949,

Elaborado por　　O Chefe da RAF:　　o Chefe Daf

Rosa Paula　　Faustino T. Tsotsane　　Anselmo Inguane

Receitas

図 17：収入更新テンプレート

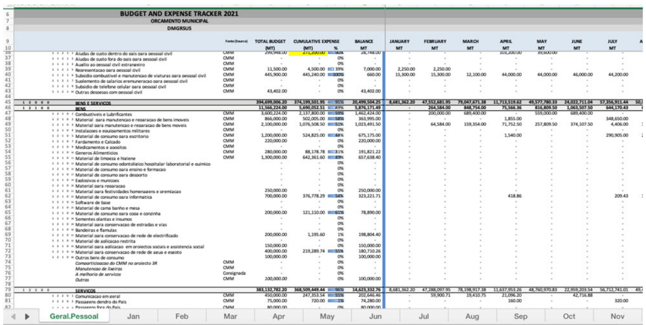


図 18：予算・支出更新テンプレート

参加型予算編成に関しては、2020-2022 年の COVID-19 感染拡大に伴うプロジェクト活動への影響により、DSMAS 予算編成時の JET の観察・関与は限定的となった。しかし 2021 年の予算編成時には DSMAS が提案するウレネ処分場委運営委託契約について調達担当部局と協議するなど、機会あるごとに支援・指導を実施した。

マプト市廃棄物管理分野の財務持続性戦略

マプト市廃棄物管理セクターの財務実績について詳細な分析を行った。廃棄物管理セクターの年間運営収入の不足は 1 億 5800 万 MT~3 億 9000 万 MT に及び、平均して 58%の補助が必要であった。マプト市廃棄物管理事業の増大する資金需要に対処するための計画がなければ、2040 年度には CMM の廃棄物管理セクターへの補助は 70%に達する可能性がある。さらに、マプト市は衛生埋立処分場への投資を計画しているため、廃棄物管理事業費は倍増する可能性がある。

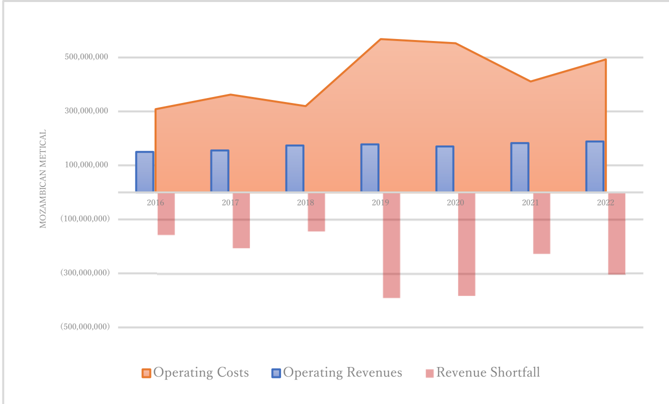


図 19：2016-2022 年の DSMAS 財務運営実績

JICA マプト 3R プロジェクトで得られた知見や提言、プロジェクト・チーム内での様々な議論やブレーンストーミングを踏まえ、多岐に渡る要因の徹底的な分析を経て、マプト市廃棄物管理分野の収益向上とコスト最適化のための現実的な解決策として、財務持続性戦略を策定した。

本戦略は、(1)現行システムの不具合是正、(2)取引に係る透明性確保の仕組み、(3)住民、事業者、関係機関の廃棄物管理費用の公平な負担、を目的としている。

現在、廃棄物管理サービスの運営経費の 90%は、1 次・2 次収集に係る ME 及び WCSP への委託契約、並びにウレネ処分場運営に係る委託契約に支払われている。このためコスト最適化は財務持続性確保のために重要な要素であり、これら委託サービスの契約管理とモニタリングに焦点を当てる必要がある。よって本プロジェクトの成果 2 活動では、都市ごみ収集サービスの委託契約管理とモニタリング活動に注力した。

他方で、財務持続性確保のためには収益向上も同様に重要な要素である。収益向上の実現により、CMM の補助金を大幅に削減し、廃棄物管理改善のための活動が、廃棄物管理セクターの収入によって適切に賄われることになる。

財務持続性戦略では、マプト市廃棄物管理セクターの 3 つの主要な収入源について、以下の革新的な方法を提案した。

(1) 電気料金を通じて徴収する清掃料金では、現行の 3 段階の料金体系を廃止し、都市ごみ発生量(kg)、廃棄物管理サービス総費用（MT）、電力消費量（kWh）の関係に基づいて、都市ごみ排出者の区分（家庭又は事業者）に応じた清掃料金単価（Mt/kWh）を設定する。

(2) マプト市内の400以上の事業者に対する調査に基づき、事業者に課せられる清掃税を50%削減するとともに、現行のサービス証明（PdS）システムによる請求に代えて、毎年の事業許可証の発行・更新時に清掃税を徴収する。

(3) 最終処分場を利用する全ての民間ごみ収集業者から処分料金を徴収することとし、モザンビーク国内で一般的なモバイル決済システムである M-PESA、MKESH、e-MOLA による POS 決済を導入する。

プロジェクト・チームは、DSMAS 及び CMM 財務局に対して、上記の財務持続性戦略に関する様々なポリシー・ミックスと対応するコスト・リカバリー・シナリオを提示した。

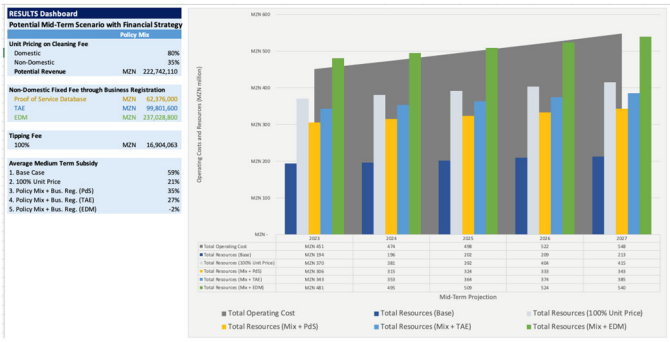


図 20：財務持続性戦略の政策手段と財務予測

本プロジェクトで策定した財務持続性戦略は、2022年にマプト市長と評議員に提示され、好意的に受け止められた。加えて、清掃料金の徴収を担うモザンビーク電力公社（EDM）とも協議し、EDM は本提案の合理性を認め、現行の清掃料金徴収システムへの導入は可能であるとの見解を示した。

これらを受けてプロジェクト・チームは、本戦略に対するマプト市議会の承認を得るため、DSMAS による提案文書（決議、審議、理由）の作成を支援した。また、本戦略に対する関係者の理解を促すために「クイック・リード」と呼ばれる概要説明資料を作成した。

さらに JET は、本戦略の様々な政策構成を採用した場合の財務予測シナリオを提供する MS Excel を使った簡単なモデルを作成し、DSMAS に本モデルの使用方法を説明・指導した。CMM の財務担当者と意思決定者の両方が、本モデルを用いて廃棄物処理料金の定期的な評価と更新を行うことが期待される。

7. 成果 6：環境教育・住民啓発活動の推進

ごみ分別ワークショップ

発生源分別 P/P に対する DSMAS・CMM・マトラ市職員の理解と協力を得るため、成果 3 活動で導入した資源分別ごみ箱と分別サインボードを用いて、ごみ分別ワークショップを開催した。

参加者は、初めに「なぜ発生源分別が必要なのか」、「分別したごみはどこへ行くのか」といった知識を学習した。続いて、ペットボトルや金属缶、ガラス瓶、雑紙といった身近にある資源ごみサンプルの分別に取り組んだ。最後に Q&A セッションを設け、質疑応答や意見交換を行った。

図 21：DSMAS でのごみ分別ワークショップ

「Bairro Mais Limpo」の支援

「Bairro Mais Limpo」は、マプト市が主導するバイロー対抗の清掃・美化コンテスト活動である。コンテスト期間は数か月に及び、各バイローは街路や側溝の清掃、植樹、浸食対策、環境教育などの活動を実施し、これら活動のパフォーマンスが評価された。プロジェクト・チームは清掃用具の調達や、バナー、ポスター、ステッカーなどの広報マテリアル、並びにスタッフ・関係者用のキャップ・ベストの製作・調達を支援した。

コンテスト期間を通じた住民の積極的な参加が評価され上位入賞したバイローの代表者は、マプト市主催の表彰式において市長から表彰を受けた。

図 22：広報マテリアルのバイロー事務所への配布

「スポ GOMI」活動の普及

「スポ GOMI」は、従来型のごみ拾い活動に「スポーツ」の要素を加え、今までの社会奉仕活動を「競技」へと変換させた日本発祥の取り組みである。参加者はチーム単位で予め定められたエリアで制限時間内にごみを拾い、拾ったごみ量でポイントを競い合う。

プロジェクト・チームは、マプト市及びマトラ市の幾つかの学校で「スポ GOMI」を実施した。参加した子ども達は、意欲的に校庭内のごみを分別しながら拾い集め、従来の清掃活動よりも多くのごみを回収することができた。回収した資源ごみは、活動後にリサイクル業者へと引き渡された。

図 23：マプト市内小学校でのスポ GOMI 活動

「環境絵日記」活動の実施

「環境絵日記」は、環境問題について考えた内容を絵や文章で自由に表現する絵日記である。

プロジェクト・チームは、マプト市及びマトラ市の幾つかの小学校で「環境絵日記」活動を実施した。参加した子ども達は、ごみの発生源分別、ごみのポイ捨て防止、海洋ごみ問題、森林保全といった様々なテーマで絵日記を描き、子ども達の環境問題に関する幅広い知識や関心を伺い知ることができた。

図 24：マプト市内小学校での環境絵日記活動

8. 成果 7：マプト・モデルの整理

プロジェクト・チームは、本プロジェクト活動や他の DSMAS 業務活動から得られた経験や教訓を「マプト・モデル」として整理した。今後、モザンビーク国内自治体やアフリカ諸国における統合的廃棄物管理改善に向けた取り組みの中で、「マプト・モデル」が参考資料として活用されることが期待される。

マプト・モデルの構成は表 3 に示すとおりである。

表 3：マプト・モデルの構成

No.	構成・内容
0	背景・導入
1	廃棄物管理マスタープラン
2	廃棄物収集運搬
3	リサイクル推進
4	衛生埋立処分場の運営・管理
5	財務管理
6	組織・制度管理
7	環境教育・住民啓発
8	マプト・モデル普及計画

CMM/DSMAS は、MTA・ANAMM・ANGER と協力・連携し、プロジェクト終了後に「マプト・モデル」の普及に向けた取り組みを開始する。

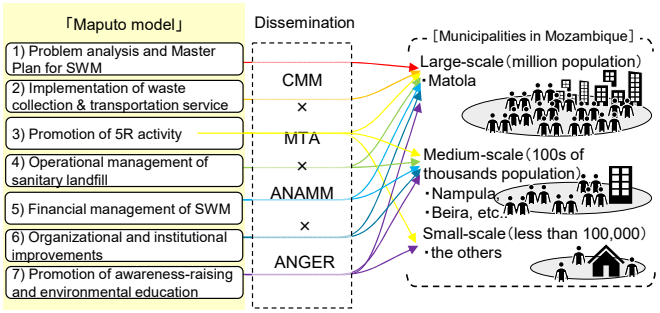


図 25：マプト・モデルの普及活動イメージ

Appendices of Chapter 2.2
Activities Related to Output 1

Appendix 2-1

Comparison of Approved M/P, CMM's Activity Plan and Action Plan of Draft M/P

Appendix 2-2

Action Plan of the Master Plan

Appendix 2-3

Comparison of M/P Monitoring Systems between Approved M/P and Draft M/P

Appendix 2-4

Monitoring System of the Action Plan

Appendix 2-5

Mid-term Review Report of the Master Plan

Appendix 2-1
Comparison of Approved M/P, CMM's Activity Plan and Action Plan of Draft M/P

Comparison of approved M/P, CMM's Activity Plan and Action Plan of revised M/P (as Activity 1-4)

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
Organizational Development			
Section 3.1		Specific Objective 56.5	AP2
Institutional and Organizational Development The Organizational Structure of the Directorate shall be in accordance with the following responstibilities of the sector: ・ Management of private sector entities that carry out waste collection and transportation services through contracts with CMM or individual companies; ・ Operation of the final disposal site, Hulene dumping site; ・ Operation and Maintenance of municipal equipment used for solid waste management; ・ Urban Solid Waste	**Reorganization of DMSC** ・ Establishment of the directorate dedicated to SWM (2017-18) ・ Reorganization of DAF (2017-18, Financial Section) ・ Capacity development of Directorate Staff (from 2017) ・ Consideration of inter-municipal association for landfill operation (from 2018) ・ Consideration of future model (2025-26)	[2019 Plan] 56.5 Boost intra-African cooperation relations 56.5.3 Identify organizations and municipalities with potential for cooperation taking into account the added value of this cooperation for Maputo (exchange of technical experience and sharing of best practices in areas such as: Waste management, cleaning in cities (Ex: Kigali) ・ at least 2 countries from each region of the continent ・ Identify partners with best practices in the areas in	**AP2-1: Establishment of DMGRSUS** (1) Submission of the Proposal of Establishment of DMGRSUS separated from DMSC to CMM (2) Approval by CMM (3) Operation of DMGRSUS **AP2-2: Re-Organization of DAF** (1) Internal Discussion within DMGRSUS for the Re-Organization of DAF (2) Approval by DMSC **AP2-3: Capacity Development of DMSC/DMGRSUS Staff** (1) Preparation of Annual Training Plan (2) Participation into the Training

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
Management for the City of Maputo - Master Plan; ・ Monitoring and supervision of the daily waste management; ・ Civic education, including promotion of 3R in cooperation with the private sector and NGOs. ・ Management of human resources of the Directorate; ・ Financial management of the Directorate.		reference [2020 Plan] *No specific activity related to waste management under specific objective 59.5.*	Opportunities in and out of Country **AP2-4: Consideration of Inter-Municipal Association for Landfill Operation** (1) Internal Discussion on the Necessity of Inter-Municipal Association (2) Decision Making on the Introduction of Inter-Municipal Association
Collection and Transportation			
Section 6.7		Specific Objective 48.1	AP3
Cement City: [Strategy] ・ Regular collection of USW is to be continued by private contractor(s) ・ The function to mitigate illegal dumping and other problems is		48.1 Improve the quality and coverage of the solid waste collection service [2019 Plan] 48.1.1 Create conditions for the implementation of the Landfill in Matlamele and	**AP3-1: Consideration of Increase of Transportation Distance to the New Landfill for Urban Collection** (1) Negotiation with the Contractor for Urban Collection (2017)

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
to be maintained in DGRSUS [Plan] ・ Up to 2021, Compactor truck with containers of 1,1m3, or plastic bag ・ Contract renewal in 2019 ・ After 2022, continue the same collection system	[Plan] ・ Increase of transportation distance to Landfill, after 2019 when new Landfill in Mathlemele will start its operation ・ Expansion of compactor collection, after 2022	encourage public-private partnerships in this area ・ The resettlement of families covered covered by the landfill site is guaranteed. 48.1.3 Consolidate the primary collection in all suburban neighborhoods ・ Primary Collection USW ・ Secondary collection - Suburban area 48.1.4 Improve the supervision of services provided by contracted providers ・ Collection in the City Center ・ Training and capacity building of supervisors. [2020 Plan] 48.1.1 Promote and encourage public-private partnerships in this field	(2) Amendment of the Contract including increase of transportation cost and inclusion of tipping fee of the landfill, if necessary (3) Preparation of TOR for the New Contract for the Urban Collection (2017) (4) Tender for the Next Urban Collection (2018) (5) Contract for the Next Urban Collection (2018) (6) Implementation of the Next Urban Collection (from 2019) **AP3-2: Expansion of Door to Door Urban Collection** (1) Study for Expansion of Door to Door Urban Collection (2020) (2) Reflection to the Updated M/P (2021, related to AP1-5)
Suburban area:			**AP3-3: Consideration of**

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
[Strategy] ・ Changing the type of containers (12m3 to 6m3) for secondary transportation ・ Development of capacity of microenterprises as contractor for primary collection ・ Gradual introduction of source separation at primary collection [Plan for Primary Collection] ・ Primary collection by hand cart (tchovas) will be continued ・ After 2020, source separation will be introduced [Plan for Secondary Transportation] ・ Transportation by compactor truck with containers of 6m3 will be continued. ・ Contract renewal in 2022	[Primary Collection] ・ Increase of transportation distance to Landfill, after 2019 when new Landfill will start its operation [Secondary Transportation]	・ Waste collection in all Municipal Districts (secondary and primary collection) is guaranteed 48.1.2 Study and visit other latitudes and longitudes in order to obtain the “best practices” on this field ・ 1 experiences exchange trip (Brazil, Korea and Portugal) is made 48.1.3 Mobilize the national business community to join this business / public service ・ Environmental education to ensure the guaranteed separate collection ・ The secondary collection - suburban area is guaranteed 48.1.4 Improve the supervision of services provided by contracted providers	**Increase of Transportation Distance to the New Landfill for Secondary Collection from Sub-Urban Area** (1) Negotiation with the Contractor for Secondary Collection (2019) (2) Amendment of the Contract including increase of transportation cost and inclusion of tipping fee of the landfill (2019)

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
Katembe: [Strategy] ・ Primary collection is to be expanded to all neighborhoods of the district. ・ Collected waste is to be transported municipal final disposal site after operation of Katembe bridge. [Plan] ・ Same as in the suburban area mentioned above from 2019	[Plan] ・ Primary collection in Katembe [1neighborhood] will be started from 2017 ・ Primary collection in Katembe [3neighborhood] will be started from 2019 ・ Primary collection in Katembe [5neighborhood] will be started from 2021 ・ Transportation waste of Katembe to new landfill, after 2019 when new Landfill in	・ 2 compactor trucks and roll on roll off are purchased ・ Supervisors are trained and qualified	**AP3-4: Waste Transportation from Katembe** (1) Study for Waste Quantity to be transported from Katembe (2018) (2) Decision Making on the Waste Transportation from Katembe to the New Landfill (2018) (3) Negotiation with the Contractor for Secondary Collection from Sub-Urban Area (2019, Action together with AP3-3) **AP3-5: Primary Collection in Katembe** (1) Preparation of Expansion Plan and TOR of the Primary Collection over two (2) more Birros (2017-18) (2) Tender for the Primary Collection for three (3) Bairros (2018)

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
	Mathlemele will start its operation		(3) Implementation of the Primary Collection at three (3) Bairros (from 2019) (4) Preparation of Expansion Plan and TOR of the Primary Collection over another two (2) more Birros (2020) (5) Tender for the Primary Collection for five (5) Bairros (2020) (6) Implementation of the Primary Collection at five (5) Bairros (from 2021)
Inhaca: [Strategy] ・ collection system is to be maintained and improved to remove waste from living space. [Plan] ・ Collected by “Tractor with			

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
Trailer"			
Collection by DSMAS [Plan] ・ DGRSU in charge special collection and removal of illegal dumping	[Plan] ・ Procurement of backhoe loader for removal of illegal dump in 2018 ・ Procurement of dump truck for removal of illegal dump in 2019		**AP3-6: Removal of Illegal Dumping Waste** (1) Budget Application for Procurement of Backhoe Loader(s) (2017) (2) Tender for Procurement of Backhoe Loader(s) (2017-18) (3) Operation of the New Backhoe Loader(s) (from late 2018) (4) Budget Application for Procurement of Dump Truck(s) (2018) (5) Tender for Procurement of Dump Truck(s) (2018-19) (6) Operation of the New Dump Truck(s) (from late 2019)
Promotion of 3R Activities			
Section 6.8		Specific Objective 49.5	AP5
[Policy] ・ Establish institutional		[2020 Plan] 49.5 Construction of Matlemele	**AP5-1: Upgrade 3R Policy Framework**

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
framework to promote 3R activities ・ Promote awareness raising activity on 3R for all waste generators ・ Promote 3R activities in urban area in collaboration with non-governmental 3R actors. ・ Promote 3R activities in the suburban area by DMSC's initiative. [Plan] ・ Introduce valuable recyclables recovery activity (called as 3R-station in JICA project) starting from 2017, and aim to achieve 30 3R-stations in operation in 2027 (target year). ・ Introduce segregated waste collection activity starting from 2022, and aim to achieve	[Plan] ・ Upgrade 3R policy framework (from 2017) ・ Support 3R activity in urban area (from 2017) ・ 3R Station in suburb (from 2017) ・ Segregated collection in suburb (from 2022) ・ household composting in suburb (from 2017)	Landfill and improvement of the respective accesses 49.5.2 Interaction with the Municipality of Matola ・ Implement 2 sustainable recycling ecopoints in the municipality (as a target)	(1) Implementation of 3R Forum inviting Stakeholders (twice a year) (2) Close Coordination and Opinion Exchange with MITADER about Laws and Regulations related to 3R (3) Study for the Incentives for 3R Activities (4) Inventory Research of the Recycling Companies in Mozambique (once a year) **AP5-2: 3R Promotion in Urban Area** (1) Analysis of 3R Activities in Urban Area (2) Coordination with concerned Private and NGO Actors for 3R Promotion (3) Study for 3R Promotion including the Introduction of Segregated Waste Collection

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
in 15 neighborhoods will operate segregated collection in 2027. ・ Introduce household organic composting activity starting from 2017, and aim to achieve 1,500 households will operate household composting in 2027. ・ (as for Target) DMSC aims to invest about 40 million MZN and recover 667 – 1012 tons of recyclables in the target year (2027).			**AP5-3: Expansion of 3R Station in Sub-Urban Area** (1) Preparation of the New Operation Plan of 3R Station (2) Preparation of TOR for the New 3R Station Operation for one Bairro (3) Tender for 3R Station Operation (4) Supervision of 3R Station Operation (5) Preparation of TOR for the 3R Station Operation for another Bairro (6) Tender for 3R Station Operation for another Bairro (7) Supervision of Operation of 3R Stations at two (2) Bairros **AP5-4: Introduction of Segregated Waste Collection in Sub-Urban Area** (1) Study for the Feasibility of

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
			Introduction of Segregated Waste Collection in Sub-Urban Area (Action together with AP5-4(3)) (2) Reflection to the Updated M/P (related to AP1-5) **AP5-5: Promotion of Household Composting** (1) Consideration of Technical Cooperation Agreement with UEM or other Appropriate Organizations (2) Preparation of Strategic Plan of Promotion of Household Composting (3) Procurement of Necessary Equipment such as Composting Bins (4) Implementation of Instruction and Monitoring of Household Composting (5) Implementation of Chemical

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
			Analysis on the Compost Product
Treatment and Disposal (Intermediate Treatment)			
Section 5.7			AP4-3
[Strategy] ・ This master plan recommends CMM not to jump at any of such proposals illogically without careful feasibility studies. [Plan] ・ Assessment of a new treatment process will be carefully conducted by the directorate dedicated to SWM in cooperation with any other external technical resources from both public and private sectors because the new process swill requires the huge investment and technical	[Plan] ・ Construction of side facilities at new landfill (2018-19) ・ Operation of side facilities (from 2020) ・ Study for introduction of new treatment system (from 2020)	Nothing mentioned.	**AP4-3: Introduction of Intermediate Treatment System** (1) Construction and Operation of MRF at the New Landfill (from 2018, Action together with AP4-1) (2) Formulation of Study Team for Introduction of Intermediate Treatment System (2019) (3) Study for Introduction of Intermediate Treatment System (from 2020)

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
skills. ・ Thus, it is recommended for CMM to organize the special committee for the introduction of such new technologies. ・ As for the intermediate treatment, the development plan of the new sanitary landfill supported by Korean Exim Bank includes to construct a small scale MRF (Material Recovery Facility) which is the manual recyclable sorting facility with the capacity of 200 ton/day. This facility plan shall be assessed together with its operation plan including the market surveys on the recyclables to be sorted at the facility.			

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
Treatment and Disposal (Final Disposal)			
Section 5.4 and 5.6		Specific Objective 49.4 and 49.5	AP4-1 and AP4-2
5.4.2 New Sanitary Landfill in Matlemele ・ It Should be eminent that this investment will cover only the 1ststage of the new sanitary landfill construction with the area of approximately 50 ha for about 7.1 year's operation. The total life time of the sanitary landfill including another area of 50 ha for the 2nd stage is expected to be about 21 years. However, the detail financial source for the development of the 2nd stage is not clear at this moment, while the operation cost is also not clear. ・ Right after the resettlement of	New Sanitary Landfill [Plan] ・ Construction of Phase 1 area (2017-19) ・ Preparation of operation plan (2017-18) ・ Tender and contract for operation (2018-19) ・ Operation of Sanitary Landfill (from 2020) ・ Plan and design for Phase 2 area development (2023-24) ・ Tender for Phase 2 construction (2024-25) ・ Construction of Phase 2 area (2025-26)	[2019 Plan] 49.5 Construction of Matlemele Landfill and improvement of the respective accesses 49.5.1 Interact with the National Sustainable Development Fund to accelerate the construction process of the Matlemele landfill ・ Construction work begins at the Matlemele Landfill 49.5.2 Interaction with the Municipality of Matola ・ DUAT and Construction License [2020 Plan] 49.5 Construction of Matlemele Landfill and improvement of	**AP4-1: Construction and Operation of the New Sanitary Landfill** (1) Construction Supervision together with MITADER, FUNDS, Matola Municipality (2018-19) (2) Preparation of Landfill Operation Plan together with Cost Estimation (2017) (3) Preparation of TOR for the New Landfill Operation (2018) (4) Tender for the New Landfill Operation (2018-19) (5) Contract for the New Landfill Operation (2019) (6) Supervision of the New Landfill Operation (from

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
residents in the total planned site of 100ha is completed, the tendering process will be started and it may take 4 to 6 months until the signing on the construction contract. After the contract, construction period is expected to be 18 months including a test-run and operational training. ・ Considering the current situations on the site preparation, it is expected to launch the operation of this new sanitary landfill within 2019, at least by 2020.		the respective accesses 49.5.1 Interaction with the FNDS to accelerate the process ・ Work meetings, at least 8 (meetings and / or seminars) ・ The Matlemele Landfill is built 49.5.2 Interaction with the Municipality of Matola ・ Implement 2 sustainable recycling ecopoints in the municipality (as a target)	2020)
5.6 The Hulene Dumping Site Closure AS described in the previous M/P 2008, the closure of the Hulene	Hulene Dumping Site [Plan] ・ Re-study for closure plan (2017-18) ・ Re-tender and contract for	[2019 Plan] 49.4 Closure of the Hulene dumping and its transformation into an environmental project	**AP4-2: Closure of Hulene Dumping Site** (1) Re-Study for Closure Plan including the Post-Closure Plan with the evaluation of

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
Trash will be done in the following three steps: (1) Keep its improved operation, placing of dumped waste and a periodic cover soil, with appropriate equipment to minimize the environmental impacts such as fires, flies or odors until the closure of the site. (2) Reliable operation of weighbridge will also be continued by avoiding its unexpected malfunction. (3) Careful monitoring on the impact of the site that may affect the surrounding area will be also implemented, manually but securely. (4) Complete closure of the dumping site with an appropriate engineering works	closure (2019-20) ・ Construction for closure works (2020-22) ・ Post closure site development (2023-25, if necessary)	49.4.2 Protection works against erosion and land slide ・ Opening of access roads and final disposal 49.4.3 Site drainage works to prevent landslides ・ Construction of drainage ditches [2020 Plan] 49.4 Closure of the Hulene dumping and its transformation into an environmental project 49.4.1 Environmental and social impact study ・ Hiring of consulting services 49.4.2 Protection works against erosion and land slide ・ Consolidate the stabilization of soils at risk of erosion around the dumping site using	Private Sector's Proposals (2017-18) (2) Preparation of TOR for the Closure Plan (2019) (3) Tender for the Closure of Hulene Dumping Site (2019-20) (4) Supervision of the Closure Works of Hulene Dumping Site (from 2021)

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
including the followings: ・ Construction of surface runoff diversion channels around the dumping site. ・ Application of final cover soil with at least 500mm thickness over all the waste dumping area. ・ Insertion of gas release pipes into the waste dumping area with an appropriate pitch. ・ Application of leachate collection, storage and recirculation system to avoid to flown into the surrounding area. ・ Construction of the surrounding fence which isolates the site from the surrounding environment. ・ Application of groundwater monitoring wells around the		a bulldozer and compactor 49.4.3 Site drainage works to prevent landslides ・ Consolidate the stabilization of soils at risk of erosion around the dumping site using a bulldozer and compactor ・ Improve the safety of the Hulene dumping site	

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
surrounding area. ・ Implementation of regular sampling and analysis of leachate, landfill gas and groundwater in the monitoring well. (5) In parallel, appropriate post closure land use plan will be studied and the site will be renovated accordingly when the dumped waste will be stable by its decomposition. Usually, the site can be used as an open space like park, sports field with small buildings only. In case the large scale facility such as factory, warehouse or offices is planned to construct, a careful geological and environmental survey must be required. ・ Usually, the landfill gas is the			

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
methane rich gas and it contains high calorific value that might be effective for energy recovery. ・ This site can be also used as the facility related to the solid waste management and recycling such as the waste transfer station, the waste segregation center or other recycling facilities. ・ By the time, this dumping site will be closed, the waste picker who are currently working on their recycling activity in the site will be also terminated. After the closure of the Hulene Dumpsite, DMSC recommends that the possibility to transform the dumpsite facility into a transfer station is strongly			

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
considered, given that transfer stations are normally set up when the distance between the collection center and the sanitary landfill is over 25Km.			
Civic Education and Public Awareness Raising			
Chapter 7			
[Plan (Program)] 1. Introduction of 3R principle in teaching institutions 2. Public sensitization campaigns in critical points 3. Implementation of 3R promotion activities 4. Education campaigns for all citizens	[Plan (Program)] 1. Introduction of 3R principle in teaching institutions (from 2017) 2. Public sensitization campaigns in critical points (from 2017) 3. Implementation of 3R promotion activities (from 2022) 4. Education campaigns for all citizens (from 2022)	49.1 Improve the quality and coverage of the solid waste collection service 48.1.3 Mobilize the national business community to join this business / public service ・ Environmental education to ensure the guaranteed separate collection	**AP6-1: Introduction of 3R Principles in Teaching Institutions** 5. (1) Preparation of 3R Instruction Plan including Selection of Target Schools 6. (2) Implementation of 3R Instruction at Target Schools **AP6-2: Public Sensitization Campaigns in Critical Places** (1) Preparation of Annual Campaigns Plan for the Budget Request for the Following Year

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
			(2) Implementation of Campaign related to Stopping Waste Scattering (3) Implementation of Campaign related to Appropriate Use of Waste Containers (4) Implementation of Campaign related to Reduce the Informal Dumping (5) Implementation of Campaign related to 3R Principle Introduction (6) Implementation of Sensitization to Waste Pickers for appropriate Recycling Activities
Financial Management			
Section 7.4		Strategic Objective 28, 29, 39, 57	
7.4.4 Policies and Conditions to Support Funding for MUSW	**Major Expenditures for New System**	*There are many activities related to financial matters listed in the*	**AP7-1: Estimation of Major Expenditure for the New**

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
i. Creation of special SWM account to be managed by the Finance Section of the DMSC; ii. Instituting reforms in the Finance Section organization, roles and responsibilities of subsections; iii. Correction of functions and departmental linkages within DMSC; iv. Imposition of the regulation on payment of correct tipping fees without exempting or favoring any PSP; v. Reformulating policies to include incentives for large waste generators that are compliant to cleaning fee payments; vi. Reformulating policies to include stringent penalties for large waste generators that are	· Estimation of operation cost of new sanitary landfill · Estimation of transportation cost to new sanitary landfill · Estimation of development cost for the phase 2 of sanitary landfill **Revenue Improvement** · Study for policy change about tipping fee exemption to larger contractors · Amendment of the contract with large contractor · Charging tipping fee from large contractors · Study for change of cleaning tax rate collected by EDM (Domestic and Non-domestic) · Study for change of cleaning tax rate collected by the proof of service of CMM (Non-domestic)	*Activity Plan 2020 but not limited to the field of waste management*	**Solid Waste Management System** (1) Estimation of Operation Cost for the New Sanitary Landfill (in 2017, related to AP4-1(2)) (2) Estimation of Increase of Transportation Cost because of the New Sanitary Landfill (2017-18, related to AP3-1(2) and 3-3(2)) **AP7-2: Improvement of the Revenue Mechanism** (1) Study and Discussion about the Policy Change on the tipping fee exemption to large contractors (2017-18) (2) Negotiation with Large Contractors about inclusion of the Tipping Fee to the Contract (2019, related to AP3-1(1) and AP3-3(1)) (3) Amendment of the Contract

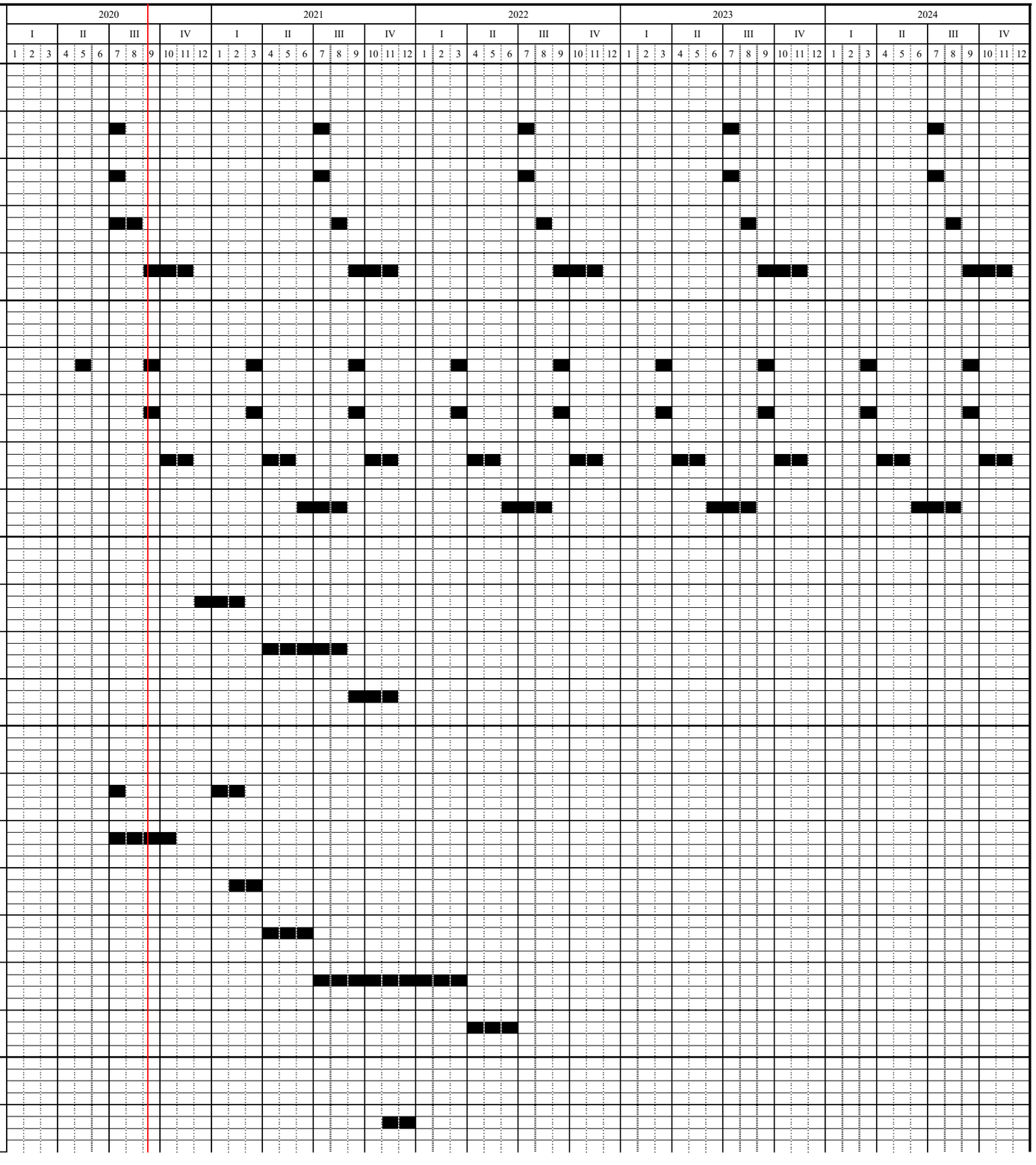
Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
non-compliant to cleaning fee payments, especially those with back payments of over one (1) year; vii. Imposition of strict transparency rules on PSPs regarding inventory of clientele; viii. Imposition of strict compliance on regulation pertaining to large waste generators having active contracts for waste transportation and collection with a PSP or the CMM, whichever is preferred. ix. Imposition of full disclosure of monthly data by EDM to CMM with regards to cleaning tax collections; x. More detailed evaluation of bids, especially for large	· Review and change of Cleaning Tax · Upgrading the proof of service system · Study for the change of fee charge system of proof of service · Implementation of new charging system		including Tipping Fee of the landfill (2019, related to AP3-1(2) and AP3-3(2)) (4) Supervision of Tipping Fee Collection from Large Contractors (from 2020) **AP7-3: Study for Change of Cleaning Tax Rate and its Charging System** (1) Study for Change of Cleaning Tax Rate Collected by EDM (2) Study for Change of Cleaning Tax Rate Collected by the Proof of Service of the CMM (3) Preparation of Proposal for Change of Cleaning Tax Rate (4) Upgrading the Proof of Service System (5) Study for Change of Fee Charging System of the Proof of Service (6) Preparation of TOR for

Respective Plan proposed in Approved M/P	Table 6.24 Implementation Schedule of Activities	CMM Activity Plan 2020	Action Plan of revised M/P
contracts, that would scrutinize financial proposals of bidders to determine the service provider that can deliver its service with the most cost efficient method, and which would be advantageous to CMM. This practice can potentially LOWER the cost of service provision for collecting and transporting waste in Maputo City, significantly. xi. External funding support from international development partners will be very favorable to support the high costs of SWM of Maputo City.			Change of Fee Charging System (7) Tender for the Change of Fee Charging System (8) Contract for the Change of Fee Charging System (9) Implementation of the Change of Fee Charging System

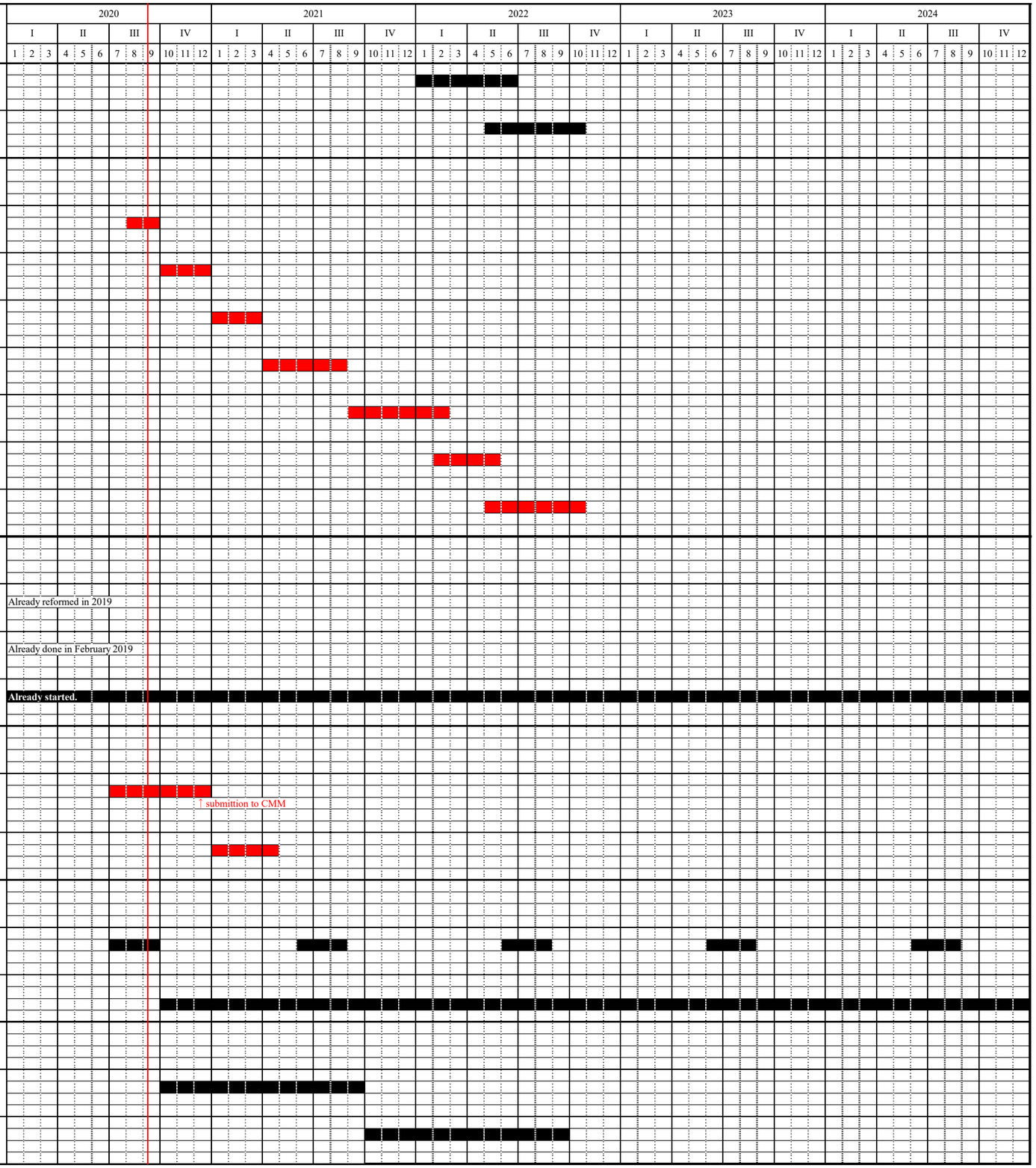
Appendix 2-2
Action Plan of the Master Plan

Action Plan 2020

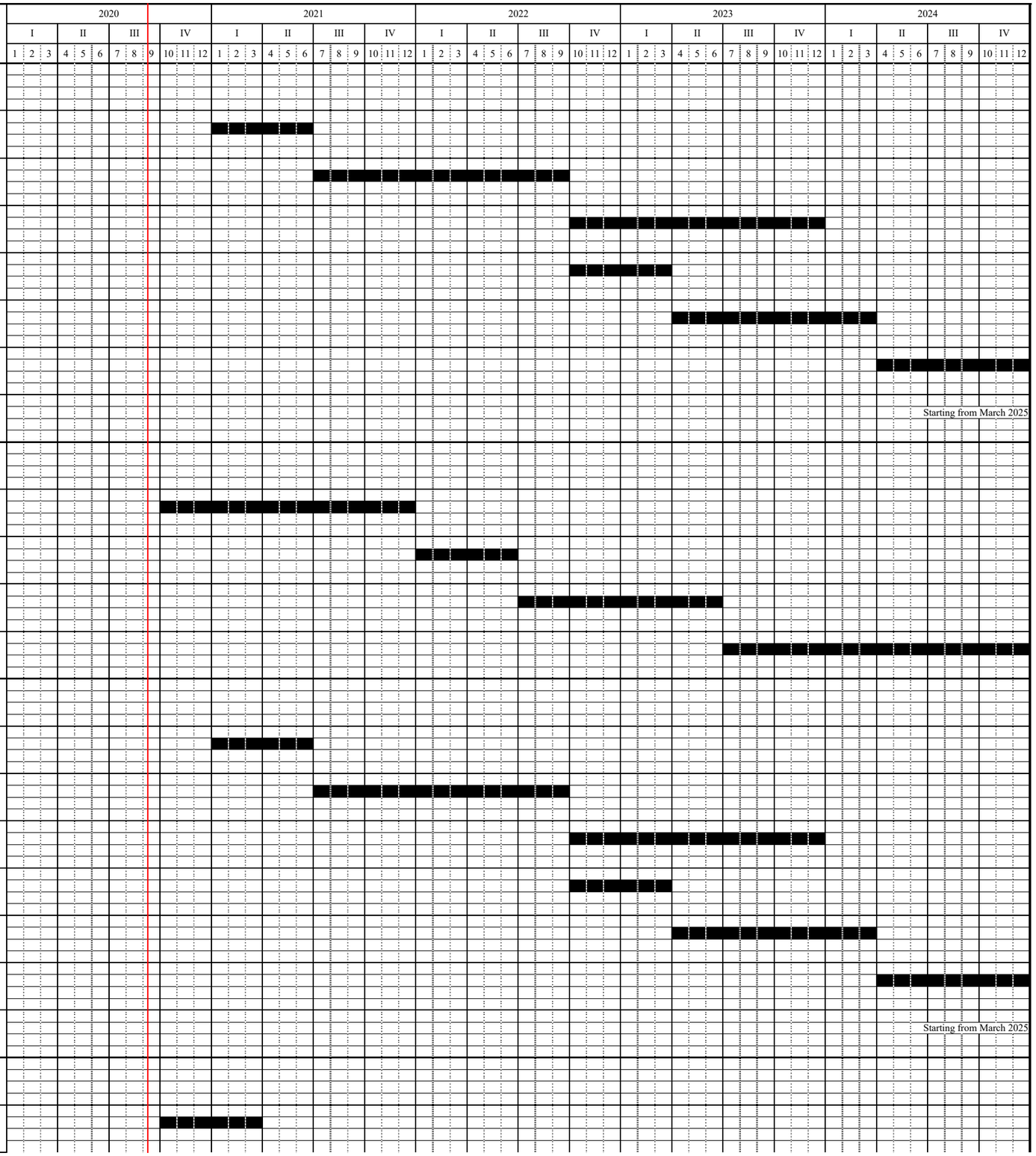
Related Contents of Master Plan 2018 approved by CMM	Actions taken during 2020 to 2024	Goal to be Achieved	Responsible Department, Section	Person in Charge	Related Organizations*	Direct Activity Expenditures	Expenditures Responsibility
AP1. Overall of Master Plan	**AP1-1: Monitoring of the Progress of the approved M/P 2018**						
	(1) Formulation of Monitoring Team	Monitoring Team	DSMAS	Deputy Director of SWM	All Departments	Not Necessary	Not Necessary
	(2) Preparation of Annual Monitoring Schedule	Monitoring Schedule	DSMAS	Deputy Director of SWM	All Departments	Not Necessary	Not Necessary
	(3) Preparation of Monitoring Sheet	Monitoring Sheet	DSMAS	Deputy Director of SWM	All Departments	Not Necessary	Not Necessary
	(4) Implementation of Annual Monitoring	Monitoring Report	DSMAS	Deputy Director of SWM	All Departments	Not Necessary	Not Necessary
	AP1-2: Monitoring of the Progress of the A/P (2020 to 2024)						
	(1) Formulation of Monitoring Team	Monitoring Team	DARHF	DARHF Head	Other Departments	Not Necessary	Not Necessary
	(2) Confirmation of Semi-Annual Monitoring Schedule (March and September)	Monitoring Schedule	DARHF	DARHF Head	Other Departments	Not Necessary	Not Necessary
	(3) Implementation of Semi-Annual Monitoring	Monitoring Report	DARHF	DARHF Head	Other Departments	Not Necessary	Not Necessary
	(4) Reflection to the CMM's Annual Activity Plan	CMM's Annual Activity Plan	DARHF	DARHF Head	Other Departments	Not Necessary	Not Necessary
	AP1-3: Implementation of the Mid-Term Review for the approved M/P 2018						
	(1) Preparation of Review Plan and Schedule	Review Plan	DSMAS	Deputy Director of SWM	DSMAS	Not Necessary	Not Necessary
	(2) Implementation of Mid-Term Review	Review Report	DSMAS	Deputy Director of SWM	DSMAS	Not Necessary	Not Necessary
	(3) Report of the Review Result	Review Report	DSMAS	Deputy Director of SWM	DSMAS	Not Necessary	Not Necessary
	AP1-4: Implementation of Waste Quantity and Quality Survey						
	(1) Formulation of Survey Team	Survey Team	DGRSU	DGRSU Head	Other Departments	Not Necessary	Not Necessary
	(2) Preparation of Draft TOR for the Survey for Budget Application	Draft TOR and Budget Application	DGRSU	DGRSU Head	Other Departments	Not Necessary	Not Necessary
	(3) Finalization of TOR	Finalized TOR	DGRSU	DGRSU Head	Other Departments	Not Necessary	Not Necessary
	(4) Tender for the Survey	Tender Report	DGRSU	DGRSU Head	Other Departments	Not Necessary	DARHF
	(5) Implementation of the Survey	Survey Report	DGRSU	DGRSU Head	Other Departments	Necessary	DGRSU
	(6) Analysis of the Survey Result and Reporting	Survey Analysis Report	DGRSU	DGRSU Head	Other Departments	Not Necessary	DGRSU
	AP1-5: Minor Updating the approved M/P 2018 (Updated M/P 2023)						
	(1) Formulation of M/P Update Team	M/P Update Team	DSMAS	Dirctor	All Departments	Not Necessary	Not Necessary



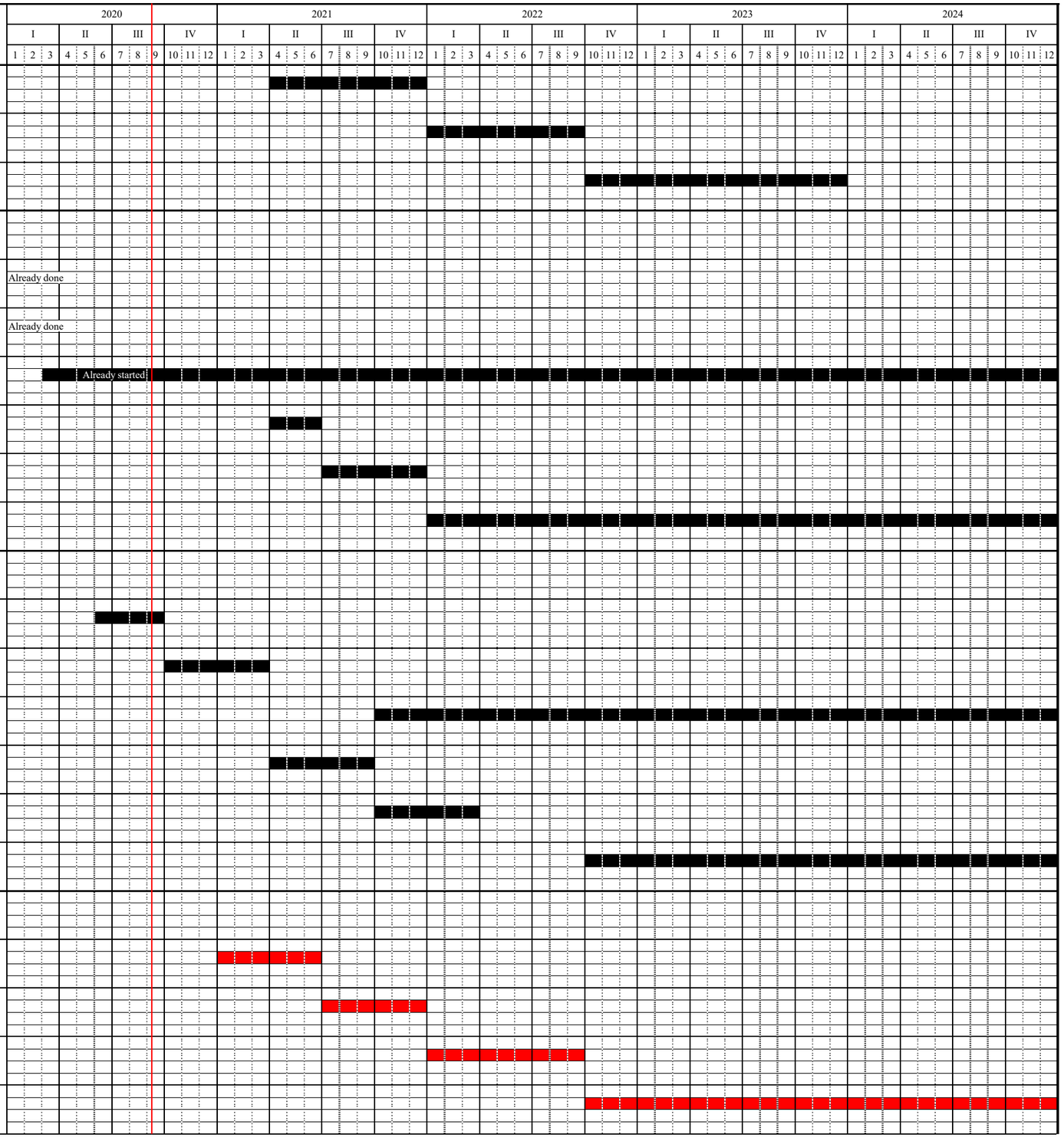
Related Contents of Master Plan 2018 approved by CMM	Actions taken during 2020 to 2024	Goal to be Achieved	Responsible Department, Section	Person in Charge	Related Organizations*	Direct Activity Expenditures	Expenditures Responsibility
	(2) Preparation of Updated M/P 2023	Updated M/P	DSMAS	Director	All Departments	Not Necessary	Not Necessary
	(3) Approval of Updated M/P 2023	Approval of Updated M/P	DSMAS	Director	All Departments/ CMM	Necessary	DSMAS
	AP1-6: Amendment of Cleansing Ordinance						
	(1) Formulation of Cleansing Ordinance Development Team	Cleansing Ordinance Development Team	DSMAS	Director	All Departments/ CMM	Not Necessary	Not Necessary
	(2) Preparation of Draft TOR for Consultant	Draft TOR for Consultant	DSMAS	Deputy Director of SWM	All Departments/ CMM	Not Necessary	Not Necessary
	(3) Finalization of TOR	Finalized TOR	DSMAS	Deputy Director of SWM	All Departments/ CMM	Not Necessary	Not Necessary
	(4) Tender for the Consultant	Tender Report	DSMAS	Deputy Director of SWM	All Departments/ CMM	Necessary	DSMAS
	(5) Supervision of Consultant with review of draft Ordinance	Draft Cleansing Ordinance	DSMAS	Deputy Director of SWM	All Departments/ CMM	Necessary	DSMAS
	(6) Finalization of New Cleansing Ordinance	New Cleansing Ordinance	DSMAS	Deputy Director of SWM	All Departments/ CMM	Necessary	DSMAS
	(7) Approval of New Cleansing Ordinance	Approval of New Cleansing Ordinance	DSMAS	Director	All Departments/ CMM	Necessary	DSMAS
AP2. Review of Organizational Structure of DSMAS	**AP2-1: Establishment of DSMAS**						
	(1) Establishment of DSMAS, separating Cemetery Department and Merging Environmental Management Department (already done in 2019)	Re-Organization Proposal	DSMAS	Director	All Departments	Not Necessary	Not Necessary
	(2) Authorization by CMM (It was already approved by CMM in February 2019)	Approval by CMM	DSMAS	Director	All Departments	Not Necessary	Not Necessary
	(3) Operation of DSMAS	Scope of Work of DMGRSUS	DSMAS	Director	All Departments	Not Necessary	Not Necessary
	AP2-2: Review of the new organizational structure under DSMAS						
	(1) Internal Review within DSMAS for the responsibility and TOR of each Department and Division including Proof of Servise Section	Proposal on the Organizational Improvement with work discription	DSMAS	Direcotr	All Departments	Not Necessary	Not Necessary
	(2) Authorization by DSMAS	Responsible Work Description of DSMAS	DSMAS	Director	All Departments	Not Necessary	Not Necessary
	AP2-3: Capacity Development of DSMAS Staff						
	(1) Preparation of Annual Training Plan	Annual Training Plan	DARHF	DARHF Head	Other Departments	Not Necessary	Not Necessary
	(2) Participation into the Training Opportunities in and out of Country	Training Report	DARHF	Director	All Departments	Necessary	DSMAS
	AP2-4: Consideration of Inter-Municipal Association for Landfill Operation						
	(1) Internal Discussion on the Necessity of Inter-Municipal Association	Minutes of Discussion	DSMAS	Director	DSMAS/ CMM/ Matola Municipality/ FNDS	Not Necessary	DSMAS
	(2) Decision Making on the Introduction of Inter-Municipal Association	Decision Announcement	DARHF	Director	DSMAS/ CMM/ Matola Municipality/ FNDS	Not Necessary	DSMAS



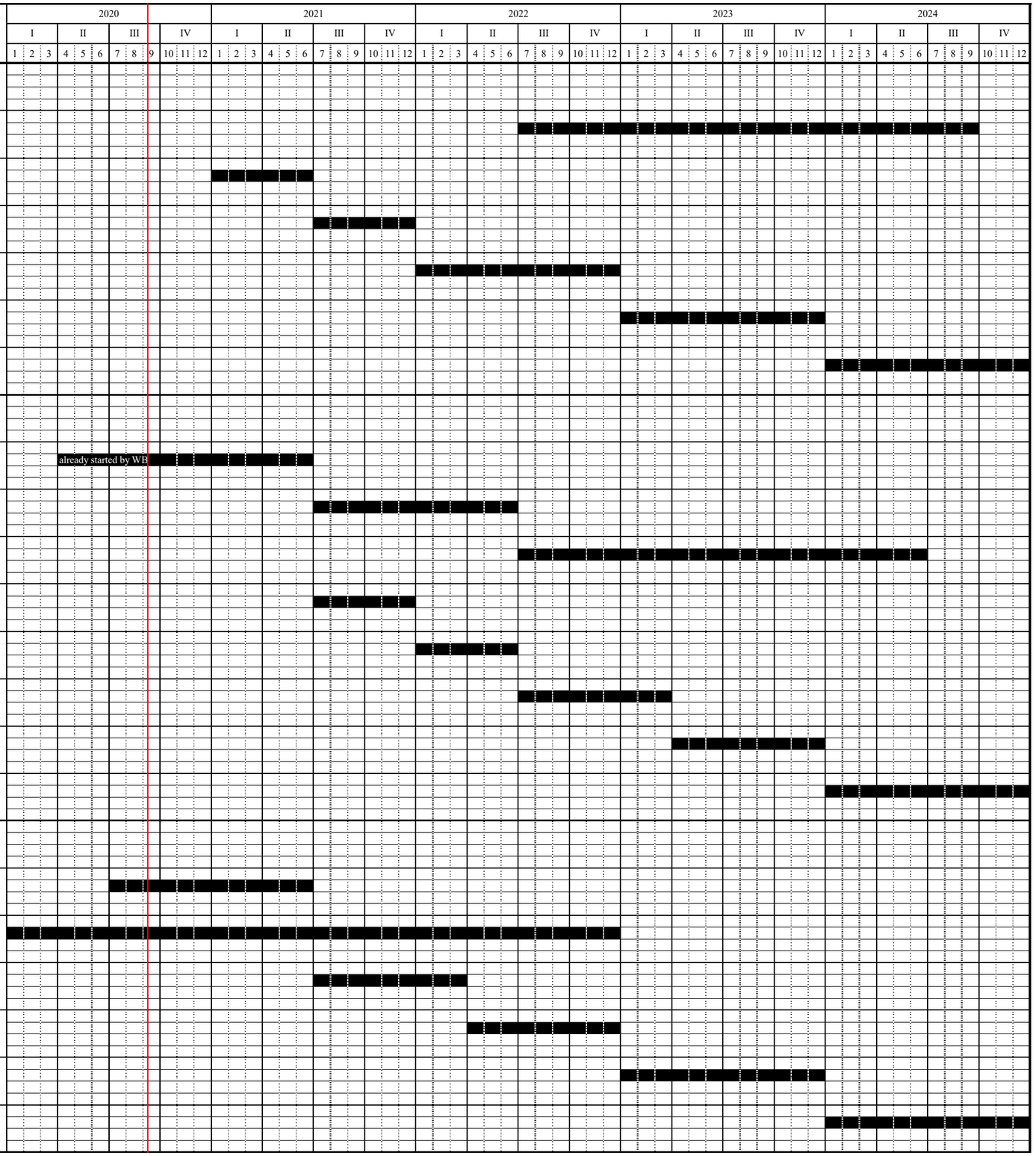
Related Contents of Master Plan 2018 approved by CMM	Actions taken during 2020 to 2024	Goal to be Achieved	Responsible Department, Section	Person in Charge	Related Organizations*	Direct Activity Expenditures	Expenditures Responsibility
AP3: Waste Collection and Transportation	**AP3-1: Consideration of Increase of Transportation Distance to the New Landfill in Mathlemele and/or Katembe for Urban Collection**						
	(1) Implementation of Time and Motion Study to the new landfill sites	Time and Motion Study Report	DGRSU	DGRSU Head	JET	Necessary	DGRSU
	(2) Negotiation with the Contractor for Urban Collection in case the new landfill will start its operation at the beginning of 2024	Minutes of Negotiation	DGRSU	DGRSU Head	DARHF	Not Necessary	Not Necessary
	(3) Amendment of the Contract including increase of transportation cost and inclusion of tipping fee of the landfill, if necessary	Contract Amendment	DGRSU	DGRSU Head	DARHF	Not Necessary	Not Necessary
	(4) Preparation of TOR for the New Contract for the Urban Collection, which may start in March 2025	TOR for New Contract	DGRSU	DGRSU Head	DARHF	Necessary	DGRSU
	(5) Tender for the Next Urban Collection	Tender Report	DSMAS	Dirctor	CMM	Necessary	CMM
	(6) Contract for the Next Urban Collection	New Contract	DSMAS	Dirctor	CMM	Not Necessary	Not Necessary
	(7) Implementation of the Next Urban Collection	Monitoring Report	DGRSU	DGRSU Head	None	Necessary	CMM
	AP3-2: Expansion of Door to Door Urban Collection						
	(1) Study for Expansion of Door to Door Urban Collection	Study Report	DGRSU	DGRSU Head	JET	Necessary	DGRSUS
	(2) Reflection to the Updated M/P (related to AP1-5)	Updated M/P	DSMAS	Director	JET	Not Necessary	Not Necessary
	(3) Preparation of expansion of Door to Door Collection, such as TOR preparation and Amendment of Contract	Updated M/P	DSMAS	Director	1	Not Necessary	Not Necessary
	(4) Implementation of expansion of Door to Door Collection	Updated M/P	DSMAS	Director	JET	Not Necessary	Not Necessary
	AP3-3: Consideration of Increase of Transportation Distance to the New Landfill in Mathlemele and/or Katembe for Secondary Collection from Sub-Urban Area						
	(1) Implementation of Time and Motion Study to the new landfill sites	Time and Motion Study Report	DGRSU	DGRSU Head	JET	Necessary	DGRSU
	(2) Negotiation with the Contractor for Secondary Collection, in case the new landfill will start its operation at the beginning of 2024	Minutes of Negotiation	DGRSU	DGRSU Head	DARHF	Not Necessary	Not Necessary
	(3) Amendment of the Contract including increase of transportation cost and inclusion of tipping fee of the landfill	Contract Amendment	DGRSU	DGRSU Head	DARHF	Not Necessary	Not Necessary
	(4) Preparation of TOR for the New Contract for the Sub-urban Collection, which may start in March 2025	TOR for New Contract	DGRSU	DGRSU Head	DARHF	Necessary	DGRSU
	(5) Tender for the Next Sub-urban Collection	Tender Report	DSMAS	Dirctor	CMM	Necessary	CMM
	(6) Contract for the Next Sub-urban Collection	New Contract	DSMAS	Dirctor	CMM	Not Necessary	Not Necessary
	(7) Implementation of the Next Sub-urban Collection	Monitoring Report	DGRSU	DGRSU Head	None	Necessary	CMM
	AP3-4: Waste Transportation from Katembe						
	(1) Study for Waste Quantity to be transported from Katembe	Study Report	DGRSU	DGRSU Head	JET	Not Necessary	Not Necessary



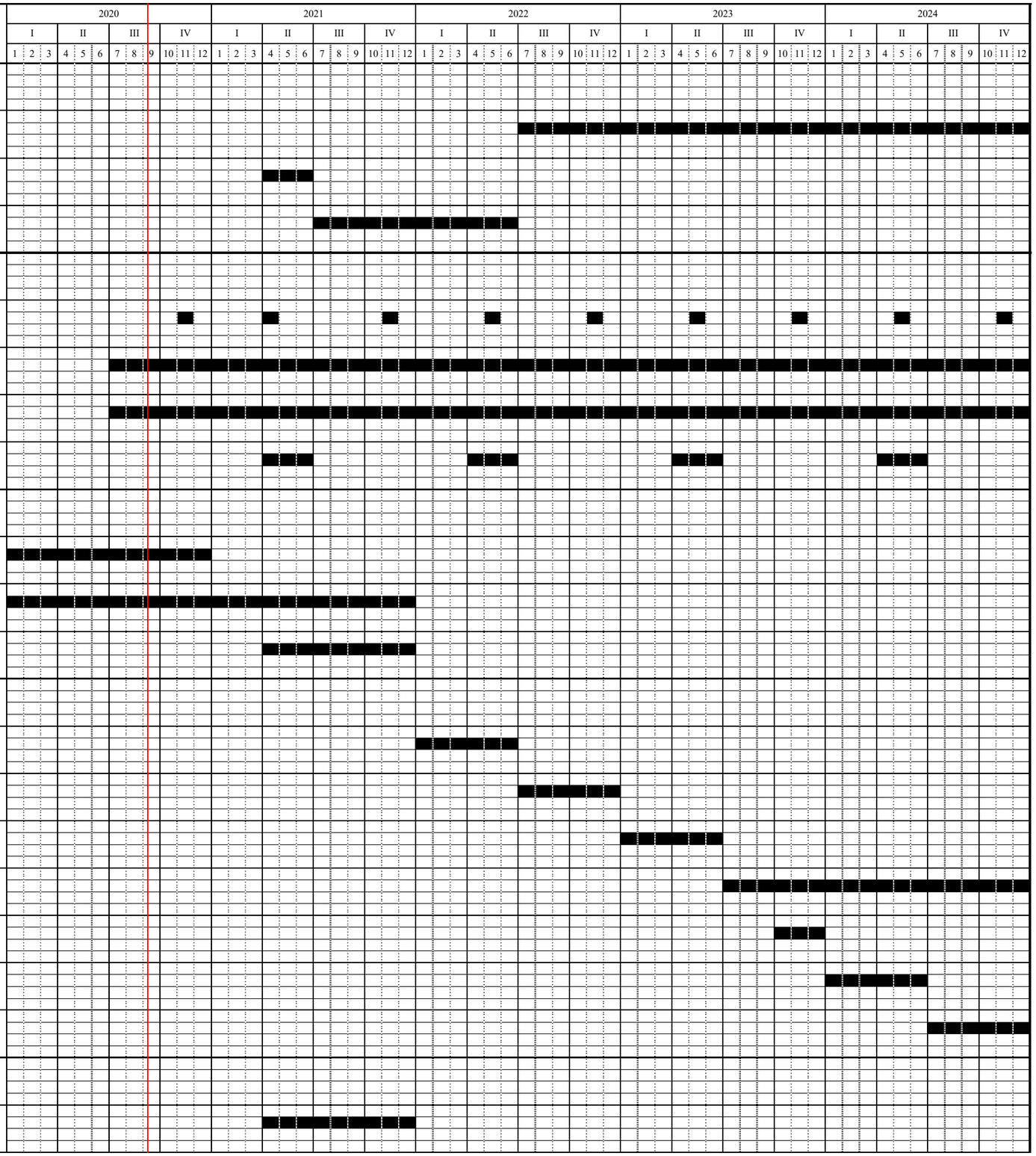
Related Contents of Master Plan 2018 approved by CMM	Actions taken during 2020 to 2024	Goal to be Achieved	Responsible Department, Section	Person in Charge	Related Organizations*	Direct Activity Expenditures	Expenditures Responsibility
	(2) Decision Making on the Waste Transportation from Katembe to the New Landfill where might be in Katembe or Mathlemele	Decision Announcement	DSMAS	DGRSU Head	CMM/Katembe District	Not Necessary	Not Necessary
	(3) Negotiation with the Contractor for Secondary Collection from Sub-Urban Area (Action together with AP3-3)	Minutes of Negotiation, Contract Amendment	DGRSU	DGRSU Head	DARHF	Not Necessary	Not Necessary
	(4) Amendment of the Contract including increase of transportation cost and inclusion of tipping fee of the landfill	Contract Amendment	DGRSU	DGRSU Head	DARHF	Not Necessary	Not Necessary
	AP3-5: Primary Collection in Katembe						
	(1) Preparation of Expansion Plan and TOR of the Primary Collection over two (2) more Bairros	Expansion Plan	DGRSU	DGRSU Head	DARHF	Not Necessary	Not Necessary
	(2) Tender for the Primary Collection for three (3) Bairros	Tender Report	DSMAS	Director	CMM	Not Necessary	Not Necessary
	(3) Implementation of the Primary Collection at three (3) Bairros	Monitoring Report	DGRSU	DGRSU Head	None	Necessary	DSMAS
	(4) Preparation of Expansion Plan and TOR of the Primary Collection over another two (2) more Bairros	Expansion Plan	DGRSU	DGRSU Head	DARHF/ CMM / Katembe District	Not Necessary	Not Necessary
	(5) Tender for the Primary Collection for five (5) Bairros	Tender Report	DSMAS	Director	CMM/ Katembe District	Not Necessary	Not Necessary
	(6) Implementation of the Primary Collection at five (5) Bairros	Monitoring Report	DGRSU	DGRSU Head	None	Necessary	DSMAS
	AP3-6: Removal of Illegal Dumping Waste						
	(1) Budget Application for Procurement of Backhoe Loader(s)	Budget Application	DARHF	DARHF Head	DGRSU/ DOPA	Not Necessary	Not Necessary
	(2) Tender for Procurement of Backhoe Loader(s)	Tender Report	DSMAS	DSMAS Head	DGRSU/DARHF/ DOPA	Not Necessary	Not Necessary
	(3) Operation of the New Backhoe Loader(s)	Monitoring Report	DGRSU	DGRSU Head	DOPA	Necessary	DSMAS
	(4) Budget Application for Procurement of Dump Truck(s)	Budget Application	DARHF	DARHF Head	DGRSU/ DOPA	Not Necessary	Not Necessary
	(5) Tender for Procurement of Dump Truck(s)	Tender Report	DSMAS	DSMAS Head	DGRSU/DARHF/ DOPA	Not Necessary	Not Necessary
	(6) Operation of the New Dump Truck(s)	Monitoring Report	DGRSU	DGRSU Head	DOPA	Necessary	DSMAS
	AP3-7: Improvement of Special Collection by DSMAS						
	(1) Preparation of Improvement Plan of Special Collection by DSMAS	Improvement Plan of Special Collection	DGRSU	DGRSU Head	DARHF/ DOPA	Not Necessary	Not Necessary
	(2) Budget Application for Procurement of Collection Truck(s)	Budget Application	DARHF	DARHF Head	DGRSU/ DOPA	Not Necessary	Not Necessary
	(3) Tender for Procurement of Collection Truck(s)	Tender Report	DSMAS	DSMAS Head	DGRSU/DARHF/ DOPA	Not Necessary	Not Necessary
	(4) Operation of the New Collection Truck(s)	Monitoring Report	DGRSU	DGRSU Head	DOPA	Necessary	DSMAS



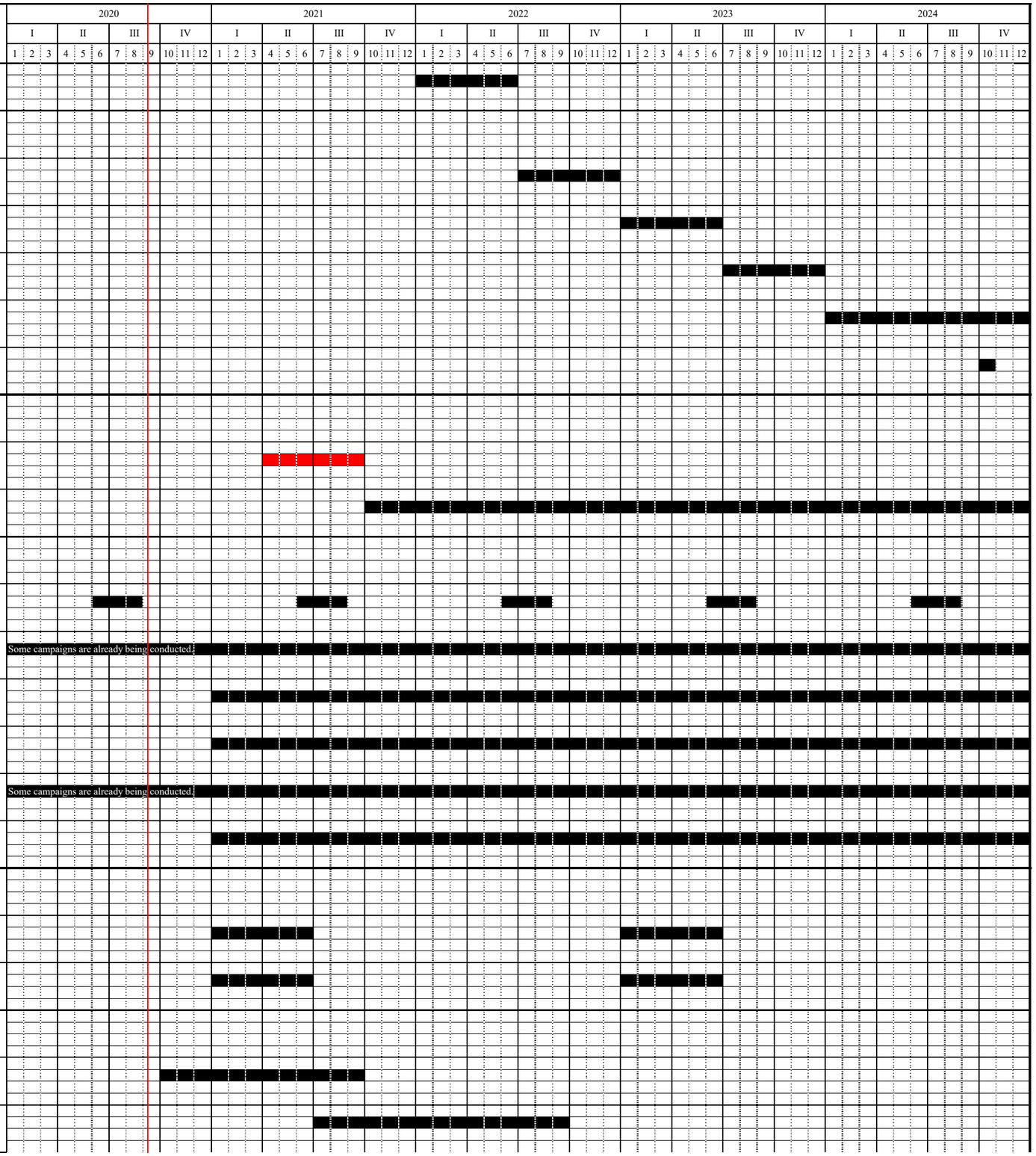
Related Contents of Master Plan 2018 approved by CMM	Actions taken during 2020 to 2024	Goal to be Achieved	Responsible Department, Section	Person in Charge	Related Organizations*	Direct Activity Expenditures	Expenditures Responsibility
AP4: Waste Treatment and Disposal	**AP4-1: Construction and Operation of the New Sanitary Landfill in Mathlemele**						
	(1) Construction Supervision together with MITA, FNDS, Matola Municipality	Supervision Report	DGRSU	DGRSU Head	DARHF/ CMM/ Matola Municipality/ FNDS	Necessary	DGRSU
	(2) Preparation of Landfill Operation Plan together with Cost Estimation	Landfill Operation Plan	DGRSU	DGRSU Head	DARHF/ CMM/ Matola Municipality/ FNDS	Necessary	DGRSU
	(3) Preparation of TOR for the New Landfill Operation	TOR for New Landfill Operation	DGRSU	DGRSU Head	DARHF/ CMM/ Matola Municipality/ FNDS	Necessary	DGRSU
	(4) Tender for the New Landfill Operation	Tender Report	DSMAS	Director	CMM/ Matola Municipality/ FNDS	Not Necessary	Not Necessary
	(5) Contract for the New Landfill Operation	Contract for New Landfill Operation	DSMAS	Director	CMM/ Matola Municipality/ FNDS	Not Necessary	Not Necessary
	(6) Supervision of the New Landfill Operation	Monitoring Report	DGRSU	DGRSU Head	CMM/ Matola Municipality/ FNDS	Necessary	DGRSU
	AP4-2: Construction and Operation of the New Sanitary Landfill in Katembe						
	(1) Study for Katembe Landfill by the world bank, including the feasibility study, basic design and financial plan	Study Report	DSMAS	Deputy Director of SWM	World Bank/ CMM/ MITA/ FNDS	Necessary	CMM
	(2) Tender for Detail Design and Construction of the new landfill	Tender Document and Tender Result	DSMAS	Director	CMM/ FNDS	Necessary	CMM
	(3) Construction Supervision	Supervision Report	DGRSU	DGRSU Head	DARHF/ CMM/ Matola Municipality/ FNDS	Necessary	DGRSU
	(4) Preparation of Landfill Operation Plan together with Cost Estimation	Landfill Operation Plan	DGRSU	DGRSU Head	DARHF/ CMM/ Matola Municipality/ FNDS	Necessary	DGRSU
	(5) Preparation of TOR for the New Landfill Operation	TOR for New Landfill Operation	DGRSU	DGRSU Head	DARHF/ CMM/ Matola Municipality/ FNDS	Necessary	DGRSU
	(6) Tender for the New Landfill Operation	Tender Report	DSMAS	Director	CMM/ Matola Municipality/ FNDS	Not Necessary	Not Necessary
	(7) Contract for the New Landfill Operation	Contract for New Landfill Operation	DSMAS	Director	CMM/ Matola Municipality/ FNDS	Not Necessary	Not Necessary
	(8) Supervision of the New Landfill Operation	Monitoring Report	DGRSU	DGRSU Head	CMM/ Matola Municipality/ FNDS	Necessary	DGRSU
	AP4-3: Closure of Hulene Dumping Site						
	(1) Preparation of tentative operation plan of Hulene Dumping site in accordance with MOEJ's suggestions	Tentative Operation Plan	DGRSU	DGRSU Head	MOEJ	Necessary	DGRSUS
	(2) Continuous rehabilitation works of Hulene Dumping site in accordance with MOEJ's suggestions.	TOR for Hulene rehabilitation works	DGRSU	DGRSU Head	CMM	Necessary	CMM
	(3) Re-Study for Closure Plan including the Post-Closure Plan	Study Report	DGRSU	DGRSU Head	CMM/ MITA	Necessary	DGRSUS
	(4) Preparation of TOR for the Closure Plan	TOR for Hulene Closure Plan	DGRSU	DGRSU Head	DARHF/ CMM	Necessary	DGRSUS
	(5) Tender for the Closure of Hulene Dumping Site	Tender Report	DSMAS	Director	DARHF/ CMM	Not Necessary	Not Necessary
	(6) Supervision of the Closure Works of Hulene Dumping Site	Monitoring Report	DGRSU	DGRSU Head	CMM	Necessary	DGRSUS



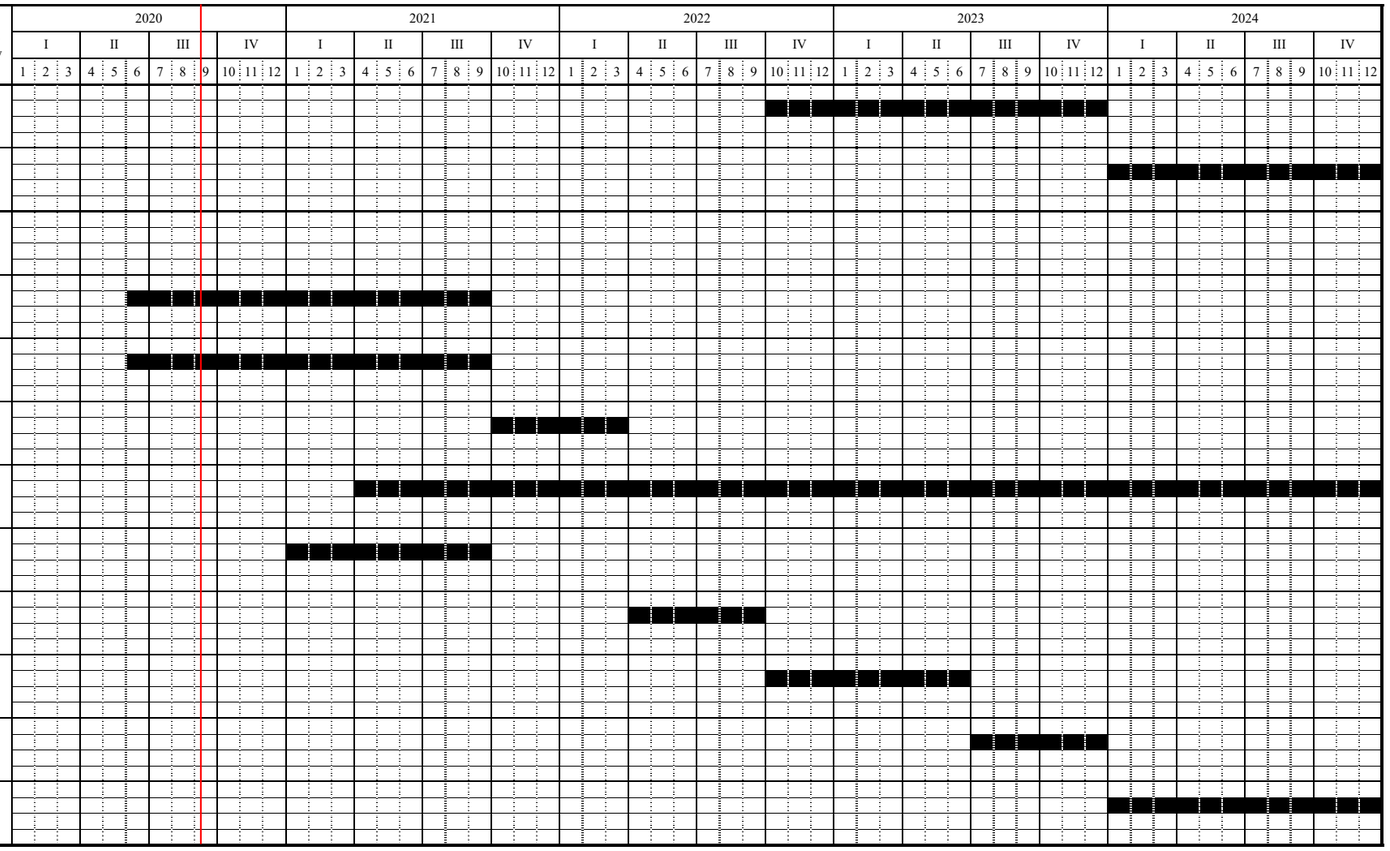
Related Contents of Master Plan 2018 approved by CMM	Actions taken during 2020 to 2024	Goal to be Achieved	Responsible Department, Section	Person in Charge	Related Organizations*	Direct Activity Expenditures	Expenditures Responsibility
	AP4-4: Introduction of Intermediate Treatment System						
	(1) Construction and Operation of MRF at the New Landfill (Action together with AP4-1)	Supervision Report, Monitoring Report	DGRSU	DGRSU Head	CMM/ Matola Municipality/ FNDS	Necessary	CMM
	(2) Formulation of Study Team for Introduction of Intermediate Treatment System	Study Team	DSMAS	Dirctor	DGRSU/ DGIA/ CMM	Not Necessary	Not Necessary
	(3) Study for Introduction of Intermediate Treatment System	Study Report	DGRSU	DGRSU Head	DGIA/ CMM	Necessary	DGRSU
AP5: 5R Promotion	**AP5-1: Upgrade 5R Policy Framework**						
	(1) Implementation of 5R Forum inviting Stakeholders (twice a year)	3R Forum Report	REA	REA Head	DGIA/ DGRSU/ DARHF	Necessary	DGIA
	(2) Close Coordination and Opinion Exchange with MITA about Laws and Regulations related to 5R	Minutes of Discussion	DGIA	DGIA Head	MITA	Not Necessary	Not Necessary
	(3) Study for the Incentives for 3R Activities	Study Report	REA	REA Head	DGIA/ DGRSU/ DARHF	Necessary	DGIA
	(4) Inventory Research of the Recycling Companies in Mozambique (once a year)	Research Report	DGIA	DGIA Head	MITA	Necessary	DGIA
	AP5-2: 3R Promotion in Urban Area, includng recyclables recovery from public buildings and spaces						
	(1) Analysis of 3R Activities in Urban Area	Analysis Report	REA	REA Head	DGIA/ JET	Necessary	DGIA
	(2) Coordination with concerned Private and NGO Actors for 3R Promotion	Minutes of Discussion	REA	REA Head	DGIA/ JET	Necessary	DGIA
	(3) Study for 3R Promotion including the Introduction of Segregated Waste Collection	Study Report	REA	REA Head	DGIA/ DGRSU/ JET	Necessary	DGIA
	AP5-3: Expansion of 5R Station in Sub-Urban Area (if this action can be applicable)						
	(1) Preparation of the New Operation Plan of 5R Station	New Operation Plan	REA	REA Head	DGIA/ DGRSU/ DARHF/ CMM	Not Necessary	Not Necessary
	(2) Preparation of TOR for the New 5R Station Operation for one Bairro	TOR for New 3R Station Operation	REA	REA Head	DGIA/ DGRSU/ DARHF/ CMM	Necessary	DGIA
	(3) Tender for 5R Station Operation	Tender Report	DSMAS	Director	CMM	Not Necessary	Not Necessary
	(4) Supervision of 5R Station Operation	Monitoring Report	REA	REA Head	DGIA	Necessary	DGIA
	(5) Preparation of TOR for the 5R Station Operation for another Bairro	TOR for New 3R Station Operation	REA	REA Head	DGIA/ DGRSU/ DARHF/ CMM	Necessary	DGIA
	(6) Tender for 5R Station Operation for another Bairro	Tender Report	DSMAS	Director	CMM	Not Necessary	Not Necessary
	(7) Supervision of Operation of 5R Stations at two (2) Bairros	Monitoring Report	REA	REA Head	DGIA	Necessary	DGIA
	AP5-4: Introduction of Segregated Waste Collection in Sub-Urban Area (if this action can be applicable)						
	(1) Study for the Feasibility of Introduction of Segregated Waste Collection in Sub-Urban Area (Action together with AP5-2(3))	Study Report	REA	REA Head	DGIA/ DGRSU/ DARHF/ CMM	Necessary	DIGA



Related Contents of Master Plan 2018 approved by CMM	Actions taken during 2020 to 2024	Goal to be Achieved	Responsible Department, Section	Person in Charge	Related Organizations*	Direct Activity Expenditures	Expenditures Responsibility
	(2) Reflection to the Updated M/P (related to AP1-5)	Updated M/P	DSMAS	Director	CMM	Not Necessary	Not Necessary
	AP5-5: Promotion of Household Composting (if this action can be applicable)						
	(1) Consideration of Technical Cooperation Agreement with UEM or other Appropriate Organizations	Technical Cooperation Agreement	REA	REA Head	DGIA	Necessary	DGIA
	(2) Preparation of Strategic Plan of Promotion of Household Composting	Strategic Plan	REA	REA Head	DGIA/ DGRSU	Not Necessary	Not Necessary
	(3) Procurement of Necessary Equipment such as Composting Bins	Procurement Reports	REA	REA Head	DGIA/ DGRSU/ DARHF	Necessary	DGIA
	(4) Implementation of Instruction and Monitoring of Household Composting	Monitoring Report	REA	REA Head	DGIA/ DGRSU	Necessary	REA
	(5) Implementation of Chemical Analysis on the Compost Product	Analysis Report	DGIA	DGIA Head	DARHF/ UEM	Necessary	DGIA
AP6: Civic Education	**AP6-1: Introduction of 5R Principles in Teaching Institutions**						
	(1) Preparation of 5R Instruction Plan including Selection of Target Schools	5R Instruction Plan	REA	REA Head	DGIA/ JET	Not Necessary	Not Necessary
	(2) Implementation of 5R Instruction at Target Schools	Instruction Report	REA	REA Head	DGIA/ JET	Necessary	REA
	AP6-2: Public Sensitization Campaigns in Critical Places						
	(1) Preparation of Annual Campaigns Plan for the Budget Request for the Following Year	Annual Campaign Plan	REA	REA Head	DGIA/ JET	Not Necessary	Not Necessary
	(2) Implementation of Campaign related to Stopping Waste Scattering	Campaign Report	REA	REA Head	DGIA/ JET	Necessary	REA
	(3) Implementation of Campaign related to Appropriate Use of Waste Containers	Campaign Report	REA	REA Head	DGIA/ JET	Necessary	REA
	(4) Implementation of Campaign related to Reduce the Informal Dumping	Campaign Report	REA	REA Head	DGIA/ JET	Necessary	REA
	(5) Implementation of Campaign related to 5R Principle Introduction	Campaign Report	REA	REA Head	DGIA/ JET	Necessary	REA
	(6) Implementation of Sensitization to Waste Pickers for appropriate Recycling Activities	Campaign Report	REA	REA Head	DGIA/ JET	Necessary	REA
AP7: Financial Management	**AP7-1: Estimation of Major Expenditure for the New Solid Waste Management System**						
	(1) Estimation of Operation Cost for the New Sanitary Landfill (related to AP4-1(2))	Study Report	DGRSU	DGRSU Head	DARHF/ CMM/ Matola Municipality/ FNDS	Necessary	Not Necessary
	(2) Estimation of Increase of Transportation Cost because of the New Sanitary Landfill (related to AP3-1(2) and 3-3(2))	Study Report	DGRSU	DGRSU Head	DARHF/ CMM	Not Necessary	Not Necessary
	AP7-2: Improvement of the Revenue Mechanism						
	(1) Study and Discussion about the Policy Change on the tipping fee exemption to large contractors	Study Report	DARHF	DARHF Head	DGRSU/ CMM/ JET	Necessary	DARHF
	(2) Negotiation with Large Contractors about inclusion of the Tipping Fee to the Contract (related to AP3-1(1) and AP3-3(1))	Minutes of Negotiation	DSMAS	Deputy Director of SWM	CMM	Not Necessary	Not Necessary



Related Contents of Master Plan 2018 approved by CMM	Actions taken during 2020 to 2024	Goal to be Achieved	Responsible Department, Section	Person in Charge	Related Organizations*	Direct Activity Expenditures	Expenditures Responsibility
	(3) Amendment of the Contract including Tipping Fee of the landfill (related to AP3-1(2) and AP3-3(2))	Contract Amendment	DSMAS	Director	CMM	Not Necessary	Not Necessary
	(4) Supervision of Tipping Fee Collection from Large Contractors	Monitoring Report	DARHF	DARHF Head	DGRSU/ CMM	Necessary	DSMAS
	AP7-3: Study for Change of Cleaning Tax Rate and its Charging System						
	(1) Study for Change of Cleaning Tax Rate Collected by EDM	Study Report	DARHF	DARHF Head	DGRSU/ CMM/ JET	Necessary	DSMAS
	(2) Study for Change of Cleaning Tax Rate Collected by the Proof of Service of the CMM	Study Report	DGRSU	DGRSU Head	DARHF/ CMM/ JET	Necessary	DSMAS
	(3) Preparation of Proposal for Change of Cleaning Tax Rate	New Cleaning Tax Proposal	DSMAS	Deputy Director of SWM	CMM/ JET	Not Necessary	Not Necessary
	(4) Upgrading the Proof of Service System	System Monitoring Report	DGRSU	DGRSU Head	DARHF/ CMM/ JET	Necessary	DSMAS
	(5) Study for Change of Fee Charging System of the Proof of Service	Study Report	DGRSU	DGRSU Head	DARHF/ CMM/ JET	Necessary	DSMAS
	(6) Preparation of TOR for Change of Fee Charging System	TOR for New Fee Charging System	DSMAS	Deputy Director of SWM	CMM/ JET	Not Necessary	Not Necessary
	(7) Tender for the Change of Fee Charging System	Tender Report	DSMAS	Director	CMM	Not Necessary	Not Necessary
	(8) Contract for the Change of Fee Charging System	Contract Report	DSMAS	Director	CMM	Not Necessary	Not Necessary
	(9) Implementation of the Change of Fee Charging System	Monitoring Report	DGRSU	DGRSU Head	DARHF/ CMM/ JET	Necessary	DSMAS



*Related Organizations: Other Department, Section, Private Firm/NGO/Cooperatives or so on.

Abbreviations: M/P (Master Plan), A/P (Action Plan), TBD (To Be Determined), DSMAS (Municipal Service for Environmental Management and Health, DARHF (Department of Administration, Human Resources and Finance), RRH (Human Resources Division), RAF (Office of Administration and Finance), RP (Distribution of Patrimony), DGRSU (Department of Urban Solid Waste Management), RGC (Contract Management Office), RFM (Inspection and Monitoring Office), RRP (Public Removal Office), RLM (Municipal Waste Disposal), DOPA (Workshop and Auto Park Department), RMG (General Mechanical Division), RAM (Distribution of Material Supply), RPA (Auto Park Office (Transportation)), RSBP (Metalwork, Bate-Chapa and Painting Office), DGIA (Department of Management and Environmental Inspection), RRU (Division of Urban Resilience), RIA (Environmental Inspection Office), REA - Division of Environmental and Sanitary Education)

Legend: : Original Schedule : Actual Schedule

Appendix 2-3
Comparison of M/P Monitoring Systems between Approved M/P and Draft M/P

Comparison of "6.2 Indicator Matrix and Monitoring System 2017 – 2027" in the approved M/P and "Chapter 7" in the revised M/P

Approved M/P (2018)

"6.2 Indicator Matrix and Monitoring System 2017 – 2027"

Component 1:	DMSC Capacity and Institutional Organization (Capacity Development, Supervision, Proof of Service, etc.)
Objective:	Improve Organizational and Institutional Quality
Indicator	1. Organizational Structure is Updated and Approved 2. Organizational Structure is operationalized

Result	**Indicator**
RH with technical skills required for USWM	· Key Personnel with full domain of USWM tools
DMSC Staff profiles is redefined	· Jobs filled according to planned profiles
DMSC effectively and efficiently applies the planning and monitoring tools	· Degree of application of planning and monitoring tools · Nr. Of Staff with deep knowledge of contract management · Nr. Staff from the monitoring department with expertise in the elaboration of ToRs

"Chapter 7" in the revised M/P

"Table 7.2 and 7.3 Matrix Indicator and Definition"

1. Re-Organization of DMSC		
	Indicator	**Definition**
1.1	Establishment of DMGRSUS	Organizational Change
1.2	Reorganization of DAF	Organizational Change
1.3	Continuous Capacity Development	Number of DMSC Staff who take training

Supervisors with full domain of the Ordinance and Regulations and apply them correctly	・ Nr of correctly applied fines. ・ Reduction in the number of citizen‘s complaints about errors in the application of Ordinance and Regulations
The Civic Education and Environmental Promotion Office is Established	・ updated organization chart

Component 2:	USWM (Collection, Transport, Degree of Service Coverage, final Disposal, Recycling, etc.)
Objective:	To improve the service provision quality in USWM
Indicator	1. Degree of coverage of cleaning services. 2. Quantity of USW discharged at the final destination (Ton / day) 3. Citizens' Level of satisfaction

Result	**Indicator**
The collection and transportation of all USW generated in Maputo city is guaranteed in an economically and environmentally acceptable way	・ Degree of coverage of cleaning services; ・ Number of existing Ecopoints

2. Collection & Transportation

	Indicator	**Definition**
2.1	Quantity of waste collection by urban contractor (ton/day)	Quantity of waste collected and transported by contractor for urban area
2.2	Amount of waste collection by secondary collection (ton/day)	Quantity of waste transported by contractor for secondary collection
2.3	Number of neighborhood of KaTembe with primary collection	Number of neighborhood of KaTembe where primary collection is implemented

3. Treatment & Disposal

	Indicator	**Definition**
3.1	Averaged daily quantity of	Quantity of transported waste

All USW collected in environmentally acceptable conditions are discharged	・ Quantity of USW discharged at the final destination ・ Quantities of recyclable withdrawn from the USWM system.
The negative environmental impact of USW is reduced in Maputo city	・ Percentage of USW collected from total waste generated in the city
USW generation is reduced through 3Rs activities	・ Quantities in tones of collected recyclables
Treatment stations are identified and established.	・ Number of Identified and Created Treatment Stations.
Sanitary Landfill built and operational. The Hulene Dumping site is closed and Requalified.	・ Landfill operation according to international norms and standards. ・ Reduction of Negative Impacts of HD
Citizens collaborate in USWM	・ Number of citizens practicing the 3Rs. ・ Number of reports by MOPA platform
Efficient Management of Contracts	・ Performance evaluation of private service providers. ・ Number of revised contracts.

	waste enter the landfill site (ton/day)	to the site including one for MRF
3.2	Average daily quantity of recyclables collected at MRF (ton/day)	Quantity of collected recyclables at MRF
3.3	Averaged daily quantity of waste disposed of at landfill (ton/day)	Total quantity of waste disposed of at landfill with residual waste from MRF

4. 3R Promotion

	Indicator	Definition
4.1	Amount of waste recycled in suburban area	Quantity of recyclables recovered by 3R station and household composting activities in suburb
4.2	Amount of waste recycled in urban area	Amount of recyclables recovered by 3R actors' activities in urban area
4.3	Workshops with 3R actors	Workshops on information sharing with 3R actors

5. Civic Education

	Indicator	Definition

	・ Number of new contractors hired

5.1	Introduction of 3R principles in teaching institutions	Percentage of schools per district that received training on 3R principles
5.2	Public sensitization campaigns in critical places	Percentage of neighborhoods per district where sensitization activities are conducted

Component 3:	Financial Management of USWM (Contract Management, Revenue, Costs, Cost Coverage)
Objective:	Ensuring Financial Sustainability of USWM
Indicator	1. Ratio of Price / Tons. 2. Degree of cost coverage. 3. Percentage relation between income and costs

Result	**Indicator**
The Proof of Service is Consolidated and Extended	・ Nr. Of companies registered in the PS system ・ Increased revenue collected on proof of service.
Extension of the cleaning fee payment basis	・ Number of households that pay the cleaning fee. ・ Nr of companies and institutions that pay the cleaning fee.

6. Financial Management		
	Indicator	**Definition**
6.1	Self-Coverage rate for SWM Cost	Coverage Rate on total SWM expenditure with DMSC internal revenue
6.2	Target coverage rate for Proof of service revenue	Coverage rate for full cost recovery by Proof of Service
6.3	Target coverage rate for Cleaning Tax	Coverage rate for full cost recovery by Cleaning Tax through EDM

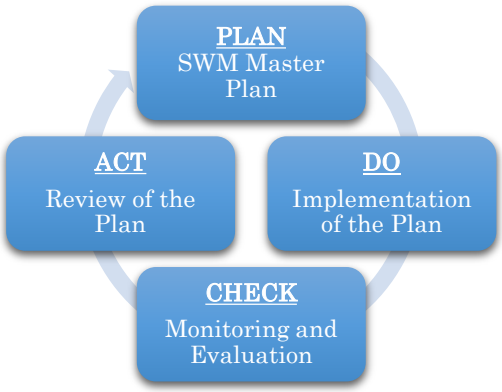
Appendix 2-4
Monitoring System of the Action Plan

MASTER PLAN MONITORING SYSTEM

1. Introduction

It is sometimes observed, in other countries, that the solid waste management master plan has become nothing but a mirage, especially in cases where the Master Plan was developed mainly by a third part. To avoid such situations and to use it efficiently, it is crucial that the contents and appropriate monitoring of the Master Plan are well understood. Fortunately, this Master Plan was prepared through joint work between Mozambican counterparts, mostly DSMAS staff, and JICA Expert Team as one of the outputs from activities under the JICA technical cooperation project. This active participation of DSMAS staff on the preparation process of the Master Plan should provide a sense of ownership for the Master Plan. In addition, CMM acquired experience in monitoring the Master Plan by making their efforts to comply with the programs and activities proposed in the previous Master Plan developed in 2008.

Based on such existing experience, monitoring of this master plan is to be conducted as "Check" under the concept of PDCA (Plan, Do, Check and Action) cycle.



Source: JICA Expert Team

Figure 7.1: PDCA Cycle of Master Plan

Monitoring will be done with the Indicators for measuring the achievement of implementation of the Master Plan comparing the targets set in this Chapter.

This Master Plan has a duration of ten (10) years up to 2027 and its target period will be divided into two stages, of which five (5) years are for the short-term plan and ten (10) years for the medium-term plan. Because Decree nº 94/2014 of 31 December stipulates that a Master Plan will be revised and modified every five (5) years, this Master Plan sets the targets for the first five years from 2017 to 2021.

All responsible entities for implementing the Master Plan, which are mainly under DSMAS, must ensure the achievement of targets, through their action plan and operational plan. they are also responsible for the monitoring of all indicators and must submit reports stating their progress, according to the agreed targets, to the Municipal Council for approval.

2. Consideration of Sustainable Development Goals (SDGs)

As it is known, the world is moving forward together to achieve the Sustainable Development Goals (SDGs), officially known as "Transforming our world: the 2030 Agenda for Sustainable Development", which was adopted by the United Nations member countries in September 2015. The SDGs were set as the post 2015 Development Agenda which was known as the Millennium Development Goals (MDGs). The SDGs contains 17 goals associated with 169 targets. Out of these, the following goals and targets are especially related to the solid waste management and 3R which should be considered for this Master Plan.

Details for SDGs can be referred in the web site below;

https://sustainabledevelopment.un.org/sdgs

Table 1: SDGs related to the SWM and 3R

Goal 11	Make cities and human settlements inclusive, safe, resilient and sustainable
Targets 11.6	By 2030, reduce the adverse per capita environmental impact of cities, including paying special attention to air quality and municipal and other waste management
Indicator 11.6.1	Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities

Goal 12	Ensure sustainable consumption and production patterns
Targets 12.5	By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse
Indicator 12.5.1	National recycling rate, tons of material recycled

Source: Summarized by JICA Expert Team from https://sustainabledevelopment.un.org/sdgs

3 Monitoring Indicators with Targets

Table 2 shows the monitoring indicators for each SWM category together with its definition, measuring method and target values from 2018 to 2022.

Table 7.2: Monitoring Indicators and Targets (2017 – 2021)

No	Indicator	Definition and how to measure	Target 2018	Target 2019	Target 2020	Target 2021	Target 2022
Re-Organization of DSMAS							
1.1	Establishment of DMGRSUS	Approved by CMM	In process	completed	-	-	-
1.2	Reorganization of DAF	Approved in DSMAS	In process	completed	-	-	-
1.3	Continuous Capacity Development	Number of DSMAS Staff who take training	5 staff	3 staff	3 staff	3 staff	3 staff
Collection & Transportation							
2.1	Averaged daily quantity of waste collection by service providers in urban area (ton/day)	Record of weighing bridge	114 *(182)*	115 *(185)*	116 *(188)*	117 *(191)*	117 *(195)*
Note : Above value is from Approved M/P (see Table 44: Cement City) with the assumption of collection coverage rate is 100% (see Table 49) *(Below value) is the reference value from Draft M/P prepared at the Previous JICA Project, with the assumption of gradual increase of collection coverage rate.*							
2.2	Averaged daily quantity of waste collection by secondary collection in sub-urban area (ton/day)	Record of weighing bridge	464 *(700)*	467 *(721)*	469 *(742)*	472 *(764)*	475 *(786)*
Note : Above value is from Approved M/P (see Table 44: suburban area) with the assumption of collection coverage rate is 100% (see Table 49) *(Below value) is the reference value from Draft M/P prepared at the Previous JICA Project, with the assumption of gradual increase of collection coverage rate.*							

No	Indicator	Definition and how to measure	Target 2018	Target 2019	Target 2020	Target 2021	Target 2022
2.3	Number of neighborhood of KaTembe with primary collection	Report by micro enterprise	1	3	3	5	5
Treatment & Disposal							
3.1	Averaged daily quantity of waste enter the landfill (ton/day)	Record of weighing scale	1,259	1,273	1,284	1,299	1,312
			(988)	*(1,026)*	*(1,066)*	*(1,106)*	*(1,148)*
Note : Above value is from Approved M/P (see Table 44:total) with the assumption of collection coverage rate is 100% (see Table 49) *(Below value) is the reference value from Draft M/P prepared at the Previous JICA Project, with the assumption of gradual increase of diversion (waste reduction) rate and self-disposal rate.*							
3.2	Average daily quantity of recyclables collected at MRF (ton/day)	Record of MRF operation	0	0	52	52	52
Note : Target value is the reference value from Draft M/P prepared at the Previous JICA Project, with the assumption of gradual increase of collection coverage rate.							
3.3	Averaged daily quantity of waste disposed of at landfill (ton/day)	By Calculation (= Index 3.1 – index 3.2)	1,259	1,273	1,232	1,247	1,260
			(988)	*(1,026)*	*(1,014)*	*(1,054)*	*(1,096)*
3R Promotion							
4.1	Annual Quantity of recyclables collected in urban area (ton/year)	DSMAS obtain data on recyclables recovered by private and non-governmental3R actors.	4,400	4,800	5,200	5,700	6,200
Note : Target value is the reference value from Draft M/P prepared at the Previous JICA Project, with the assumption of gradual annual increase of 10%.							
4.2	Annual quantity of waste recycled in the suburban area (ton/year)	DSMAS obtain data on recyclables recovered by 3R station and household composting activities	25	47	72	96	160
Note : Target value is the reference value from both approved M/P and draft M/P.							
4.3	Workshops with 3R actors	Number of workshops held	2 times	2 times	2 times	2 times	2 times
Civic Education							
5.1	Introduction of 3R principles in teaching institutions	Percentage of schools per district that received training on 3R principles	40 %	50 %	60 %	70 %	80 %
Note : Target value is set to achieve 80% in 2022 but not based on the detailed plan.							
5.2	Public sensitization campaigns in critical places	Percentage of neighborhoods per district where sensitization activities are conducted	10 %	20 %	30 %	40 %	50 %
Note : Target value is set to achieve 50% in 2022 but not based on the detailed plan.							
Financial Management							
6.1	Self-Coverage rate for SWM Cost	Annual financial report	100 %	100 %			
6.2	Target coverage rate for Proof of service revenue	Annual financial report	70 %	70 %	70 %	70 %	70%
6.3	Target coverage rate for Cleaning Tax	Stipulations in Municipal By-law	80 %	80 %	80 %	80 %	80 %

Source: JICA Expert Team

4 Monitoring System

Together with the monitoring index and targets described in Table 2, Table 3 also defines those responsible for providing the necessary data, the frequency of reports and an estimation of the required resources. The overall responsibility for the implementation of the monitoring system and the supervision of its prompt and adequate implementation belongs to the Director of the responsible sector of the Municipality, mainly the DSMAS. The current assignments must be reviewed, if there is an

organizational Sector reorientation such as establishing the DMGRSUS. The matrix and annual reports progress will be approved by the CMM.

Table 3: Monitoring Matrix

No	Indicator	Definition	Measurement methodology	Responsible	Frequency	Resources
Organization						
1.1	Establishment of DMGRSUS	Organizational Change	CMM Approval	DSMAS/CMM	Annually	DSMAS
1.2	Reorganization of DAF	Organizational Change	DSMAS Approval	DSMAS	Annually	DSMAS
1.3	Continuous Capacity Development	Number of DSMAS Staff who take training	Submission of Training Certificate	DSMAS	Annually	DSMAS
Collection & Transportation						
2.1	Quantity of waste collection by urban contractor (ton/day)	Quantity of waste collected and transported by contractor for urban area	Weighing bridge at landfill	DSMAS	Monthly	DSMAS
2.2	Amount of waste collection by secondary collection (ton/day)	Quantity of waste transported by contractor for secondary collection	Weighing bridge at landfill	DSMAS	Monthly	DSMAS
2.3	Number of neighborhood of KaTembe with primary collection	Number of neighborhood of KaTembe where primary collection is implemented	DSMAS monitor the contract with microenterprise	DSMAS	Annually	DSMAS
Treatment & Disposal						
3.1	Averaged daily quantity of waste enter the landfill site (ton/day)	Quantity of transported waste to the site including one for MRF	Record of weighing bridge	DSMAS and Matola City	Monthly	DSMAS and Matola City
3.2	Average daily quantity of recyclables collected at MRF (ton/day)	Quantity of collected recyclables at MRF	Record of MRF operation	DSMAS and Matola City	Monthly	DSMAS and Matola City
3.3	Averaged daily quantity of waste disposed of at landfill (ton/day)	Total quantity of waste disposed of at landfill with residual waste from MRF	By Calculation (= Index 3.1 – index 3.2)	DSMAS and Matola City	Monthly	DSMAS and Matola City
3R Promotion						
4.1	Amount of waste recycled in suburban area	Quantity of recyclables recovered by 3R station and household composting activities in suburb	DSMAS obtain data of recyclables recovered by 3R station and household composting activities	DSMAS	Monthly	DSMAS
4.2	Amount of waste recycled in urban area	Amount of recyclables recovered by 3R actors' activities in urban area	DSMAS obtain data on recyclables recovered by private and non-governmental 3R actors.	DSMAS	Biannually	Private and non-governmental 3R actors
4.3	Workshops with 3R actors	Workshops on information sharing with 3R actors	DSMAS take record on number of workshops held	DSMAS	Biannually	DSMAS

No	Indicator	Definition	Measurement methodology	Responsible	Frequency	Resources
Civic Education						
5.1	Introduction of 3R principles in teaching institutions	Percentage of schools per district that received training on 3R principles	Having an updated list of schools per district and organizing data where training activity is conducted	DSMAS	Monthly	DSMAS
5.2	Public sensitization campaigns in critical places	Percentage of neighborhoods per district where sensitization activities are conducted	Having an updated list of neighborhoods per district and organizing data where sensitization activity is conducted	DSMAS	Monthly	DSMAS
Financial Management						
6.1	Self-Coverage rate for SWM Cost	Coverage Rate on total SWM expenditure with DSMAS internal revenue	Calculated by the revenue / expenditure record in annual financial report	DSMAS/CMM	Annually	DAF/DSMAS
6.2	Target coverage rate for Proof of service revenue	Coverage rate for full cost recovery by Proof of Service	Calculated by analysis the Proof of Service Activities Record	DSMAS	Annually	PdS/DGRSU
6.3	Target coverage rate for Cleaning Tax	Coverage rate for full cost recovery by Cleaning Tax through EDM	Calculated by analysis the revenue record of Cleaning Tax through EDM	DSMAS	Annually	DARHF/DSMAS

Source: JICA Expert Team

Table 4: Implementation Schedule of the Activities

	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27
Updating the Master Plan and Action Plan											
Master Plan											
Monitoring of Master Plan											
Mid-term Review of Master Plan											
Waste Quantity and Quality and other Surveys											
Minor Updating of Master Plan											
Terminal Review of Master Plan											
Waste Quantity and Quality and other Surveys											
Preparation of New Master Plan											
Action Plan											
Monitoring of Action Plan (2017-2021)											
Preparation of Action Plan (2022-2026)											

	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27
Monitoring of Action Plan (2022-2026)											
Preparation of New Action Plan (2027-2031)											
Reorganization of DMSC											
Establishment of the directorate dedicated to SWM											
Reorganization of DAF (Financial Section)											
Capacity development of Directorate Staff											
Consideration of inter-municipal association for landfill operation											
Consideration of future model											
Collection & Transportation											
Urban collection											
Increase of transportation distance to Landfill											
Expansion of compactor collection											
Secondary collection											
Increase of transportation distance to Landfill											
Transportation waste of Katembe to new landfill											
Primary collection											
Primary collection in Katembe [1neighborhood]											
Primary collection in Katembe [3neighborhood]											
Primary collection in Katembe [5neighborhood]											
Removal of illegal dump and problems											
Procurement of backhoe loader		X									
Procurement of dump truck			X								
Waste Treatment and Disposal											
Final Disposal											
New Sanitary Landfill											
Construction of Phase 1 area											
Preparation of operation plan											
Tender and contract for operation											
Operation of Sanitary Landfill											
Plan and design for Phase 2 area development											

	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27
Tender for Phase 2 construction											
Construction of Phase 2 area											
Hulene Dumping Site											
Re-study for closure plan											
Re-tender and contract for closure											
Construction for closure works											
Post closure site development (if necessary)											
Intermediate Treatment System											
Construction of side facilities at new landfill											
Operation of side facilities											
Study for introduction of new treatment system											
3R Promotion											
Upgrade 3R policy framework											
Support 3R activity in urban area											
3R Station in suburb											
Segregated collection in suburb											
household composting in suburb											
Civic Education											
Introduction of 3R principles in teaching institutions											
Public sensitization campaigns in critical places											
Implementation of 3R promotion activities											
Educational campaigns for all residents											
Financial Management											
Major Expenditures for New System											
Estimation of operation cost of new sanitary landfill											
Estimation of transportation cost to new sanitary landfill											
Estimation of development cost for the phase 2 of sanitary landfill											
Revenue Improvement											

	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27
Study for policy change about tipping fee exemption to larger contractors											
Amendment of the contract with large contractor											
Charging tipping fee from large contractors											
Study for change of cleaning tax rate collected by EDM (Domestic and Non-domestic)											
Study for change of cleaning tax rate collected by the proof of service of CMM (Non-domestic)											
Review and change of Cleaning Tax											
Upgrading the proof of service system											
Study for the change of fee charge system of proof of service											
Implementation of new charging system											

Source: JICA Expert Team

Appendix-1 (table 4-5 of approved M/P, English translation version))

Table 4-5: USW production growth between 2017 - 2027 (tons / day)

Activity	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Cement City, high-density	84	85	86	86	87	87	87	88	88	89	89
Cement City, Townhouses	28	29	29	30	30	30	30	31	31	31	32
Suburban area	460	464	467	469	472	475	478	480	482	485	487
Rural area	45	45	46	46	46	47	47	47	47	47	48
Catembe	4										
Inhaca	1										
Waste from Markets and Fairs	113	114	115	115	116	116	117	117	118	118	119
Special removal	167	167	167	167	168	168	168	168	168	168	169
SW from Public Cleaning (SWPC)	60	60	60	60	60	61	61	61	61	62	62
Industrial and Commercial SW	283	290	298	306	315	323	332	341	351	361	371
TOTAL (tons / day)	**1245**	**1,259**	**1,273**	**1,284**	**1299**	**1312**	**1,325**	**1338**	**1,351**	**1366**	**1,382**

Source: DMSC adaptation from the GTZ-AGRESU methodology

Appendix-2 (Projection of Waste Generation, Collection and Disposal at Draft M/P

Scenario 2											
	2017	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Urban	101	102	104	106	107	109	110	112	113	115	116
Suburban area	679	700	721	742	764	786	808	831	854	877	901
Catembe	11	11	13	14	16	17	19	21	22	24	25
Inhaca	2	2	2	2	2	2	2	2	2	2	2
Sub total	794	816	840	864	888	913	939	965	991	1,018	1,045
Markets and Fairs waste	95	97	99	101	103	105	107	109	111	114	116
Commercial SW	78	79	81	82	84	86	87	89	91	93	95
SW Public cleaning (SWPC)	24	24	25	25	26	26	27	28	28	29	29
Green waste	40	41	42	42	43	44	45	46	47	48	49
Bulky waste	13	13	14	14	14	14	15	15	15	16	16
Construction waste	67	68	70	71	73	74	75	77	79	80	82
Industry waste	79	81	83	84	86	88	89	91	93	95	97
Sub total	396	404	412	420	429	437	446	455	464	473	483
Total [ton/day]	**1,190**	**1,220**	**1,252**	**1,284**	**1,317**	**1,351**	**1,385**	**1,420**	**1,455**	**1,491**	**1,528**
a. Diversion Rate	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12
b. Self-Disposal Rate	0.18	0.16	0.14	0.12	0.1	0.08	0.06	0.04	0.02	0	0
c. Final Disposal Rate	0.8	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.88
d. Final Disposal Quantity	952	988	1,026	1,066	1,106	1,148	1,191	1,235	1,280	1,327	1,344
e. Collection Quantity(1-b)	952	988	1,026	1,066	1,106	1,148	1,191	1,235	1,280	1,327	1,344
f. Diversin Quantity	24	37	50	64	79	95	111	128	146	164	183
g. Collection Rate	81.6%	83.5%	85.4%	87.4%	89.4%	91.4%	93.5%	95.6%	97.8%	100.0%	100.0%
h. Recycled Quantity at MR	0.0	0.0	0.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
i. Final Landfilled Quantity	952	988	1,026	1,014	1,054	1,096	1,139	1,183	1,228	1,275	1,292

Appendix 2-5
Mid-term Review Report of the Master Plan

MASTER PLAN FOR URBAN SOLID WASTE MANAGEMENT IN MAPUTO CITY

MID-TERM REVIEW REPORT

July 2023

DMAS and JICA Expert Team

1. BACKGROUD AND OBJECTIVE

Current master plan for urban solid waste management in Maputo City (hereinafter, the M/P) was approved in 2018. It was drafted in 2017 with the technical support by JICA Expert Team on "Technical Cooperation Project for Promotion of Sustainable 3R Activities in Maputo (2013 – 2017)" and edited by an external expert for its approval by the Municipal Assembly in 2018.

Target duration of the M/P is set to be ten (10) years from 2018 to 2027 and it is recommended to implement the mid-term review in the middle of this period in the Action Plan for the M/P. In addition, according to Article 8 of Regulation of Urban Solid Waste Management, which is Decree 94/2014, validity of the urban solid waste management plan is also five (5) years.

Upon such circumstances, the mid-term review was jointly implemented by the Municipal Directorate of Environment and Health of City Council of Maputo (DMAS) and JICA Expert Team (JET) as a part of activities under JICA Project for the Capacity Development to Realize Integrated Solid Waste Management in Greater Maputo.

On the other side, another project is undergoing for Maputo City, which is "Maputo Urban Transformation Project (PTUM)" by the World Bank. One of the project components is the partial revision of the M/P.

Therefore, the objective of this mid-term review of the M/P is to expect the review result will be utilized when the M/P will be revised under PTUM with the close involvement of DMAS.

2. PROCEDURES ON MID-TERM REVIEW

Mid-term review was implemented intensively from April to May 2023 as a joint activity between DMAS and JET, organizing a series of mid-term review meetings. Prior to the review, DMAS organized the core review team led by the deputy director and invited other DMAS staff who are concerned with each content of the M/P chapter by chapter. DMAS also prepared the meeting memo, by summarizing

the review result, for the development of this mid-term report. Following shows the review meeting date on each table of contents of the M/P and a set of meeting memo is attached in Appendix.

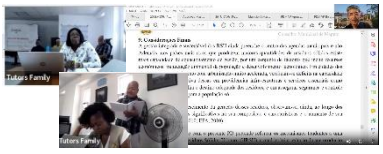
Table of Contents of M/P	Review meeting date
Overall (Table of Contents, Styles, Designs, or others) Chap. 1 The Master Plan	April 11 (PM 13:00 -)
Participants: <DSMAS> Stela, Nilza, Raul, Ricarda, Linda, Florencia, Antonio, Rute <JET> Soeda, Dionildes	
Chap. 2 Basic Information of USWM	April 14 (AM 10:00 -)
Participants: <DSMAS> Stela, Raul, Ricarda, Linda, Florencia, Leonard, Hortencia, Sheila, Moises <JET> Soeda, Mario, Dionildes	
Chap. 3 Current Management of USW in Maputo	April 18 (AM 10:00 -)
Participants: <DSMAS> Stela, Raul, Ricarda, Linda, Leonard, Anselmo, Simao, Hortencia, Antonio, Alexandre <JET> Soeda, Ace, Mario, Rogerio, Dionildes	
Chap. 5 Projection of Amount of USW (2017 – 2027) Chap. 6 Planning and Monitoring	April 19 (AM 10:00 -)
Participants: <DSMAS> Stela, Raul, Ricarda, Linda, Anselmo, Faustino, Simao, Antonio, Rafael <JET> Soeda, Ace, Mario, Rogerio, Silvino	
Section 7.4 Funding for USWM	April 21 (AM 10:00 -)
Participants: <DSMAS> Stela, Raul, Ricarda, Leonard, Anselmo, Faustino, Simao, Antonio, Zaina, Rafael <JET> Soeda, Ace, Mario, Rogerio, Silvino	
Chap. 4 Interventions in the scope of the 3Rs Chap. 7 Civic Education and Citizens Sensitization	April 24 (PM 13:00 -)
Participants: <DSMAS> Raul, Vania, Constancia, Edson <JET> Soeda, Mario, Dionildes	
Chap. 8 Implementation Schedule Chap. 9 Final Consideration	May 2 (AM 9:00 -)
Participants: <DSMAS> Stela, Raul, Nilza, Ricarda, Linda, Florencia, Faustino, Rute <JET> Soeda, Dionildes	

Table of Contents of M/P	Review meeting date
Executive Summary	July 13 (PM 13:00 -)
Bibliography	
Annexes	
Participants: <DSMAS> Sergio, Stela, Nilza, Raul, Ricarda, Linda, Florencia, <JET> Soeda, Dionildes, Fonseca	

Note: Participants name with underline are note-takers

Source: JICA Expert Team

3. RESULT OF MID-TERM REVIEW

Result of Mid-term review is summarized in the below a current chapter by chapter.

(1) Overall (Table of contents, styles, design, others)

1) Recognized points

- ✓ There are some incomplete parts in the structure of the M/P. For example, some table or figures are the same ones just copied from the previous M/P developed in 2007 with the technical assistance of GTZ (now GIZ) without updates.
- ✓ It is also observed some inconsistent description in logic. For example, in Chapter 7 which title is “Civic Educations and Citizen’s Sensitization”, there is the sub-chapter “7.4 Funding for USWM” which is describing about the financial aspects that is completely deferent topic to the Chapter title.
- ✓ It could be assumed these are because that modifications on the draft M/P, which was developed in 2017 with the technical assistance of JICA, were done during the approval process of the M/P, but incompletely due to some reasons, probably a shortage of modification time or lack of communication between CMM and a consultant who medicated the plan.

2) Recommendations

- ✓ Table of Contents is not necessary to be the same as the previous M/P. It should be re-organized appropriately by referring National Decree 94/2014, which is the regulation on Urban Solid Waste Management, and existing M/P guidelines prepared by JICA technical cooperation project in 2017 and by MTA in 2020.

- ✓ It must be also kept in mind to make the M/P easier to read with appropriate adjustment by unifying or effective using fonts and table / chart formats, in addition to coloring and use of photographs, etc.
- ✓ Current situations should be updated by the joint work between DSMAS and Consultant hired by PTUM as much as possible when the M/P will be revised. It is recommended to implement SWOT analysis, following National Decree 94/2014.
- ✓ Title of figures and tables should be given in short words.

(2) Executive Summary

1) Recognized points

- ✓ Current executive summary is mostly copied and pasted from the former M/P 2007, although it is observed some modification or some additional explanation such as the collapse of a part of Hulene Dumping Site were made. For example, Motto and general objective of the M/P are the same as those in the former M/P.
- ✓ In the same way, Figure 1 is the same figure in the former M/P 2007, showing the predicted curb on the ratio between the service coverage and urban solid waste management cost, but target duration was still kept from 2007 to 2017. This may make the readers being confused.
- ✓ Contents of Executive Summary does not correctly summarize the contents described in the M/P which comes after this in the document. In the current executive summary, there are seven (7) itemized expected results described after motto and other seven (7) itemized results described after the general objective of the M/P, while there is the description on the main elements and respective objectives in Table 01. These are a kind of duplicated expression and not clearly related to the descriptions in the M/P, which might also make the readers confusing.

2) Recommendations

- ✓ Motto (or vision) of the M/P could be the same as that in the former M/P or could be changed, but in any case, it should be determined through careful discussions by DSMAS and other stakeholders, not given by the third party, as well as objective of the M/P.
- ✓ Executive Summary is the short explanation which should be consistent with the contents of the M/P so that the reader could easily understand what are discussed in the M/P.

(3) Chapter 1 “The Master Plan”

1) Recognized points

- ✓ In Sub-chapter 1.1, there are some duplications observed in the list of objectives together with its numbering.
- ✓ It is said that the M/P has to be revised and updated every three (3) years. However, according to the National Decree National 94/2014, the M/P could be revised and updated every five (5) years.
- ✓ In Sub-chapter 1.3, it is said that the M/P is composed by three (3) parts. However, there is no relationship observed between such parts and current table of contents.
- ✓ In Sub-chapter 1.4 and 1.5, there are the description about legal context and legal framework with the introduction of related national and local regulations related to the waste management. Sub-chapter 1.7 says these legal frameworks are summarized in Annex 10.

2) Recommendations

- ✓ This chapter with the title of “The Master Plan” should focus on the description on what this M/P is, with the explanation of its structure which should be consistent with the contents of the M/P described in the following chapters. Thus, it should be discussed if the legal context and framework which are currently described in this chapter could be described in this chapter together or should be separated to another chapter. It is recommended to set the separate chapter for the legal context with appropriate chapter title so that the readers can easily understand where this matter are described.
- ✓ It is recommended to updates on the description of legal frameworks if any changes are made.

(4) Chapter 2 “Basic Information of Urban Solid Waste Management (USWM)

1) Recognized points

- ✓ Some of natural and social data such as meteorological data, population or municipal infrastructures are rather old information to be updated. Waste composition data was from JICA’s survey conducted 10 years ago, in 2013.
- ✓ Some table or figure do not put their title or included in the text. Data sources are not always shown for tables and figures.

- ✓ Since the style of tables is not unified, it is difficult to read, as well as figures for the waste composition.
- ✓ There are some descriptions in the boxes in Page 25 and Page 40, but not directly related to the text in the M/P. It is understandable why these boxes are inserted.

2) Recommendations

- ✓ All data in tables and figures should be reviewed whether they could be updated or not, then it is recommended to updates them as much as possible with the description of data sources.
- ✓ When it will be described about the climatic conditions, it could be mentioned about recent impacts due to the climate change.
- ✓ It is recommended for DSMAS to implement the waste quantity and quality survey as earlier as possible as proposed in the Action Plan, regardless the timing when the M/P will be revised.

(5) Chapter 3 "Current Management of Urban Solid Waste (USW) in Maputo

1) Recognized points

- ✓ As mentioned above, current situations described in the M/P were at the time of its development, means from 2013 to 2017. Some of situations have been changed after the approval of the M/P. For example, an organizational structure of the municipal directorate for the waste management was re-organized from DMSC to DSMAS, separating the section for the cemeteries.
- ✓ Figure 8 shows the proposal of the organizational structure after separating the section for the cemeteries. However, this chapter should focus to describe the current situations only and such proposal or planning shall be come into the following chapters.
- ✓ In Sub-chapter 3.2, there is the description about the recommendable management model, but, as same as above, it should be described at an appropriate chapter. In the middle of Sub-chapter 3.2, a topic related to the financial matter suddenly comes and continues to the following Sub-chapters, making some confusion.
- ✓ Data and information related to the current financial matters, revenues and expenditures, are rather old up to 2017 or earlier.

- ✓ There is the description about the survey on degree of citizen's satisfaction in the last lines in Page 56., but according to DSMAS, such surveys are not implemented these days.

- ✓ As previously mentioned, the result of SWOT analysis on the current situation, which is recommended in the National Decree 94/2014, is missing. In Draft M/P 2017, actually, there was the result of SWOT analysis what DSMAS and JET jointly conducted but was totally removed during the approval process.

2) Recommendations

- ✓ Description about the organization structure should be updated according to the latest structure of CMM and DSMAS with the date of confirmation like using "As of xxx", including the number of municipal employees. If the latest organization will be still under the approval process, it should be annotated.

- ✓ When the M/P will be revised, It should be discussed where shall be an appropriate chapter for the description of organization chart, the previous chapter for basic information of urban solid waste management or this chapter.

- ✓ Considering the recent circumstance which is the approval of the establishment of the municipal enterprise for the waste management, more detailed explanation on the municipal enterprise such as advantage and disadvantage shall be described together with the description of its background.

- ✓ Financial data and current mechanism shall be updated as well as other aspects such as waste collection system at both urban area and suburban area, including the newcomer for the secondary transportation which is "Clean Africa", and updated information of the micro-enterprises for the primary collection in Sub-urban area.

- ✓ Regarding the current waste treatment and disposal, the collapse of Hulene dumping site in 2018 should be described together with its rehabilitation works with the assistance of Japanese Government.

- ✓ Current status of the development of new landfills at both Mathlemele and Katembe should be also described.

- ✓ It is recommended to put the mapping information of critical points in the city with the inappropriate accumulation of discharged waste at the streets, open space, ravines and depressions.

- ✓ It is recommended to show the material flow of municipal waste from its generation to final disposal via some recycling activities during its process in this Chapter.

(6) Chapter 4 "Interventions in the scope of the 3Rs"

1) Recognized points

- ✓ There are some descriptions about the pilot projects related to waste reduction through 3Rs activities implemented during the previous JICA technical cooperation project. However, sub-title for the source separation pilot project in Chamanculo D bairro is missing.

- ✓ In addition to above mentioned pilot projects, some other activities related to the 3Rs have been implemented by DSMAS or other stakeholders.

- ✓ Title of Sub-Chapter 4.4 which is "Other aspects of USWM" is not match the contents of Section 4.4.1 "Public Perception and Civic Education" and 4.4.2 Participants (Stakeholders") in USWM area.

- ✓ It is difficult to understand why Sub-Chapter 4.5 "Problem analysis and performance indicators" is located under this Chapter, because its description is not completely related to 3Rs. Actually, Section 4.5.1 and 4.5.2 describe the analysis of "Institutional situation" and "Technical and operation situation".

- ✓ In addition, some statements as shown below are suddenly shown up which ate from some external literature, not from the facts of Maputo City.

    - The Urban Solid Waste Management System is still below the desired level, characterized by limited institutional capacity, namely the human, material, and financial for an Integrated Management of USW.

- ✓ There is the explanation that the capacity building of CMM started with the creation of partnerships between AGRESU and succeeded by ProMaputo (2007-15). However, there is no description about JICA's technical cooperation project started from 2013 to also aim to develop the capacity of CMM and DSMAS on the waste management.

- ✓ At the end of this chapter, suddenly, an unclear material flow of the municipal waste shows up. This material flow seems to be copied and pasted from the old M/P 2007 with some updates.

2) Recommendations

- ✓ It should be discussed when the M/P will be revised if this chapter related to 3Rs (or 5Rs) shall be independent as it is or be included in the previous chapter which is the current conditions.
- ✓ "3R" shall be replaced into "5R" with its explanation "Rethink, Refuse, Reduce, Reuse and Recycle" because this 5R concept has been already pervasive among residents through the public awareness campaigns so far.
- ✓ As well as other chapters, chapter title, contents and structure shall be re-organized, as well as that data and information in the current M/P shall be updated according to the recent situations.

(7) Chapter 5 "Projection of Amount of USW (2017 – 2027)"

1) Recognized points

- ✓ This Chapter is very important because the projection of waste generation quantity is the fundamental condition to consider all aspect of waste management. Current M/P considers population growth and economic growth for its projection. Although the footnote of Table 44 says "DMSC adaptation from the GIZ-AGRESU methodology", Current DSMAS staff seems not to realize this methodology.
- ✓ Table 45 shows summary of basic data for different types of USW collection, but it is unclear what objective of this table, because it is not directly related to the waste projection.
- ✓ In the current M/P. description about the final disposal site and intermediate treatment options are included in Sub-Chapter 5.4. although this chapter should describe the projection of waste amount.

2) Recommendations

- ✓ Projection of amount of municipal waste shall be updated based on the recent data which are actual weighbridge data recorded at Hulene dumping site and population data. Methodology and base data for the estimation should be also clearly and logically explained in the M/P.
- ✓ Description about the final disposal site and intermediate treatment options should be replaced to the appropriate chapters, which is the planning part, Chapter 6 in the current M/P. In addition,

updated information such as the construction plan of a new landfill at Katembe shall be also included.

(8) Chapter 6 “Planning and Monitoring”

1) Recognized points

- ✓ Despite the title of this chapter is “Planning of Monitoring”, there is no contents related to the monitoring in this chapter.

- ✓ Actually, in the draft M/P developed during the previous JICA technical cooperation project, detail explanations of proposed plan of each aspect of the waste management were described after Sub-Chapter 6.1 which explains five fundamental approaches to the appropriate planning. However, in the approved M/P, many of these detail explanations were removed and only description about waste collection / transportation and promotion of 3Rs activities were remained. It may cause very unbalance structure for this chapter which should be most essential part of the M/P.

- ✓ Table 49 “Level of Service for Collection and Transportation of USW in Different Areas of Maputo” shows the level of service for the waste removal at all areas in the City had reached 100% but it is not referred to the planning of waste collection and transportation services which should be discussed in this Chapter.

2) Recommendations

- ✓ As mentioned above, although this chapter should be a core part of the M/P which describes the fundamental plan on each process of the waste management, rules on waste discharge, collection & transportation, recycling and other treatment, final disposal, public awareness raising and financial management with necessary projects, current contents could be said quite incomplete and appropriate. Therefore, the structure in this chapter should be carefully re-organized in the revised M/P.

- ✓ New condition which is the construction plan of the new landfill in Katembe and related activities at Hulene dumping site under PTUM should be added in the revised M/P.

- ✓ In addition, related to the above, it is recommended to refer the result of a comparison study on the alternative transportation plan to the new landfills at both Katembe and Mathlemele developed during JICA project.

- ✓ New strategy on financial management on the waste management which is now under discussion in CMM should be also reflected to the revised M/P.
- ✓ The word “Monitoring” shall be removed from the title of this chapter and it is recommended to set another individual chapter for the monitoring of the M/P.

(9) Chapter 7 “Civic Education and Citizens Sensitization”

1) Recognized points

- ✓ Under the title of this chapter “Civic Education and Citizens Sensitization”, there is the different topic which is “financing for urban solid waste management” is included. Descriptions on both topics were referred from the draft M/P as they were at the year of 2017.
- ✓ After the approval of the current M/P in 2018, there was a very fundamental re-organization of DSMAS which merged with Environmental Department. This re-organization made a good collaboration on the civic education aspects within DSMAS.
- ✓ Related to this, there was a discussion on the technical wording on this sector, “civic education” or “environmental education” among the DSMAS staffs who participated in the M/P review meeting.

2) Recommendations

- ✓ As mentioned above, it should be discussed when the M/P will be updated if this sector, civic education and citizens sensitization, shall be in independent chapter or included together with other sectors, as well as “financing for urban solid waste management”
- ✓ As also mentioned above, it is recommended to take a careful discussion on the appropriate use of technical wording on this sector, “civic education” or “environmental education”.

(10) Chapter 8 “Implementation Schedule”

1) Recognized points

- ✓ Under the title of this chapter “Implementation Schedule”, there is Table 70 which shows “Indicator Matrix and Monitoring System 2017 – 2027” which is rather different topic than the title. There is also no explanation in the document about this Table 70.

- ✓ Table 69 “Implementation Schedule of Activities” is the same schedule proposed in the draft M/P, although the contents of the approved M/P had been modified from the draft M/P during its approval process. It means there is a lack of consistency between the implementation schedule and activities stipulated in the approved M/P.

- ✓ Table 70 “Indicator Matrix and Monitoring System 2017 – 2027” shows the monitoring indicators and their means of verification buy no numeral targets to be achieved by the certain timing.

2) Recommendations

- ✓ Most important condition for preparing the implementation schedule of the revised M/P is the construction and operation schedule of new landfills at Katembe and Mathlemele. Therefore, frequent and close communication with PTUM team and other stakeholders such as MTA, FNDS and Matola City is very crucial.

- ✓ In addition to the implementation schedule, implementation structure with private sectors and possible establishment of the municipal enterprises shall be discussed.

- ✓ It is recommended to separate the part of monitoring of M/P from this chapter.

- ✓ Monitoring index should have numeral targets so that it could be easier to monitor the progress of the M/P.

(11) **Chapter 9 “Final Consideration”**

1) Recognized points

- ✓ There are very general explanations about waste management referring from the literatures in this chapter, but It is unclear what is the objective of this chapter as “Final Consideration” at the end of the M/P. Any pointes to be considered would be discussed and solved in the M/P. If its objective aims to summarize the contents of the M/P, there is already “Executive Summary” at the beginning of the document.

2) Recommendations

- ✓ It should be discussed if this chapter itself is necessary or not. If yes, it is recommended to clarify its objective.

(12) **Bibliography and Annexes**

1) Recognized points

- ✓ Some of bibliographies are copied and pasted from the old M/P developed in 2007 and some of these are not directly related to the contents of the current approved M/P.
- ✓ As well as above, some of Annexes are just copied and pasted from the old M/P developed in 2007 and some of these are not updated.

2) Recommendations

- ✓ Since both bibliographies and annexes are very important information and data to understand the contents of the M/P concretely and effectively, it is recommended to select these which are really related to the contents of the M/P.

4. CONCLUSION

As mentioned in the previous section, the current M/P which was approved in 2018 by CMM has some incomplete parts in its structure and also some inconsistent description in its logic that were happened during the modification process on the draft M/P to get the approval from CMM Assembly.

Main objective of this mid-term review of the approved M/P is not to find fault with such incomplete parts and structure, but to prevent recurrence and make the next revised M/P a practically usable document.

In order to achieve this objective, it is recommended that, as also previously stated, full engagement of DSMAS, who is the responsible organization for the waste management in Maputo City, to the updating process of the M/P with the consultant team contracted under PTUM.

It should be noted that the technical capacify of DSMAS has been remarkably improved since the time of development of the first M/P in 2007 through its accumulated experiences by participation to AGRESU, ProMaputo and JICA Technical Cooperation. Without DSMAS's concrete understanding on the contents, the revised M/P will not be feasible and practical.

In addition, an approval process of the revised M/P shall be clear and transparent.

5. APPENDIX (MEETING MEMOS)

- MP review meeting memo_chap 1_EN
- MP review meeting memo_chap 2_EN
- MP review meeting memo_chap 3_EN
- MP review meeting memo_chap 4&7_EN
- MP review meeting memo_chap 5&6_EN
- MP review meeting memo_chap 7.4_EN
- MP review meeting memo_chap 8&9_EN
- MP review meeting memo_ES_Bibliography_EN

Notes on the first mid-term review meeting of the USW Management Plan.

1. **Chapter I: General Provisions**

- Rute: The USWMMP review should consider the current status of USWM in Maputo, giving special attention to the following objectives and challenges.
- Florência: There is a need to include environmental aspects in the review of the USWMMP

  Soeda: Is the inclusion of environmental issues in the revised USWMMP pertinent or not, given the provisions of Decree 94/2014?

- DMAS staff responded that the Master Plan under revision is for USWM for Maputo City, however, it should accommodate the issues related to the environment, including the recently approved environmental legislation as this component is associated with.
- Meriamo: We suggest that the chapter on general aspects of the Master Plan should include the vision, the objectives, the background and legitimization, and the guiding structure of the Master Plan so that it can guide us in knowing the contents dealt with in this plan.
- For a better organization and identification of the contents, the table of contents should be highlighted in chapters with letters or fonts that are different from the other subchapters;
- The document should be colored to make it appealing to read, and the issue of the Maputo Municipality vision (Most Beautiful, Clean, Prosperous and Solidary City) should be reviewed.
- Section 1.3 (Structure and outline for the Master Plan) should appear right after the executive summary;
- Chilaule: Proposed the introduction of a chapter that reflects aspects of the legal context of Solid Waste Management to integrate the Legal Framework that combines Section 1.2 (Framework and Legitimization) and 1.5 (Legal Framework) and briefly addresses all current legislation in force in the country applicable to USWMMP.
- Review the aspects dealt with in the table of contents and in the rest of the document according to the new DSMAS structure.
- The table of contents (appendices) and the rest of the document must take into account the current database (updated sources).
- The titles of the tables must be shorter (a topic).
- In the objectives there are duplicated items, for example: number 1 and 8 & 2 and 9.

In summary, there is a need to review the table of contents of USWMMP and take into consideration the observations given.

DMAS participants: Meriamo Stela, Nilza Zandamela, Florência Martins, Rute Massingue, Raul Chilaule, António Ferreira, Ricarda Jemisse, Linda Verdiano,

Minutes of the meeting on the midterm review of Master Plan for USWM

Chapter II: Basic Information for the Urban Solid Waste Management

2.1. Historical Summary of Maputo

Mr. Raul Chilaule: The historical summary should include details on climate change impact on Maputo City.

Director Stela: Considering the aspects about climate change impact on Maputo City, it should be updated the temperature map because it mentions data from the years 1986 – 2015.

Mr. Soeda: Establish the link between SWM and climate change.

Director Stela: When making the description of Maputo City, it should be update the data, based on the National Institute of Statistic (INE) information.

Gheographic and Climate Description

2.2. Description of the Economy and Infrastructure

Director Stela: The current information in the master plan reflects the data from 2014 to 2016, so it should be updated.

Mr. Mário Fijamo: There is a need of updating the data because when the Master Plan for USWM was being elaborated, it was used projections.

Mr. Raul Chilaule: There is a need of confirming the neighborhoods of Maputo City - 64 neighborhoods.

Mr. Soeda: It should be inserted a table illustrating the level of development of Maputo City and update the infrastructure and water supply.

2.3. Demographic and Urban descprition

Mr. Soeda: The tables 06 and 07 in USWM Master Plan should demonstrate the amount of SW produced by each type of urban area.

Mr. Raul Chilaule: With the construction of the new bridge, KaTembe's data should be updated.

Director Stela: The information inside the rectangle is not properly framed, it should be removed.

2.4. Urban Solid Waste Description

Mr. Raul Chilaule: It should reference the sources of the information and update the USWM Master Plan because at the moment the Municipal Ordinance is being updated.

2.5. Production and Composition of USW in Maputo

Director Stela: It should be updated the table 08 because in 2013 a characterization study was done with JICA and there is data that was updated based on the research.

Mr. Soeda: Recommended to conduct a new research in order to obtain updated data.

Mário Fijamo: Table 10 and 11, in the last survey, the estimation of the commercial waste was not done because it was verified in the field that the waste was mixed.

In short, the last rectangle should be removed because the information is repeated in the text above.

MUNICIPALITY OF MAPUTO

CITY COUNCIL

MUNICIPAL DIRECTORATE FOR ENVIRONMENTAL AND SOLID WASTE MANAGEMENT SERVICE

URBAN SOLID WASTE MANAGEMENT DEPARTMENT

Contract Management Section

Notes of findings to update the Master Plan of Urban Solid Waste Management

Date: 04/18/2023

Time: 10:00 am

Chapter III

3.1. Organizational structure

- Revise the title, instead of GRSU Organizational Structure, it reads CMM /DSMAS Organizational Structure;
- Review the designation of the City Council for Solid Waste Management and Cemetery to the City Council for Territorial Planning, Environment and Construction and the Municipal Directorate for Solid Waste Management and Cemeteries to the Municipal Directorate for Environmental and Solid Waste Management;
- Review the content of the 1st paragraph is not in agreement, for example: (see 3rd sentence);
- Update the Municipality Law 2/97 of February 18th, which was revoked by Law 06/2008 of August 3rd;

Fig.06: CMM organizational chart

- The organizational structure must be updated taking into account that it is still in the process of being revised (it was not approved);
- In reviewing the organizational structure, it should be restricted to VOTAC and DSMAS and not to the general organizational structure of the CMM;
- In the event of any changes, it is necessary to request the updated Organizational Structure from the Human Resources Directorate Headquarters;
- When updating documents, it is necessary refer to the date of their update, since the Organizational Structure is constantly being revised;

Fig. 07. DMAS Organizational Structure

- Update the document in accordance with the new attributions of the Directorate and refer to the date of its update;
- The Organizational Structure must be moved from chapter III to chapter II, since it was inherited from the previous Master Plan;

Table 2.2: DSMAS Staff

- It must be updated, since it underwent the restructuring of the Departments and the respective personnel (eliminate the Planning and Monitoring Department and adding the Environmental and Inspection Management Department);

Table 2.2.1: Cemetery Management

- It must be eliminated, since this Directorate was dissociated to another Council;

3.2. Private Sector Involvement and Recommendable Management Model

- It is necessary to carry out a detailed study on the creation of an autonomous Municipal Enterprise for SWM.

3.3. Revenue from Cleaning Fees

- It is necessary to review the currently fees collected taking into account the study carried out;
- Information on expenses and revenue for the last 5 years must be included;
- Mention should be made of the growth in the number of taxpayers paying fees;

3.4. SWM expenses

Table 26: DSMAS Approved Budget by the Municipal Assembly for the years 2015, 2016 and 2017

- There is a need to update the table according to information from the last 5 years;

3.5. The Removal of SW in Maputo City

- The collection system should also mirror the respective system for monitoring the activities to be carried out in the signed contracts.
- In the description of service providers, Clean Africa should be included, taking into account the current reality of the companies that provide the services;

Tables 27 (Objectives of the Services) and 28 (Equipment of Ecolife company)

- They must be revised according to the current situation, reflecting the last 5 years;

3.6 Primary Collection

- Update tables 29, 30 and 31 according to current information;

3.7 Secondary Collection

- Update tables 32, 33 and 34 that reflect the amounts of waste collected, taking into account the last 5 years;

3.8. Solid Waste Management Equipment

3.8.1 Current status of the Auto Workshop

- Update the acquired and currently existing equipment for SW treatment.

3.8.2 Industrial and Commercial Waste Removal

- Reviewing the information contained in the text, since it talks much more about the registration of waste producers and taking into account that everyone must have a waste collection provider regardless of the quantities produced;
- Regarding industrial waste, it should be added how they should be treated and where they should be taken;

3.9. Medical Waste

- Information regarding the location and capacity of existing incinerators in the Municipality of Maputo should be added to the text;

3.10. Treatment and Final Disposal of SW

Regarding waste treatment, the treatment of special solid waste should be included in the text;

3.10.1. Hulene dumpsite

About the Hulene Municipal Dumpster, the following information should be added:

- Update the extension area of Hulene Municipal Dumpster from 17 hectares to 22 hectares;
- Information on the accident that happened in 2018 of the landslides of the Hulene Municipal Dumpster that claimed human lives;
- Talk about the support provided by the Government of Japan to ensure the operationalization of the Hulene Municipal Dumpster;
- The volume of waste transported and deposited in the Hulene Municipal Dumpster;
- Update table nº 35 on Ecolife weighing averages.

3.10.2 Sanitary landfill for hazardous waste in Matola

- The capacity must be added to the text.

3.10.3 Informal Dumps

- Information on mapping critical points should be added, where the appearance of garbage focuses more frequently is verified;
- Talk about the existing ravines and their location in the Municipality of Maputo;

Prepared by Hortência Nhamahango

Verified by Leonardo F. Almajane

Minutes of the Meeting between the Technicians from the Environmental, Monitoring and Management Department and JICA for the Master Plan review in Chapters 4 and 7.

As part of the meeting to review the Solid Waste Management Master Plan, below are the points discussed at the meeting:

CHAPTER IV

- It was agreed that the title Chapter 4 "Interventions in the scope of the 3R's" should appear in the index of the Master Plan.
- It was agreed that the 3R's should be changed to 5R's, taking into consideration that the 5R's have already been implemented in the public awareness campaigns, however, there is a need to emphasize the 3R's since the community is not yet very familiar with them. Where the 5R's stand for: **Rethink, Refuse, Reduce, Reuse and Recycle.**
- It was raised a question regarding point 4.1: *"To instill responsibility to each individual by promoting correct attitudes about the storage and proper disposal of domestic waste in the respective containers"*, which implies that during the disposal the waste will be segregated however, this does not reflect the current reality of the Municipality. To this question, Mr. Soeda clarified that "proper disposal" in point 4.1. refers to disposal in containers and obeying the correct time for disposal of solid waste.
- It was agreed that the contents, tables and images of the points 4.2 - 4.3 - 4.4 - 4.5 need to be updated because they are based on the 2007 Master Plan and do not reflect the amount of waste that is currently produced.

CHAPTER VII

- It was found that Chapter 7 "Civic Education and Public Awareness" and Chapter 4 "Interventions in the scope of the 3R's " should be merged, where Chapter 4 would be a sub-theme of Chapter 7 which is Civic Education and Public Awareness.

- In the revision of the Master Plan (MP) it is necessary to consider not only the legal instruments mentioned in the legal framework, but also the provisions of the Environmental Education Plan (PEA) prepared and approved by the CMM in the scope of the implementation of PROMAPUTO (Maputo Municipal Development Program).
- It was proposed to change the theme of chapter 7 from "Civic Education" to "Environmental Education".
- It is proposed to remove point 7.4 "Financing for USWM", and to create a Finance chapter, where contents on costs and revenues can be addressed, thus responding to the provisions of Decree 94/2014 that guides the preparation of Master Plans for USWM.

Capacity Development Project for the Implementation of Integrated Solid Waste Management in the Greater Maputo Region.

Summary of the Meeting.

Subject		
Date	April 19 , 2023	
Meeting Place	DMAS Meeting Room – start 10h 19min	
Participants	**DSMAS:** Deputy Director Meriamo Stela , Anselmo Inguane , Raul Chilaule , Simão Mutereda , Ricarda Jamisse , Faustino Tsotane , Linda Verediano , Rafael Sambo **Absences: Justified -** **Unjustified** – **JICA:**	**DSMAS:** **Justifiedabsences:** **Unjustified** – **JICA:**
Editor	Simão Pedro S. Mutereda	
Summary of the Meeting, Main Points Discussed .	**previous points** Chilaule Raul nominated the editors Simão and Linda Verediano . **Cap. 5 and 6** Mr. Soeda presented the chapters to be discussed, 5 and 6 and the proposal of the aspects to be reviewed in the PD and presented the 7 subpoints and also presented the suggestion of a model for calculating solid waste in the future and taking into account population growth at the	

	base of the plan for the construction of the Katembe landfill considering the various studies that have changed over time. dr Chilaule said that it would be necessary to look at the solid waste quantity and quality studies done by JICA. Director Stela added that the projection was based on the 2017 population census and JICA experts could suggest the best method for the projection taking into account the current situation. Mr Soeda said that an updated calculation of the projection was not made, but if the CMM had done it, he could share it because in the initial project of the PD there was not a single base used for the effect by which, per capita quantity methodologies , projection of population growth and economic growth in a given area. He also said that the solid waste unit rate is intricately linked to economic growth, he said that this factor should be included in the consultant's update of the PD and should take into account the MITADER guide. A critical look was made at tables 44 and 45, on the discrepancy of quantities, and it was concluded that there is a need to revise the tables looking at the current issue and recommends the use of studies carried out by result 2 of the ongoing project. Regarding the intermediate treatment, it was mentioned that a more detailed model had to be thought of, because	

	in the PD project, this aspect was not very detailed. And following the government's strict guidance, the Hulene municipal dump should have already been closed, suggest to the PTUM to use the data from result 2 of the JICA project. Director Stela suggested that figures should be included that illustrate some representative images and in the monitoring system looking at the PDCA. Dr. Chilaule said that the monitoring content and the 3rs issues are not included in the PD, we have to reflect looking at the 5rs which is a current issue. Mr Soeda _ suggest that the original model of the PD project be visited, as it already contained many elements that do not reflect in the approved PD. It is important to suggest, in the review of the PD, the use of studies carried out by the project in result 2 and an important discussion about the inclusion of the aspect of waste segregation in the Recycling component. The next meeting was scheduled for Friday, April 21, 2023 at 10 am, to discuss chapters 7 and 4.	

Notes on the Mid-Term Review Meeting of the MSW Management Master Plan.

Chapter 7.4: Financing for Urban Solid Waste Management

2.1.Historical Overview of Maputo

Mr Anselmo: Proposed that the financial component should be considered as a separate chapter and not a sub-chapter of chapter 7

Deputy Director Stela : proposed that the chapters that introduce aspects related to Civic Education should be removed from the position they are in and placed at the end, avoiding mixing with financial aspects.

In the same vein, Deputy Director Stela: recalled that Mr. Otsuka carried out a projection study of these, for the Matlemele and Katembe Embankments, which could be useful for us to enrich the document.

The update of the study that Mr. Otsuka made regarding landfill and landfill management costs.

Deputy Director Stela , regarding operating costs in the *Other Services component* , suggested that there be an update based on current data.

Regarding *Primary Collection Costs* , Deputy Director Stela said that they had changed due to the number of Micro Companies, there was a need to update operating costs. Regarding *Secondary Collection* in the Urban and Suburban zone, the system's operating model changed from 2018 to 2023 and there is a need to if you update the costs according to the changes.

At the Hulene Dump we had an Equipment Operation model, but from 2021 onwards the model used is a contract and there has been an increase in costs, with the need to proceed with updates.

Dr Ferreira: Proposed the rationale with regard to human resources, since it is not known until then, whether the personnel who will be in the management of the weighbridge , will be through management of the CMM (internal) or private.

Regarding the garbage rate, there is a great challenge in relation to the implementation of improved financial sustainability *strategies , being necessary to update the data with the EDM to include the information in the Director's Plan.*

Mrs. _ Ace : reiterated that the information from the study carried out within the scope of PTUM, should be included in the Master Plan, including the feasibility model made by Mr Camille, which did not have the result.

Maputo on April 27, 2023

The Editors

Faustino Titos Sotsane Zaina Pires Mandlate

MAPUTO MUNICIPALITY

MUNICIPAL COUNCIL

DIRECÇÃO MUNICIPAL DE AMBIENE E SALUBRIDADE

MUNICIPAL DIRECTORATE FOR ENVIRONMENT AND SOLID WASTE MANAGEMENT

Acta da Reunião de Revisão do Plano Director de Gestão de Resíduos Sólidos

Minutes of the Meeting for Solid Waste Management Master Plan Review

1. Chapter 8: Implementation Schedule

a) Start of operations at the new landfill

Mr. Soeda: Questioned about the construction and operation plan for the Katembe Landfill and raised the question about the entity that will manage the landfill, whether it would be DMAS or a company subcontracted by the Municipality.

1. Regarding the construction plan for the Katembe landfill, the activities are dependent on the studies being carried out by the consultants (TPF) hired by the World Bank under PTUM, which will determine the subsequent phases.

Mr. Soeda: He informed that the Transport Plan cannot be put in place without being certain of its implementation.

Regarding the forecasting of costs of the transportation plan for the operation of the KaTembe landfill, PTUM in its schedule of activities for this sector will conduct feasibility studies for the implementation of the landfill.

The information regarding transport costs was shared in accordance with Output 2, operational cost studies were also done using the KaTembe landfill, the Matlemele landfill and another using the Hulene Municipal Landfill as a reference center that can serve as a reference for the future collection plan. It was also informed that regarding to the Mathemele landfill, the coordination committee led by MTA was reactivated and work is being done in order to begin with the resettlement of families on the perimeter of the Matlemele landfill,

in which the Municipality of Maputo through DMAS has the responsibility to provide support in transporting the families from the landfill to the location where the 20 houses will be built.

Mr. Soeda: Mr. Soeda: Questioned if these families belong to Municipality of Maputo or Matola.

It was informed that the families belong to the jurisdiction of the Municipality of Matola.

Mr. Soeda: Congratulated DMAS for the fact that there is a very strong inter-municipal cooperation, which he believes that it is very important that it continues this way until the resettlement of these families is concluded.

It was said that the construction processes for the new landfill should follow the same model that is in the current Master Plan for its ease understanding.

Mr. Tsotsane: Questioned whether the schedule presented is only about the activities of Output 2 or reflects the activities of the entire Master Plan, because in the previous sessions of the Master Plan review it was agreed that the chapters related to finance would be isolated from chapters 4 and 7.

It was answered that the schedule presented is for the implementation of all Master Plan activities including the financial issue, meaning that all the previously seen chapters will be embodied in the same schedule of activities.

Mr. Soeda: Agreed with Director’s Stella's explanation and added that the Financial Management in the MP must be aligned with the proposed approaches in improving financial management, and there is a need to prepare a detailed action plan based on the MP itself.

2. Chapter 9: Final Considerations

Regarding to the Final Considerations of the Master Plan, it was noted that international activities are mentioned, and we have a lot of information about solid waste management activities, which is sufficient to make the final considerations of our activities. It was also proposed that the chapter should be changed from "Final Considerations" to "Conclusion".

It is proposed that the Conclusion of the document should be a summary of the document responding to the specific objectives of the Master Plan itself and change the title from Final Considerations to Master Plan Recommendations or Conclusion.

CONSELHO MUNICIPAL
DIRECÇÃO MUNICIPAL DE AMBIENTE E SALUBRIDADE

Project for Capacity Development to Realize Integrated Solid Waste Management in the Greater Maputo Region.

Output 1 (MP Monitoring Meeting)

Topic	**Meeting on MP Review**	
Date	**13th July, 2023**	
Venue	**DMAS Meeting Room**	
Participants	**DMAS: Director:** Sérgio Paulo Francico Manhique; **Deputy-director**: Meriamo Stela Novela; **Heads of Departments:** Nilza Zandamela, **Technitionss:** Leonardo Almanjane, Ricarda Jemisse, Linda Vénia Verdiano, Raul Chilaule. **JICA:** Shungo Soeda; Dionildes Mucanze.	
Notetaker	**Florência Francisco Martins**	

Aproval of the minutes	The meeting was chaired by Mr. Shungo Soeda. The meeting was opened by the Deputy Director Meriamo Stela who greeted all the participants and explained the work that the team carried out regarding the Monitoring of the Master Plan. She then passed the floor to Mr. Shungo Soeda.	
	Output 1: *Analysis of current solid waste management issues and challenges (Stela Novela/ Chilaule/Ricarda/Linda/Florencia/Soeda).* The Deputy Director, Ms. Meriamo Stela Novela gave an update on the progress of output 1 activities and reported as follows: • *The technical work for the mid-term review of the Master Plan for Urban Solid Waste Management of the Municipality of Maputo (PGRSUMM) was completed by JET and DMAS teams according to the planned schedule..* • *Afterwards, Mr. Soeda introduced the topics in the Master Plan that require attention and data updating as part of the revision of the Master Plan for Urban Solid Waste Management of the Municipality of Maputo..* • Discussion began on the Executive Summary, specifically, the Classification, the results of the SWOT analysis (which are not included in the current document and the team felt it would be appropriate to look at the study and recommend the incorporation of the results of the study, the Guidelines for the Preparation of	

	Plans provide guidance on the inclusion of the results of the SWOT). • The current financial context of the SWM sector, updated ordinance, and guidelines should be reviewed. • The structure, vision and Mission shall be reviewed. • Revise the Bibliographic References, as the current document presents inaccurate documents.. • Review population figures by Municipal Districts and make appropriate projections.. • Incorporate details of the structure and responsibilities of the Municipal MSW Management Enterprise. . • JICA's support after the collapse of Hulene Municipal Dumping site. • Construction of the two Landfills (Matlemele and Katembe) • New financial management strategy for waste management • And finally we also talked about the updated flow of SW from generation to the final disposal site. **Maputo, 07th July de 2023**	

Appendices of Chapter 2.3
Activities Related to Output 2

Appendix 3-1

Plan for Improvement of Waste Collection andTransportation Service 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

Collection management improvement plan

June 2023

Japan International Cooperation Agency (JICA)

Nippon Koei Co., Ltd.

Table of Contents

List of Figures

List of Tables

Currently, in principle, waste collection and transportation in Maputo is carried out by private contracted collection and transportation companies (MEs and WCSPs) for household waste, and by private licensed collection and transportation companies for business waste. In addition, some government organizations and special wastes, although less in quantity, are carried out by waste collection equipment owned by CMM. Therefore, CMM manages WCSPs and licensed PSPs. However, DSMAS itself is not fully capable of identifying problems and do not know how the collection service is actually being conducted.

In view of this situation, the draft plan for improvement of waste collection and transportation service in Maputo City is compiled, focusing on improving the waste management capacity of DSMAS, which implements the management of waste collection contracts.

1. CURRENT SITUATION AND ISSUES

Interviews were conducted with relevant DSMAS departments and major WCSPs in each collection service category to understand the current status of waste collection services and analyze issues.

1.1 Current situation

1.1.1 Waste collection and transportation system (before May 2020[1])

The current situation of waste collection and transportation service in Maputo City is summarized below. At the time of writing this report, the waste collection and transportation service in Maputo City was undergoing a change to a new waste collection and transportation system contracted in May 2020, and therefore, the current situation and issues were analyzed regarding waste collection and transportation service under the contracts before May 2020.

(1) Waste collection and transportation methods

Table 1 summarizes waste collection methods for each type of waste in Maputo City.

Table 1 Waste Collection and Transportation Methods for Each Type of Waste

Type of Waste	Collection Area		Collection Point	WCSP
Household waste	Urban area (1 District)		1.1 m3 container 2.5 m3 container 5.5 m3 container	Ecolife
	Suburban area (4 Districts)	Primary collection	Door-to-door (Microenterprises)	Enviroserv (some area by Ecolife)
		Secondary collection	12 m^3 or 6 m^3 container	
Business waste			Depending on waste generators	WCSP contracted
Waste from public institution, bulky and illegally dumped waste			Depending on waste generators	CMM

Source: JICA Project Team

(2) Household waste collection

1) Urban area

Waste collection in the urban area is carried out by Ecolife, a waste collection service provider contracted by CMM. Household waste generated in the urban area is discharged into a 1.1 m^3 collection container and it is collected by compactor trucks operated by Ecolife. In principle, each container is collected once a day, but some waste containers are collected three times a day. In some areas, door-to-door collection is also being implemented. Each collection vehicle is equipped with global positioning system (GPS) and linked to mapping software to manage collection routes, speed, and time required for waste collection and transportation. The waste collection hours are scheduled at nighttime; however, it is actually carried out throughout the day. The current collection area by Ecolife is KaMpfumu, which is usually called as urban area, and part of Nlhamanculu municipal district

[1] This survey was conducted before the new contract started in May 2020.

located in suburban area, but with the new contract renewed in May 2020, Ecolife's service area will be only KaMpfumu.

Waste collection route

The waste collection service by Ecolife is carried out by setting up the eight collection routes. In principle, waste collection points are located every 100 m and four to five containers are placed at each location. However, placement of containers is being changed on a daily basis depending on situation of waste discharge. The placement of the containers is decided in consultation with CMM/DSMAS.

Equipment

The waste collection equipment owned by Ecolife is as follows:

- Compactor 20 m^3: 9 units
- Step loader: 1 unit
- Rotation: 1 unit
- Maintenance and cleaning: 1 unit
- Supervise: 3 units
- 1.1 m^3 collection container: 670 units (100 units in storage)
- 5.5 m^3 collection containers: 80 units (used in suburban areas)
- 2.5 m^3 collection containers: 4 units (leased by CMM)

2) Suburban area

The waste collection service in the suburban area consists of primary and secondary collections. The primary collection service is provided by Microenterprise (ME) contracted by CMM. The waste collected by MEs is dumped into 12 m^3 and 6 m^3 collection containers (5.5 m^3 in some areas) located in each neighborhood. The waste dumped in the collection containers is collected and transported to Hulene Dumping Site by Enviroserv (Ecolife in some areas), which is the waste collection service provider for secondary collection contracted by CMM.

Primary collection

Door-to-door collection is carried out by micro-enterprises 46 (MEs) contracted by CMM to provide primary collection service in each neighborhood. Collected waste is dumped into containers located in each neighborhood.

In the primary collection, each neighborhood is divided into three areas, and waste collection service is carried out in each area twice a week on Monday/Thursday, Tuesday/Friday, and Wednesday/Saturday from 6:00 in the morning. It is mandated that residents can discharge their waste directly into the containers during the hours from 15:30 to 19:00. However, DSMAS has not been able to adequately monitor the use of containers in each neighborhood. On the other hand, citizens have not complied with the schedule to dispose USW to public containers as set out in the city's cleaning ordinances and regulations.

There are various forms of organization in MEs such as corporations and associations, and some MEs own waste collection vehicles. There are female waste collection workers in some MEs. The waste collection workers are equipped with helmets, masks, and working clothes. In addition, waste scattered around container is collected by the waste collection workers and dumped into the container.

Recyclable waste picking by waste pickers is observed in most containers, and waste pickers mainly collects plastics (including PET) but not papers.

Secondary collection

The secondary collection of waste from collection containers to Hulene Dumping Site is carried out by Enviroserv contracted by CMM, using roll-on roll-off vehicles for 12 m^3 containers, and skip loaders and compactor trucks for 6 m^3 containers. In some areas in the suburban area, Ecolife has placed 5.5 m^3 containers, and collection and transportation are being carried out by compactor trucks. Each vehicle is equipped with GPS, and the collection routes, speed, and time required for waste collection and transportation are managed in linkage with mapping software. The waste collection hours are scheduled after 19:00 at night, but in reality, the waste collection service

is being carried out throughout the day, including daytime, since the primary collection schedule does not match with that of the secondary collection.

Collection route

According to Enviroserv, the collection routes, speed, and time required for waste collection and transportation are controlled by Enviroserv, but DSMAS does not have enough information on location of containers and the waste collection routes operated by Enviroserv.

Equipment

The waste collection equipment owned by Enviroserv is as follows:

- Roll-on/roll-off vehicles: 10 units (3 are out of order)
- Skip loaders: 2 units
- Compactor truck: 1 unit
- 6 m^3 containers: 20 units
- 12 m^3 containers: unknown

(3) Businesses waste

Municipal waste generated from businesses is collected and transported to Hulene Dumping Site by licensed PSPs contracted by business waste generators.

According to the weighbridge data of Hulene Dumping Site, there are about 80 licensed PSPs that transport businesses waste to Hulene Dumping Site. However, only 30% of those licensed PSPs are registered in the Proof of Service (PdS) database. In addition, information on about 2,000 businesses waste generators contracted by licensed PSPs is registered in the Proof of Service (PdS) database. The list of licensed PSPs, including WCSPs providing waste collection and transportation service for businesses waste generators is shown in Appendix 4.

(4) Waste from public institutions, bulky waste, and illegally dumped waste

Waste from public and private institutions contracted with DSMAS is collected by DSMAS. The list of public institutions that have contract with DSMAS is shown in Appendix 5. Besides, DSMAS has responsibility to collect and transport municipal solid waste of a special nature (bulky, debris, green waste from pruning) as duly requested by citizens, upon the payment of a fee as well as to collect the illegally dumped waste in public spaces."

(5) Market waste

Waste in the markets is collected by the Market Management Committee and disposed into containers set up near the market. The market management committee also cleans the waste around the containers. However, in some areas, it was observed that market waste and household waste collected by MEs were disposed in the same containers. Secondary collection and transportation of the containers is carried out by the contracted large-scale WCSP assigned to collect household waste in the area.

1.1.2 Waste reception management (waste amount management) (before May 2020[2])

Waste reception management at Hulene Dumping Site is handled by the Municipal Dumping Site Section (RLM). The management at Hulene Dumping Site is carried out 24 hours a day, and it is operated by two shifts. The administrative staff work from 7:30 to 15:30 and staff in charge of waste reception management works in shifts and are available for 24 hours a day to respond to any problems. The former waste reception management system

[2] This survey was conducted before the new contract started in May 2020.

had three shifts: 6:00 to 14:00, 14:00 to 22:00, and 22:00 to 6:00; however, due to difficulty of staff commuting after 10 pm, the shift was changed to two shifts.

(1) Waste reception management in Hulene Dumping Site

At the Hulene Dumping Site, only collection vehicles with CMM permit are allowed to bring in collected waste. However, a small amount of waste transported by private vehicles is only accepted upon the payment of a fixed rate according to the amount of waste to be discharged for the case of non-authorized providers.

The waste amount management is managed by the staff of the Municipal Dumping Site Section (RLM) at the landfill weighbridge. These data are used by the Contract Management Section (RGC) to check the status of waste acceptance and to compare with invoices from WCSPs.

When the weighbridge was in operation in 2019, the weighbridge was used for waste reception management. Since weights of each waste collection vehicle had been registered in advance, weight of waste collection vehicles was measured only once when they entered the Hulene Dumping Site. The weighing data was stored in a PC system equipped with the weighbridge and transmitted to DSMAS from the Hulene Dumping Site via internet. Public Removal Section (RRP) receives waste amount data in Microsoft (MS) Excel format and prepared monthly reports based on this data. The datasheet used for waste reception management is shown in Table 2.

Table 2 Datasheet of Waste Reception Management at Hulene Dumping Site

No.	Time and Date	Name of SPs (Household and Business Waste)	Waste Type	ID of Vehicle	Weight	Weight of Vehicle	Weight of Waste

Source: JICA Project Team

However, the weighbridge (part of the weighing scale) broke down due to the heavy rain in December 2019 and is currently not in operation. Since then, the waste reception management has been conducted by hand-written notebook for waste receiving record. The hand-written notebook is recording the waste collection vehicles by classifying in eight categories as shown in Table 3. The waste loading capacity of each collection vehicle is calculated based on the average value for each type of collection vehicle previously calculated by GIZ.

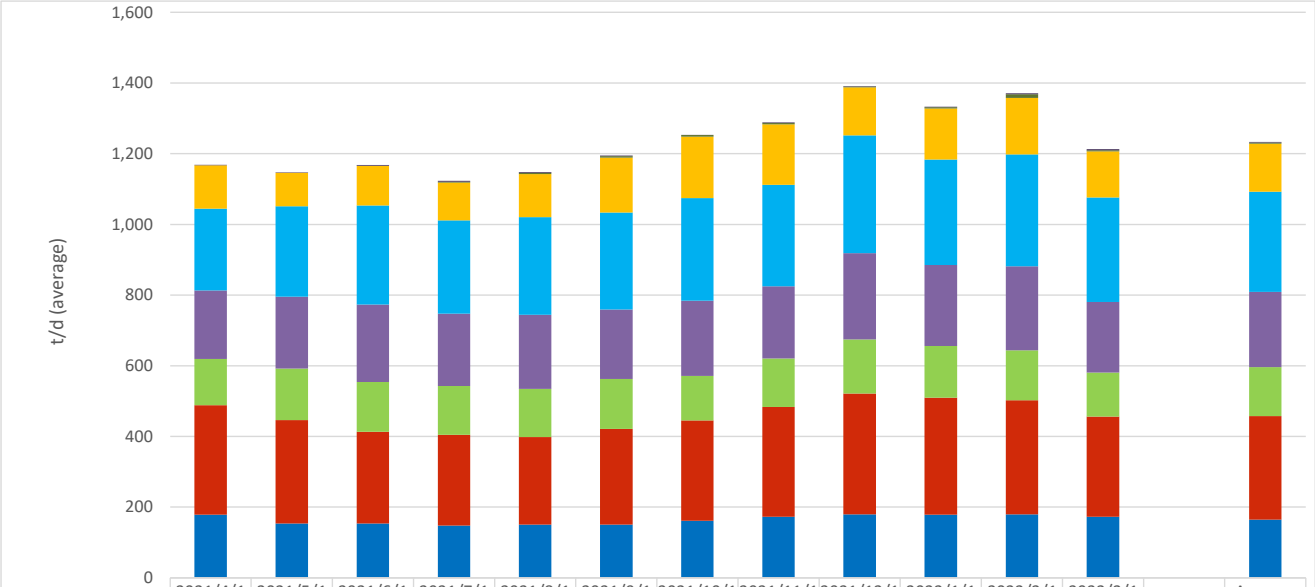
Table 3 Classification of Collection Vehicle or Waste Reception Record

Type of Service	Contents
1.Ecolife-Urban	Household waste (Compactor truck, 1.2 m3container, 6 m3container)
2.Ecolife-Business	Business waste
3.PSPs	Business waste
4.Enviroserv-Suburban	Business waste (Compactor truck, 1.2 m3 container, 6 m3 container)
5.Enviroserv-Business	Business waste
6.Enviroserv-Micro Track	Household waste (Use a dump truck when the container is overloaded. Used by Enviroserv from December. This is not eligible for payment from CMM.)
7.CMM Municipal	Waste from public institution (also uses vehicles from the Infrastructure Department) and illegally dumped cleaning waste
8.District-Municipal	Road cleaning waste, beach cleaning waste, etc.

Source: JICA Project Team

(2) Waste amount – Analysis made at the period between April 2020 and March 2021

Based on the data from April 2021 to march 2022, when the weighbridge was in operation, the actual average amount of waste received at the Hulene Dumping Site was calculated at 1,233 t/day, as shown in Figure 1.



	2021/4/1	2021/5/1	2021/6/1	2021/7/1	2021/8/1	2021/9/1	2021/10/1	2021/11/1	2021/12/1	2022/1/1	2022/2/1	2022/3/1		Average
DIS	1	2	2	2	2	2	1	2	2	1	3	3		2
CMM	0	0	1	3	4	4	4	3	2	4	11	3		3
Comercial	123	94	112	106	122	155	174	171	136	145	160	130		136
KaMubukuwane	231	256	280	264	276	274	290	287	333	298	316	296		283
KaMavota	194	204	219	205	210	197	213	204	244	229	237	200		213
KaMaxaquene	131	146	141	138	136	141	126	137	153	146	141	125		138
Nlhamanculo	310	293	259	257	248	271	284	310	342	331	323	283		293
KaMpfumo	179	154	154	148	150	150	161	173	180	179	180	173		165

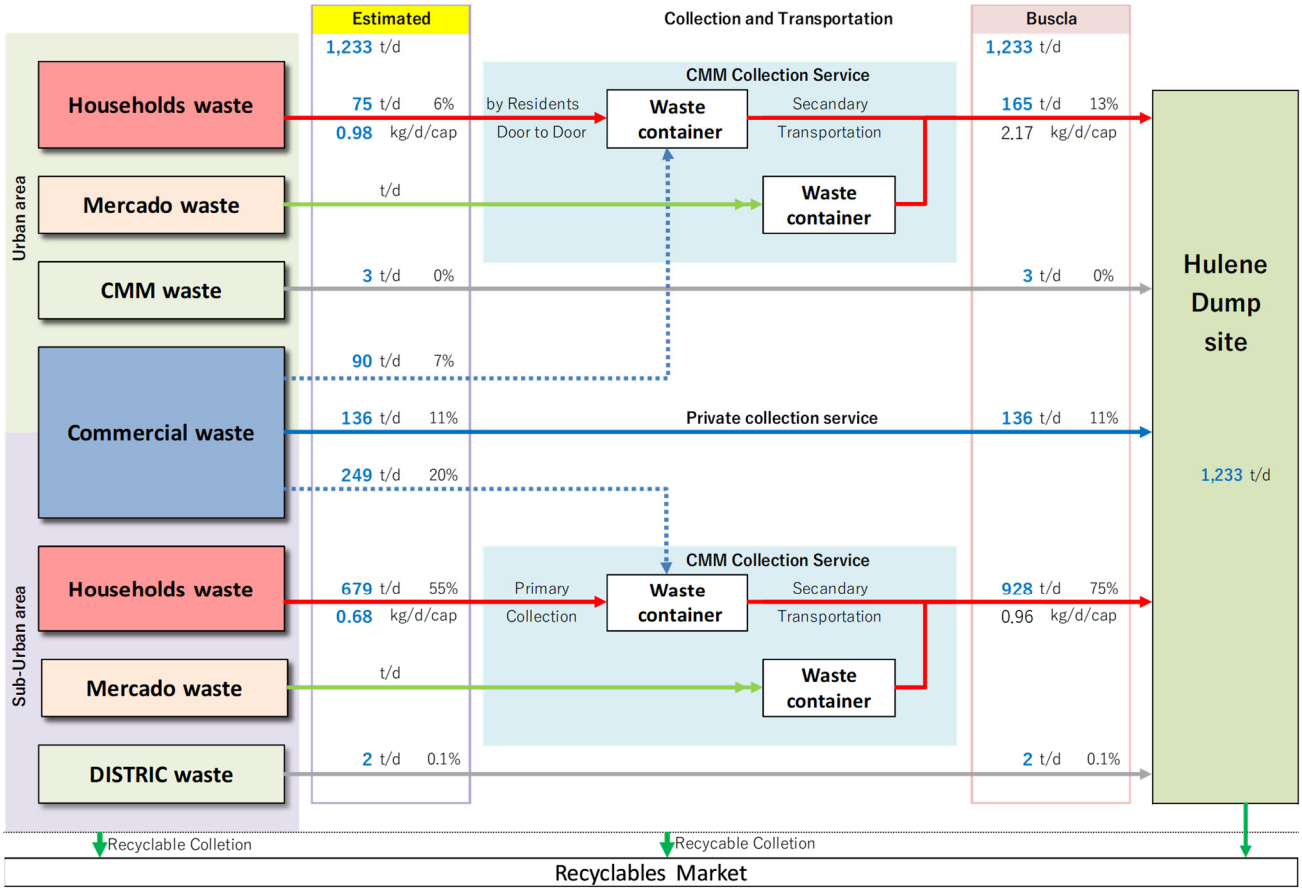
Source: JICA Project Team

Figure 1 Average Daily Waste Amount at Hulene Dumping Site by Collection Category

The average waste amount per collection area and type of waste was estimated to be 225 t/day for urban area, 1,174 t/day for suburban area, 13 t/day for public institutions, bulk waste and illegally dumped waste, 4 t/day for waste collected by the districts (e.g., street sweeping waste, coastal cleaning waste), and 87 t/day for businesses waste.

The average waste amount per collection area and type of waste was estimated to be 165 t/day for urban area, 928 t/day for suburban area, 3 t/day for public institutions, bulk waste and illegally dumped waste, 2 t/day for waste collected by the districts (e.g., street sweeping waste, coastal cleaning waste), and 136 t/day for businesses waste (Figure 2 - See Weighbridge part in). However, estimation based on waste generation rate(kg/day/person) and population, the average waste amount per collection area and type of waste was estimated to be 75 t/day for urban area, 679 t/day for suburban area, 3 t/day for public institutions, bulk waste and illegally dumped waste, 2 t/day for waste collected by the districts (e.g., street sweeping waste, coastal cleaning waste), and 475 t/day for businesses waste (Figure 2 - Estimated part).

The waste flow prepared based on the weighbridge data is shown in Figure 2.



Source: JICA Project Team

Figure 2 Waste Flow in Maputo City in 2019

(3) Issue of collection and transportation system

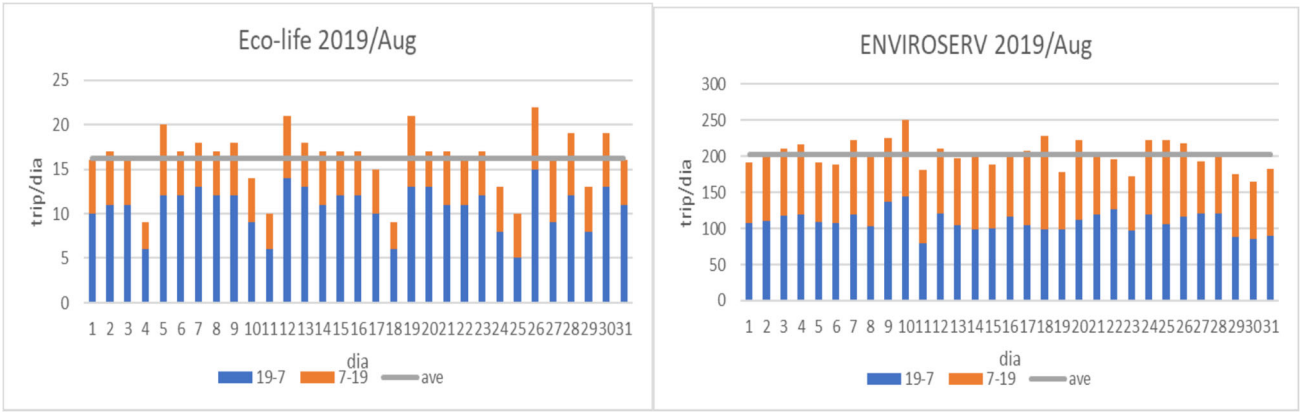
- DSMAS does not have enough information on the number and locations of containers in the city and collection routes performed by the large-scale WCSPs, and therefore, management of contracted waste collection services is not sufficient.
- The waste discharged in suburban area and collected by Ecolife is counted as waste discharged in urban area, so the amount of waste in each district is not accurately understood.
- The amount of waste is only categorized by each WCSP (including collection by CMM), so it is not clear from which waste container the waste was collected. (This is also a factor in the mixing of market waste and business waste with household waste)
- Skill of DSMAS staff with simple data analysis to process and aggregate weighbridge data is insufficient.
- The household waste generation ratio (kg/person/day) was estimated based on the waste amount data at Hulene Dumping Site and population distribution in urban and suburban areas as shown in Table 4. As it seems, household waste generation ratio is too excessive compared with the figure set in the M/P, it is possible that businesses waste is mixed into household waste collection.

Table 4 Comparison of Household Waste Generation Ratio

Area	Value Adopted by M/P	Value Calculated Based on Weighbridge Data
Urban	1.2 kg/day/person	2.46 kg/day/person
Suburban	0.65 kg/day/person	1.86 kg/day/person

Source: JICA Project Team

- Residents and business entities do not clearly understand waste discharge methods and regulations.
- Overloading and littering around containers are observed. This is because containers in urban and suburban areas are available 24 hours a day, and residents and business entities are discharging waste at any time.
- In principle, business waste generators that discharge 25 kg/day or less of waste are allowed to discharge their own business waste into household containers. However, since the containers are available 24 hours a day, some businesses are discharging more than the regulated amount of waste into the collection containers.
- Recyclable waste collection activities by waste pickers are observed at containers in urban and suburban areas. In the suburban areas, the management of containers by neighborhood offices and MEs is functioning to a certain level, and the scattering of waste around collection containers by waste pickers is not problematic relatively. On the other hand, at the containers in urban area, waste scattering due to recyclable wastes collection activities of waste pickers is a problem.
- DSMAS does not have enough information on collection areas and schedules of MEs' primary collection service. In some cases, some MEs, which are the neighboring neighborhood, use the same containers. Therefore, the capacity of the containers is insufficient, and waste is scattered.
- Figure 3 shows the number of collection trips for each collection time period in August 2019 when the weighbridge was functioning. Although the collection work should be performed at nighttime in principle, collection and transportation service are actually performed during the daytime as well.



Source: JICA Project Team

Figure 3 Number of Waste Collection Trips per Collection Time

1.1.3 Contract management

The Contract Management Section (RGC) is a newly established division in DSMAS that was created in September 2019 and currently three staffs have been assigned. The main activities of RGC are as follows:

- Contract management work for primary (MEs) and secondary collection (Ecolife and Enviroserv) service providers.
- Management work of equipment lease contracts for Hulene Dumping Site operation.
- Contract management work for the purchase of other equipment, office supplies, etc.

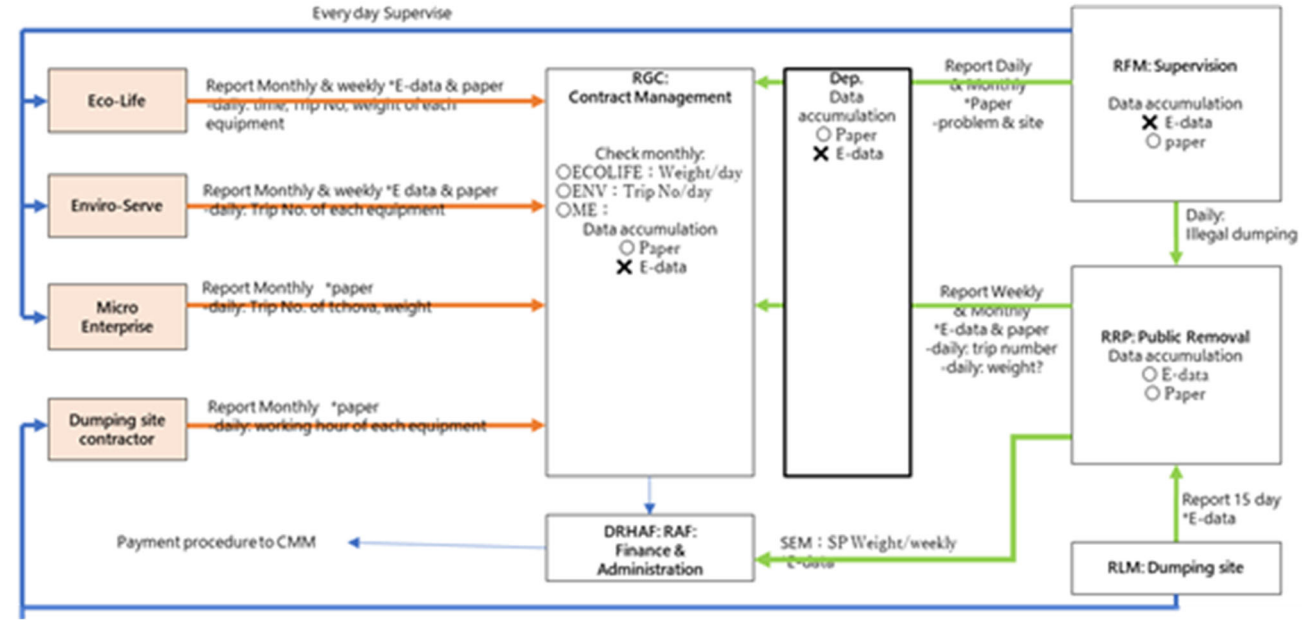
(1) Work contents of contract management

The work contents of the contract management work are summarized as shown in Figure 4. The main contract management work in waste collection service is to check the performance of waste collection work of WCSPs and to confirm the payment.

As for primary collection in suburban area, monthly reports are submitted by ME to RGC on paper basis with the approval of responsible neighborhood office and district office. As for waste collection in urban area and secondary collection in suburban area, monthly and weekly reports are submitted to RGC by WCSPs on electronic and paper basis.

On the other hand, the data related to the waste receiving data at Hulene Dumping Site is submitted by the Municipal Dumping Site Section (RLM) to the Public Removal Section (RRP) every two weeks. Then, it is checked by the RRP and submitted to the RGC. In addition, daily and monthly reports on collection issues are reported to the RGC by the Supervision Section (RFM) on a paper basis.

These submitted documents and reports are reviewed by the RGC and if there are no problems, the payment procedure for each WCSP is requested to the Department of Administration, Human Resources and Finance (DARHF). The amount paid to WCSP is calculated based on the number of collection trips for ME, the amount of waste for Ecolife (about 1,500 MZN/trip), and the number of collection trips for Enviroserv (about 1,750 MZN/Trip).



Source: JICA Project Team

Figure 4 Waste Collection Service Contract Management Procedure in DSMAS

(2) Issues of contract management

1) General

- RGC staff does not fully understand the various data related to WCSPs' contract management as RGC is a newly established department.
- DSMAS does not have sufficient information on containers' locations and WCSPs' collection routes.
- Information and data related to contract management is accumulated only by paper-base, and there is no adequate data management including analysis.
- Necessary information sharing among RFM, RRP, and RGC has not been sufficiently discussed, and effective monitoring and contract management has not been achieved.
- Performance indicators are not sufficiently set in the contracts with WCSPs, and DSMAS's monitoring, information sharing, accumulation, and analysis are not conducted effectively.

- There is a lack of coordination with district offices and neighborhood offices for management of WCSPs' service performance.
- Due to poor internet connection, it is sometimes difficult to receive weighbridge data and monthly reports from WCSP in a timely manner.

2) ME management

- The contract management is not fully functioning due to the lack of sufficient information on the implementation of ME operations (collection area for each day of the week, use of collection containers by MEs, collection hours, collection routes, availability of collection containers shared with other MEs, residents' waste discharge methods, mixing of businesses waste, etc.).

3) Tender document for WCSP

- Insufficient analysis on the current status of waste collection and transportation services and examination on measures for improvement, due to lack of human resources in DSMAS. Therefore, DSMAS only specifies the amount of waste to be collected and the numbers of collection containers and equipment needed to be procured in the tender documents, and DSMAS relies on proposals from WCSPs to select the best approaches. Still, DSMAS has insufficient capacity to examine improvement measures based on analysis of the current situation and to indicate the services required by DSMAS in the tender documents.
- The tender documents do not sufficiently stipulate the proposal format, monitoring format, permit format, performance indicators, and monitoring items.
- Currently, the contracting procedures with the new WCSPs for both primary and secondary collection services are in progress. However, the contracting process is not proceeding according to the schedule set in the bidding documents due to delays in CMM's procedures (court procedures in contracting). The schedule defines procedures such as advance payment of 30% of the contract amount to WCSPs, submission and approval of WCSPs' work plans, etc. However, the new waste collection service was provisionally launched in May 2020 without these procedures. Such delays in the contracting process with WCSP have been observed every time. In addition, the purchase of equipment by WCSPs has also been delayed due to the COVID-19 pandemic.

1.1.4 Supervision and monitoring management

(1) Contents of supervision and monitoring

The Supervision Section (RFM) performs supervision and monitoring of waste collection service. The main activities of the RFM are as follows:

- Supervision and monitoring of waste collection services.
- Issuance and distribution of cleaning tax invoices to business waste generators.
- The supervision and monitoring activities are conducted in three shifts: 5:00~8:00, 8:00~14:00, and 14:00~17:00.
- In addition to the above, by using the group function of WhatsApp, the following groups have been created and supervision and monitoring is being carried out while communicating with the participating members in the groups.
- Members of Group 1 (urban area): Ecolife, RFM, RGC
- Members of Group 2 (suburban area): Enviroserv, ME, RFM, DGRSU, RGC (posted from 5:00 to 23:00)

1) 1st shift (5:00-8:00): Monitoring of containers

- In principle, only containers on the main roads are monitored; RFM staff do not have a map of the location of containers, and they conduct inspections by visiting containers relying on their own memory.
- Eight teams which consist of two staff each (eight motorcycles) are organized and each team is assigned to a specific area for monitoring.

- They go home with their bikes after previous day's work and go directly to their assigned area in the next morning. Then the monitoring work begins. After the monitoring, they return to the DSMAS office to prepare a handwritten report and share the monitoring results within the RFM.
- When some problem is identified during monitoring, the monitoring team will contact ME, Enviroserv, and Ecolife directly. In order to confirm the results of the response to the identified problems, the problems identified in the first shift are shared with the second shift staff and the second shift staff takes over it.
- Monitoring reports are shared within DSMAS by reports submitted to Department of Urban Solid Waste Management (DGRSU) once a month.

2) 2nd shift (8:00-14:00) 3rd shift (14:00-17:00): Monitoring of business waste, etc.

- Invoice of cleaning tax for business waste generator are issued and distributed (once/year/office).
- Supervision and monitoring of waste discharge by business entities (penalties will be applied, if necessary) (in principle, once a week, basically on a different day from when invoices of cleaning tax is distributed)
- Eight teams which consist of two staff each (eight motorcycles) are organized and each team is assigned to a specific area for monitoring.
- The status of road sweeping is checked. If there identified any problem, it will be reported to the responsible district offices.
- Illegal dumping is checked. If illegal dumping is found, special collection service is requested to the Public Removal Section (RRP).
- Instruction to residents on how to discharge waste are given.
- After supervision and monitoring, the inspection teams return to DSMAS office and they submit handwritten reports. The reports include location and content of identified problem and it is submitted to RFM Section Chief. If necessary, DSMAS will contact WCSPs and instruct them to take necessary action.

3) Procedures for cleaning tax collection

- Invoices of cleaning tax for business waste generators are issued once a year, but invoices for two to three years can be issued to business waste generators that have failed to pay in previous years.
- When a business waste generator receives a cleaning tax invoice, that business waste generator pays the invoice amount by deducting the amount of cleaning tax collected through the electricity bill.
- Business waste generators are required to report to CMM or DSMAS after payment of cleaning tax. If that business waste generator does not report to CMM/DSMAS, the same invoice will be reissued.

4) Others

- RFM, in collaboration with the newly established Department of Environmental Management and Inspection (DGIA), has been conducting awareness-raising activities regarding waste discharge methods, etc., for MEs, neighborhood officers, and residents in areas where illegal dumping has been identified.

(2) Issue of supervision and monitoring

1) Supervision and monitoring management

- The location and number of containers are not sufficiently managed by DSMAS, and the procedures, routes, and control items of DSMAS's supervision and monitoring work are not clearly identified.
- When there is a problem at a container, it is often unclear whether the problem is due to ME collection, WCSP collection, waste discharged by a business, improper discharge by a citizen, insufficient container capacity, or some other factor.
- Content of the supervision and monitoring report, which summarizes problems identified by supervision and monitoring and measures taken to deal with them, is descriptive, so it is not possible to analyze the content and frequency of problems by accumulating the data. It is necessary to establish effective and

efficient monitoring procedures by clarifying the procedures and check items of the supervision and monitoring work.

- Cooperation and coordination with district offices and neighborhood offices are insufficient.
- Regulations on waste discharge are not well recognized by business entities and residents. For business waste generators in particular, even if they are suddenly ordered to pay a fine due to an inspection by the staff of RFM, many business entities do not understand the reason or basis for the fine and refuse to pay. It is necessary to provide information and educational guidance on waste management regulations to business entities, residents, and local communities. As CMM issues business permits to business entities every year, measures could be taken to have business entities to attend lectures on waste disposal regulations at this time.

2) Issue an invoice

- Issuance of cleaning tax invoices to business waste generators is conducted manually and is inefficient. In addition, even if a business waste generator pays the cleaning tax, if that business entity does not report the fact to CMM, DSMAS will issue another invoice. This billing and payment procedure for the businesses waste cleaning tax is complicated for business entities and prone to errors.

3) MOPA system

- According to DSMAS, the MOPA system was used until about June 2019, but due to delays in payments to the service provider, MOPA has been suspended.
- In addition, the head of RFM and other staff do not fully understand how to use the MOPA system.
- The study on the monitoring and control system of waste collection and transportation services using information and communication technology (ICT), “Participatory Monitoring (MOPA)”, by which the World Bank (WB) assisted the DSMAS in introducing it during 2015-2016, was conducted and reviewed.
- MOPA is a system that enables citizens to report the type, content, and GPS location information of a problem to the DSMAS from a mobile phone when they found a problem such as waste scattering or delay in the collection service. The trial introduction of MOPA had resulted in the identification of points where failures are likely to occur, installation of additional waste containers, and acceleration of response to the problems by DSMAS.
- According to DSMAS, the MOPA system was used until around June 2019, but due to late payments to the service provider, the MOPA service has been suspended now. At the present, MOPA system is not operational because CMM is not paying to the service provider.
- DSMAS is in a situation where it cannot access data in the MOPA system without paying the service provider (UX) and renewing the contract. DSMAS is not able to restart the MOPA system in the near future due to budget limitations.
- In addition, the chief of RFM and other staff do not fully understand how to use the MOPA system.

1.2 Initially Identified Issues

Based on the results of the above-mentioned understanding of the current situation, the issues on waste collection and transportation services are summarized as shown in Table 5.

Table 5 Summary of Issues on Waste Collection and Transportation Service

Item	Content
1. Container Management	· The location and number of waste containers is not sufficiently known and monitoring is not effectively implemented.
2. Waste Amount Management	· Lack of knowledge regarding the analysis and use of weighbridge data. · The weighbridge at Hulene dumping site has been out of order since December 2019, and detailed waste volume data is not available.
3. Waste Flow Management	· It is considered that business waste is not managed well and is being mixed with household waste. · In some districts, multiple WCSPs provide collection services, and it is not possible to grasp the amount of waste in each district.
4. Collection Service Management	Common to both urban and suburban areas · The collection of containers occurs 24 hours a day for dumping, and some businesses are discharging more than the allowed amount of business waste into the containers. As a result, waste is overloaded and scattered around containers. · Citizens and businesses do not understand waste discharge methods and regulations.
	Urban area · Public waste containers are available for dumping 24 hours a day, so waste is scattered around the containers due to Waste Pickers' resource collection activities.
	Suburban area [Primary collection by ME] · The current status of ME collection services (collection routes, container usage, etc.) is not fully understood. [Secondary collection and transportation by WCSP] · In some sub-urban areas, waste collection is provided by Ecolife, and the exact amount of waste collected per district is not yet known. · Collection and transporting are often not carried out due to collection equipment breakdowns in suburban area.
5. WCSP bidding and contract management (TOR)	· The content and format of documents (work plans, monthly reports, etc.) required to be submitted to the WCSP are not defined. · The items to be monitored by DSMAS for the WCSP are not sufficiently clarified. · Bidding and contracting procedures require coordination with the CMM, and delays in WCSP procurement operations are common.
6. Monitoring management	· Monitoring items by the monitoring section (RFM) are unclear, and there is no data accumulation of monitoring information or coordination with related Secction/Departments. · The contract with the service provider needs to be renewed to continue the MOPA system, but it has not been renewed and MOPA is currently not functioning. · There is inadequate coordination with district offices and neighborhood offices.

Source: JICA project team

There are three types of waste pickers, as shown below:

- Waste pickers at the Hulene dumping site: some organized groups of waste pickers have been observed and there is willingness for them to organize and receive training and some formalization. For example, identification cards for access to the dumpsite.
- Waste pickers in urban area (in the street): they work individually and since the containers in urban areas are not controlled, it is difficult to identify these types of waste pickers, as well as to formalize, organize and educate them.
- Waste pickers in suburban area (in container): they work individually in the same containers at the suburban area, and since the containers are used by MEs and markets, it is possible for them to be identified, formalized and educated, as well as involved in ME activities.

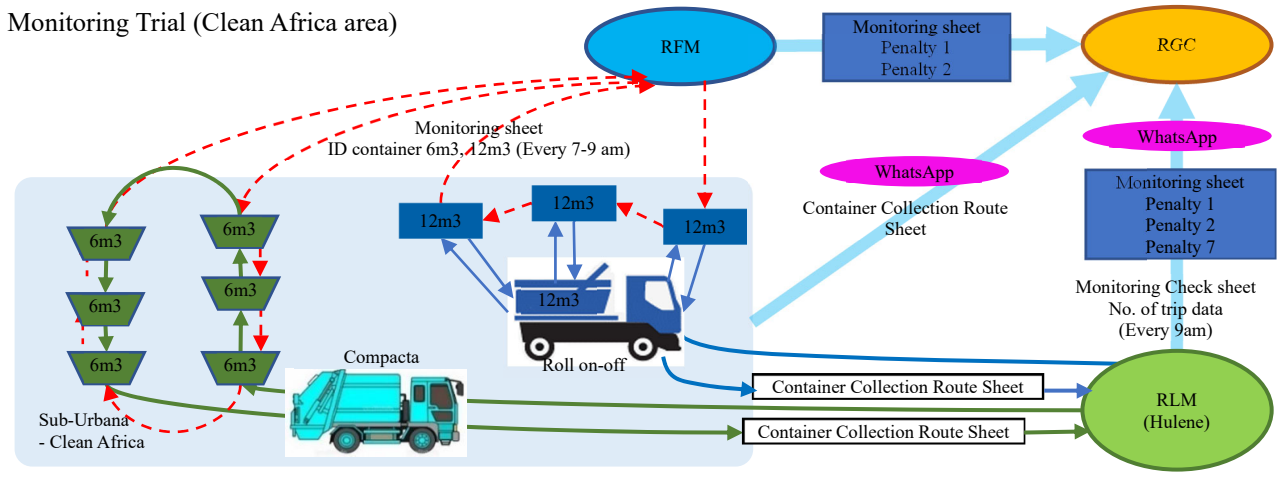
1.3 Monitoring Trial

In the current WCSP contract started in 2020, articles on penalty were set and daily monitoring by DSMAS was required (Table 6). However, since the monitoring method has not been established within DSMAS, a monitoring trial for WCSP's collection and transportation was conducted in Nlhamanculo District, which is part of the sub-urban area that accounts for about 70% of the total WCSP collection contract cost (based on contract amount). The image of monitoring trial activity is shown in Figure 5.

Table 6 Penalty

Penalty	Content	Fine
Penalty 1	Failure to complete the collection routes within the set deadlines	5000,00MT
Penalty 2	Fewer containers operational than set	3000,00MT
Penalty 3	Obsolete or damaged containers not replaced	3000,00MT
Penalty 4	Spillage and waste from uncovered vehicles	8000,00MT
Penalty 5	Waste disposed of outside designated treatment facilities	50.000,00MT
Penalty 6	Private service contracts	50.000,00MT
Penalty 7	Excessive loading weights (addition of dense materials)	50.000,00MT
Penalty 8	More than 500 kg of high-density waste	50.000,00MT
Penalty 9	More than 100 kg of Hazardous Waste	15.000,00MT
Penalty 10	Lack of documentation	17.500.00MT

Source: JICA project team



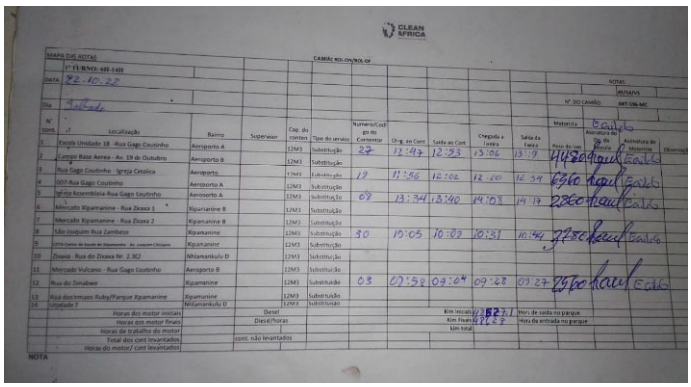
Source: JICA project team

Figure 5 Image of Monitoring Trial Activity

In the trial activities, as DSMAS's waste collection service monitoring and management method, measures were set up to avoid the above-mentioned problems by exchanging and accumulating WhatsApp data information through RGC, RPM, and RFM in order to identify daily check results, problem trends, and problem-prone areas in collection and transportation services and take effective measures.

During the trial, due to many incomplete daily reports by RLM, the information was limited to weight bridge data, daily reports from WCSP (Figure 6 - container collection route sheet) and daily reports from RFM.

Container Collection sheet for 6m3



Container collection sheet for 12m3

Source: JICA project team

Figure 6 Container collection sheet from WCSP

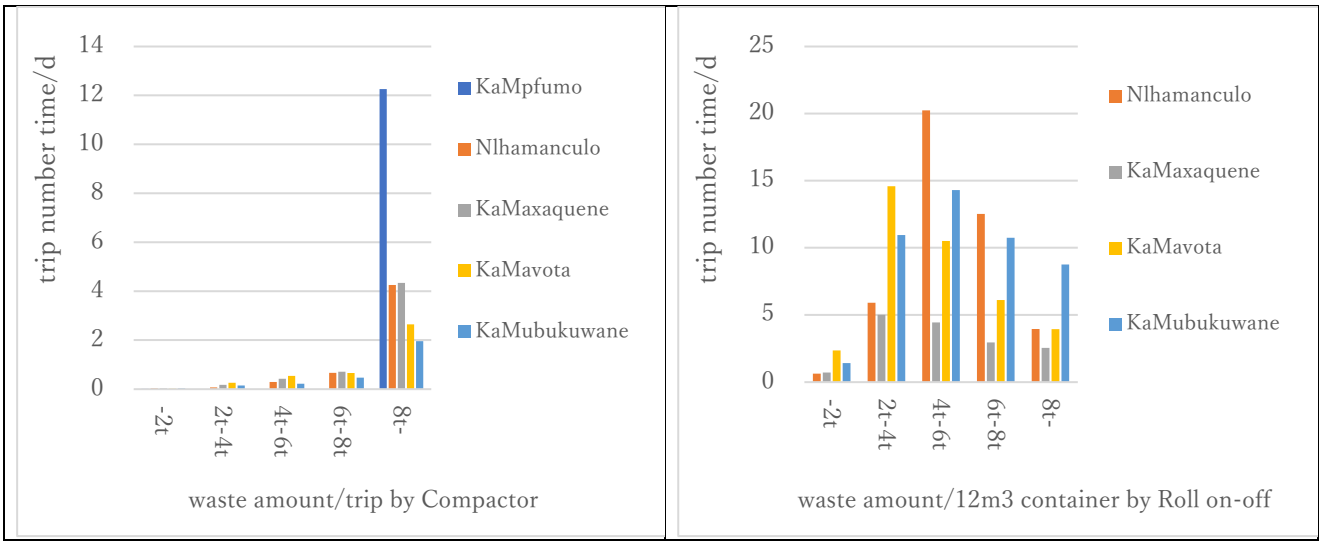
As the result of the monitoring trial activity, information management by the RGC was found to be effective to a certain extent, and issues were identified as shown in Table 7.

Table 7 Summary of Issues Identified from the Monitoring Trial

Item	Content
Lack of container and collection route management	· DSMAS does not have sufficient capacity for container management. · The WCSP itself creates a container collection route sheet with a list of containers and conducts secondary collection following the order of the list. DSMAS cannot manage container collection route sheets adequately.
Collection of empty containers	· Secondary collection of containers with extremely low amount of waste was identified. · The primary collection by MEs is based on their collection areas (a,b,c), each repeated 2 times a week, and some containers are not used on certain days of the week. It seems WCSPs collect containers that are not used on certain days of the week by MEs. · However, it was also found that the collection by compactor trucks is more efficient for empty container than Roll-On-off vehicles because the collection equipment is often fully loaded with waste (Figure 7).
More than two-time collections per day for each container	· This is especially true in Nlhamanculo district, where each container tends to be collected twice a day. Estimates based on population and waste generation rate shows that waste collected by WCSP may include not only household waste, but also business waste, including informal sector waste.
Weighbridge management	· There are differences between the weighbridge system input data and the container collection sheets by the WCSP, such as the absence of container points in the weighbridge system input data items, which also create condition for insufficient monitoring and limits the identification of problematic containers. So, it is recommended that container points should be added to the weighbridge data input field. · Weighbridge operators work more than 12 hours a day due to commuting traffic. Therefore, mistakes are more likely to occur. In addition, there are errors in the data input due to lack of proper training (Figure 8).
Insufficient internal information sharing and Inadequate work procedures	· It was found that RFM changed container locations on its own and did not share this information with RGC or RLM. There is a problem with the container information not being managed and information not being shared. · At the same time, it was found that RLM added at the weighbridge system a new WCSP collection equipment on its own, and that this information was not shared with RGC or RFM. · Need to set up clear procedure/TORs for each section/department.
Inadequate monitoring system	· Daily monitoring is required for penalties, but since the monitoring method has not been determined, no personnel have been set up for this purpose and monitoring work has not been conducted (the method was discussed during the trial activities and the trial was conducted using that method).
Payment issues	· There were instances where CMM failed to pay to the WCSPs, and even if the penalties could be identified, they could not be claimed for payment.
Change of container location by WCSP	· WCSPs have changed container locations, reduced number of containers, and changed the size of containers without sharing this information with DSMAS.

Equipment of collection is broken and no backup by WCSP	· Clean Africa remained around two months without collecting 12 m3 containers. Both 2 roll on and roll of vehicles had a break down and at the same time stayed around two months at South Africa for maintenance. During that period 7 of the 12 m3 containers were collected by DSMAS and the remaining 19 containers until the time of preparation of this report was under responsibility of Ecolife.
The sharing information by WCSP	· During the trial period, DSMAS asked Clean Africa to submit daily waste collection route sheets. However, because it was not a contractual matter (mandatory), it sometimes took days for WCSP to share daily information.

Source: JICA project team



Source: JICA project team

Figure 7 Comparison of waste amount per trip for Roll-on-off and compactor trucks in various District

Track scale data		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total
	12m3	38	47	45	44	37	40	36	47	44	39	48	42	47	33	44	50	43	42	47	44	43	43	41	41	50	44	41	42	43	30	1,274
AKT 596 MC	12m3	22	24	22	23	19	19	17	23	20	21	24	20	22	19	19	23	22	22	22	22	20	23	21	21	24	20	21	17	19	14	625
AJW 921 MC	12m3	16	23	23	21	18	21	19	24	24	18	24	22	25	14	24	27	21	20	25	22	23	20	20	20	26	24	20	25	24	16	649
	6m3	4	6	5	5	5	3	5	4	6	4	4	5	4	2	4	5	5	3	5	5	4	4	5	6	5	5	5	5	6	5	139
AJE 856 MC	6m3	4	6	5	5	5	3	5	4	6	4	4	5	4	2	4	5	5	3	5	5	4	4	5	4	2	2	0	1	0	0	111
AFJ 383 MC	6m3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	3	5	4	6	5	28
penalização		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

RGC(Papel Dato)		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total
Ruta2+Ruta3	12m3	38	47	45	44	37	40	36	48	44	39	48	42	47	50	44	50	43	45	47	44	42	43	41	41	50	44	41	42	44	43	1,309
Ruta2 trip	12m3	19	24	24	21	18	20	18	22	21	19	26	20	23	25	23	26	22	22	22	22	20	21	21	22	26	24	20	25	22	20	658
Ruta3 trip	12m3	19	23	21	23	19	20	18	26	23	20	22	22	24	25	21	24	21	23	25	22	22	22	20	19	24	20	21	17	22	23	651
Ruta1 trip	6m3	4	6	5	5	5	3	5	3	5	4	4	5	4	4	4	5	5	3	5	5	4	4	5	6	5	5	5	5	7	8	143
container	6m3	24	37	34	31	34	19	30	18	39	30	27	31	24	27	28	33	37	20	34	33	32	28	30	36	30	30	32	28	37	41	914
penalização		0	3	0	4	4	5	6	6	3	4	4	4	0	0	3	0	0	0	0	3	2	0	0	0	7	4	0	0	0	4	66

Montly Report CA		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total
	12m3	38	47	46	44	37	39	36	48	44	39	48	42	47	46	45	51	43	44	47	43	41	41	43	41	44	44	41	42	43	46	1,300
AKT-596 trip	12m3	19	23	22	23	19	19	18	25	23	20	22	20	24	25	22	25	21	23	25	21	21	21	22	19	22	20	21	17	21	23	646
AJW-921 trip	12m3	19	24	24	21	18	20	18	23	21	19	26	22	23	21	23	26	22	21	22	22	20	20	21	22	22	24	20	25	22	23	654
container AJE-856	6m3	28	38	34	33	34	21	35	21	41	27	21	30	27	27	29	34	35	23	36	36	28	33	27	39	34	35	34	33	42	48	963

Source: JICA project team

Figure 8 Comparison of the trip number basing on weighbridge data, paper data from RLM, and monthly reports collected from WCSPs

1.4 ME Survey

In order to avoid empty container collection and to ensure effective and efficient collection, it was necessary to know MEs route and to establish secondary collection routes that consider MEs collection route.

However, the bidding conditions for the MEs conducting the primary collection did not specify which MEs would use which containers. The MEs were to coordinate among themselves which MEs would use which containers after the MEs were selected in a bidding process. Therefore, DSMAS does not have information on MEs collection route.

Therefore, an ME survey which had been suspended due to the COVID-19 in 2020, was conducted in the Nlhamanculo District from June 2022, followed by other Districts in August and September 2022. Based on the survey the following problems were identified as shown in Table 8.

The survey was conducted on the following topics.

- Container usage information by each ME, including information of the day of the week;
- Problematic containers identified by MEs (e.g., waste overflowing in containers, scattering, etc.)
- Containers with mixed business waste identified by MEs (business waste volume, waste from informal sector such as street vendors, etc.)
- Number of times each container is picked up per day by WCSP identified by MEs;
- Containers used by markets, etc.

Table 8 Problems identified from the ME Survey

Problem	Content
The use of the same container by multiple MEs	· At the same day. some containers are used by two or three MEs. Consequently, it is possible to see overflow of waste in the containers and unsanitary conditions (Table 9 – column of totals). · Furthermore, on the contrary, there are containers not used by ME.
Possibility of collecting empty containers	· Some containers are used by MEs only twice a week (Table 9 – column of totals). · This means that on other days of the week, the container has very low amount of waste. This means that containers with low amount or no waste are being collected.
Geographical issues	· Some neighborhoods cannot place enough containers in their area due to geographical limitations, and in that cases MEs discharge to containers in other neighborhoods.
Mixing of business waste, etc.	· There are containers that are heavily contaminated with business waste; these containers are recognized by MEs (Table 9 – column of Business). · In some areas, there are informal activities such as street vendors, and the waste from these informal activities is being discharged into containers in unmanaged manner (especially around of market) (Table 9 – column of Problems).
Possible inaccuracy of container collection route sheet information	· Some markets are sharing the same containers with MEs (Table 9 – Column of Market). · Some container points are removed and that place become an illegal dumping.
Others	· WCSPs have changed container locations, reduced containers, and changed them from 12m3 to 6m3 without sharing this information with DSMAS. · There were points where containers were not located during container maintenance by WCSPs.

Source: JICA project team

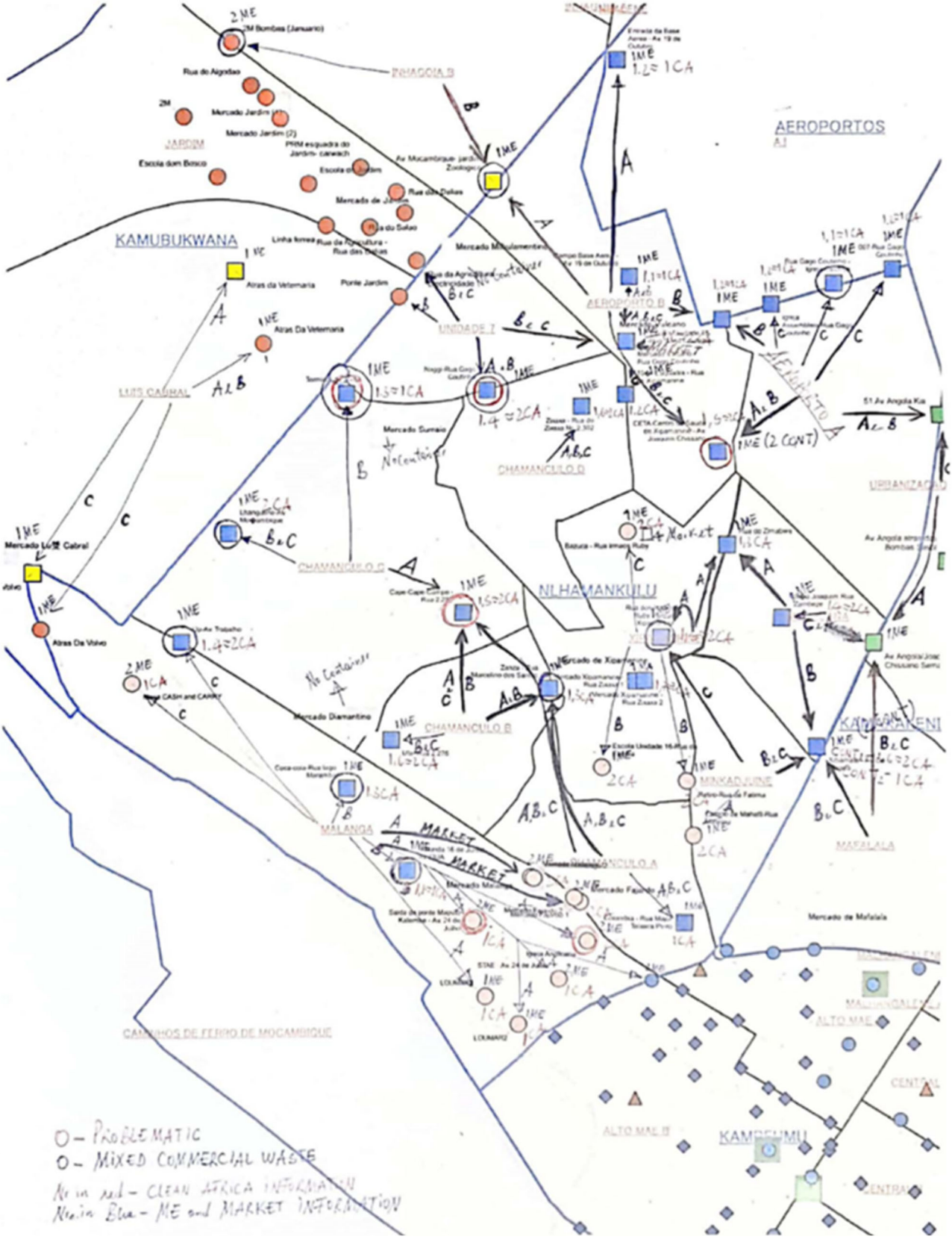
Table 9 Result of ME survey

		CONT NAME (12m3)	Problem	Business	Mercado	Total S	T	Q	Q	F	S	1 MEs	2 MEs	3 MEs
1	12m3	CETA-Centro de Saude de Xipamanine - Av. Joaq	V(overload)			1	2	1	1	2	1	AEROPORTO A	AEROPORTO B	
2	12m3	Escola Unidade 18 -Rua Gago Coutinho				0	2	0	0	2	0		AEROPORTO B	
3	12m3	Igreja Assembleia-Rua Gago Coutinho				0	0	1	0	0	1			
4	12m3	Rua Gago Coutinho - Igreja Catolica		V(small)		0	0	1	0	0	1			
5	12m3	007-Rua Gago Coutinho				0	0	1	0	0	1			
6	12m3	Entrada da Base Aerea - Av. 19 de Outubro				1	0	0	1	0	0	AEROPORTO B		
7	12m3	Campo Base Aerea - Av. 19 de Outubro				1	1	0	1	1	0			
8	12m3	Mercado Vulcano - Rua Gago Coutinho			V	1	2	2	1	2	2		UNIDADE 7	
9	12m3	10– Esquadra - Rua de Xipamanine				0	0	1	0	0	1			
10	12m3	Rua dos Irmaos Ruby/Parque Xipamanine		V	V(informal)	1	0	1	1	0	1	XIPAMANINE	MINKADJUINE	
11	12m3	Rua do Zimabwe				2	0	0	2	0	0	MUNHUANA	XIPAMANINE	
12	12m3	S益 Joaquim Rua Zambeze				1	0	1	1	0	1			
13	12m3	Xibamate 1- Av. De Angola				0	3	2	0	3	2		MINKADJUINE	MAFALALA
14	12m3	**Xibamate 2- Av. De Angola**				0	3	2	0	3	2		MINKADJUINE	MAFALALA
15	12m3	Colombia - Rua Major Teixeira Pinto				1	1	1	1	1	1	CHAMANCULO A		
16	12m3	Zanza - Rua Marcelino dos Santos		V		2	2	1	2	2	1	CHAMANCULO A	CHAMANCULO B	
17	12m3	Ufa- Rua 2.276				0	1	1	0	1	1	CHAMANCULO B		
18	12m3	Cape-Cape-Campo - Rua 2.282	V(overload)			3	2	2	3	2	2	CHAMANCULO C	CHAMANCULO B	CHAMANCULO A
19	12m3	Terminal da Junta	V(overload)	V(big)		0	1	0	0	1	0			
20	12m3	Lhanguene-Av. Mo軋mbique		V		0	1	1	0	1	1			
21	12m3	Zixaxa - Rua do Zixaxa Nr. 2.302				1	1	1	1	1	1	CHAMANCULO D		
22	12m3	Rotunda 16 de Junho- Av. OUA		V		0	1	0	0	1	0	MARANGA		
23	12m3	Coca-cola-Rua lago Maramba		V		0	1	0	0	1	0			
24	12m3	Up-Av. Trabalho		V		0	0	1	0	0	1			
25	12m3	Naggi-Rua Gago Coutinho	V(overload)	V(carpintalia)		1	1	0	1	1	0	UNIDADE 7		
26	12m3	Mercado Xipamanine - Rua Zixaxa 1			V	1	1	1	1	1	1	every day collection		
27	12m3	Mercado Xipamanine - Rua Zixaxa 2			V	1	1	1	1	1	1	every day collection		
						18	**27**	**23**	**18**	**27**	**23**			

		CONT NAME (6m3)	Problem	Business	Mercado	S	T	Q	Q	F	S	1 MEs	2 MEs	3 MEs
1	6m3	Retiro-Rua da Fatima				0	1	0	0	1	0	XIPAMANINE		
2	6m3	Escola Unidade 16-Rua da Fatima				0	1	0	0	1	0			
3	6m3	Bazuca - Rua Irmaos Ruby	V(overload)		V(informal)	0	0	1	0	0	1			
4	6m3	Campo de Mahafil-Rua Mateteu				1	0	0	1	0	0	MINKADJUINE		
5	6m3	Mercado Fajardo 1		V(Baraca)	V	2	1	1	2	1	1	MALANGA	every day collection	
6	6m3	Mercado Fajardo 2		V(Baraca)	V	2	1	1	2	1	1		every day collection	
7	6m3	Mercado Malanga 1			V	2	1	1	2	1	1		every day collection	
8	6m3	Mercado Malanga 2			V	2	1	1	2	1	1		every day collection	
9	6m3	Igreja Anglicana	V(scater)			1	0	0	1	0	0			
10	6m3	Saida da ponte Maputo Katembe - Av. 24 de Julho	V(overload)		V(informal)	1	0	0	1	0	0			
11	6m3	STAE - Av. 24 de Julho				1	0	0	1	0	0			
12	6m3	Mega CASH and CARRY				0	0	1	0	0	1			
13	6m3	LOUMAR1				0	0	1	0	0	1			
14	6m3	LOUMAR2				0	0	1	0	0	1			
						12	**6**	**8**	**12**	**6**	**8**			

		CONT NAME (6m3)	Problem	Business	Mercado	S	T	Q	Q	F	S	MEs
1	6m3	Chibantchane				1	1	0	1	1	0	CHALI
2	6m3	Espiga D'ouro				0	0	1	0	0	1	
3	6m3	Firmino				1	1	0	1	1	0	
4	6m3	Mercado Chali				0	0	1	0	0	1	
5	6m3	Raul				0	1	1	0	1	1	GUACHENI
6	6m3	EPC				1	0	0	1	0	0	
7	6m3	Complexo Guimaraes				1	0	0	1	0	0	
8	6m3	Ponto-Final (perto do Quartel)				1	0	0	1	0	0	
9	6m3	Assucena				0	1	0	0	1	0	INCASSANE
10	6m3	Cemiterio-Incassane				1	0	1	1	0	1	
						6	**4**	**4**	**6**	**4**	**4**	

Source: JICA project team

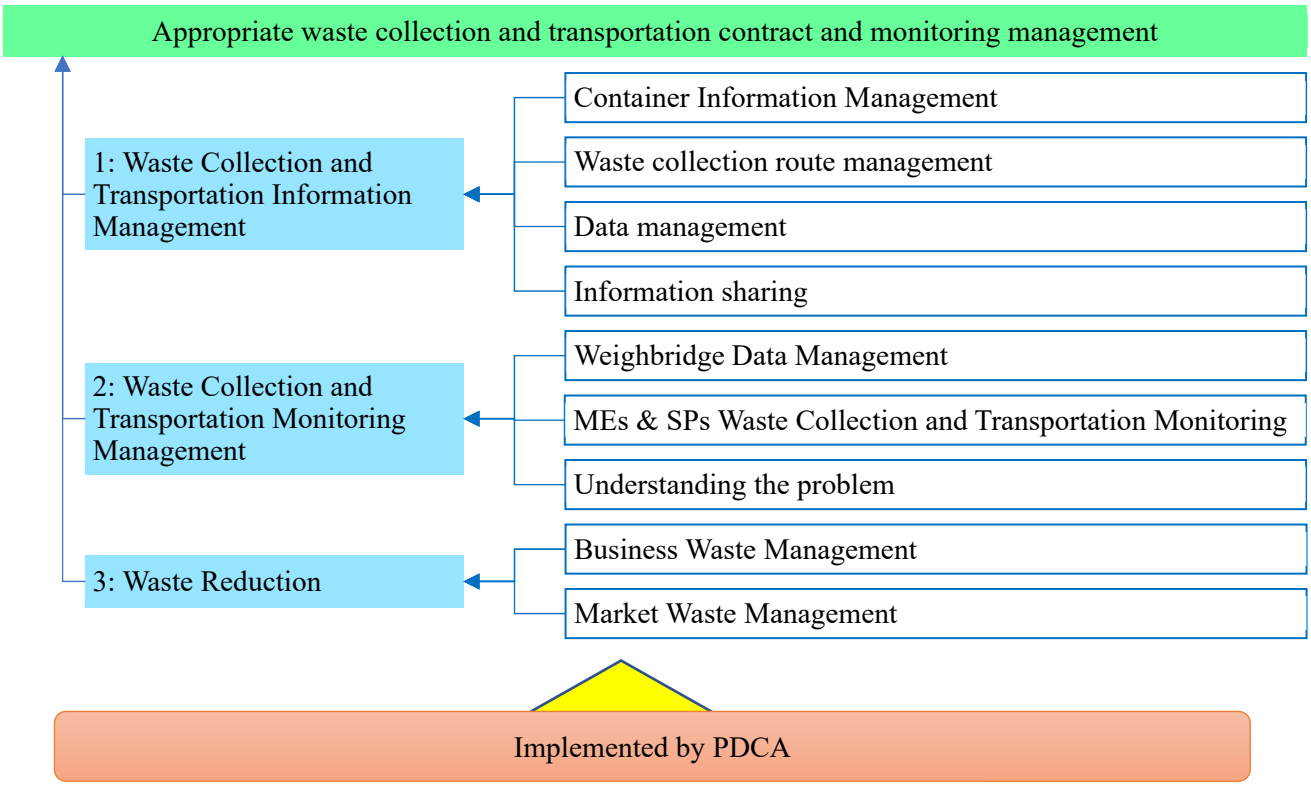


Source: JICA project team

Figure 9 Result of ME survey (MAP)

2. COLLECTION MANAGEMENT IMPROVEMENT PLAN

Based on the problems identified from the above-mentioned activities, future waste collection was discussed together with C/P, and three strategies were established for the management of outsourcing and monitoring of appropriate waste collection and transportation service. In addition, measures to be implemented for each strategy were organized. In addition, the implementation of the PDCA cycle is important for the implementation of these strategies (See Figure 10).



Source: JICA project team

Figure 10 Proper Waste Collection and Transportation Contract and Monitoring Management

2.1 Waste collection and transportation information management

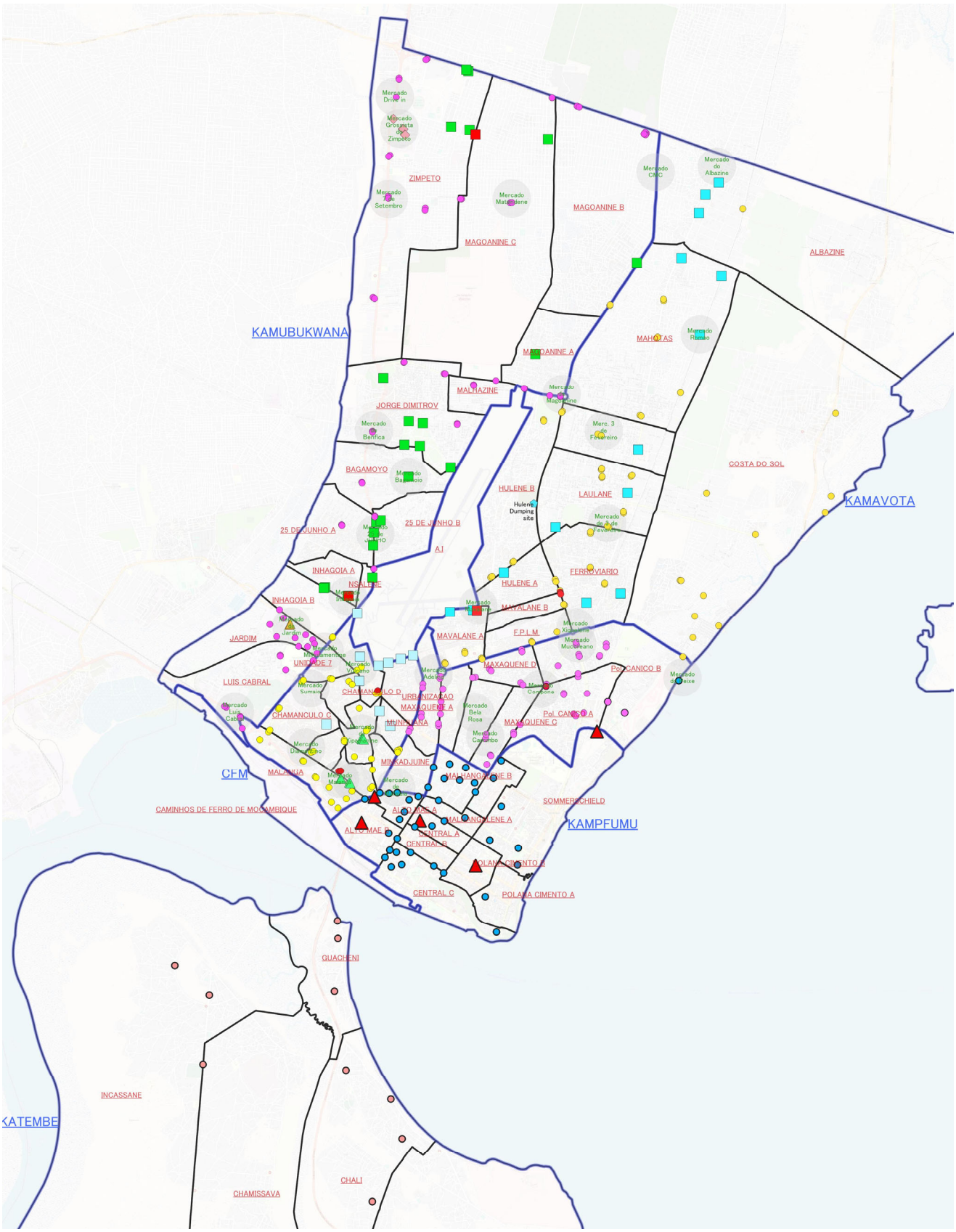
The first strategy is "waste collection and transportation information management" including capacity building, because it is difficult to take action if DSMAS does not manage the necessary information to monitor waste collection and transportation service. The contents of this strategy are container information management, collection route management, data management, and information sharing.

2.1.1 Container information management

Information management such as container lists including information on container location and capacity, MEs route, etc. will be conducted by DSMAS. When the capacity or location of containers is changed due to monitoring activities, etc., such changes will be reflected and managed.

DSMAS does not fully manage the locations of containers in Maputo City. This is an obstacle to effective and efficient implementation of contract supervision and monitoring of WCSPs. Therefore, Container lists and container maps (Google Maps, QGIS, and paper-based maps) were created by the project (Figure 11).

However, data updating and other tasks related to QGIS data management skills, and such personnel need to be hired/identified internally. In addition, as described below, a system that utilizes mapping software such as MOPA allows container information to be placed on a map, making it possible to store and update data on an outsourced basis.



Source: JICA project team

Figure 11 Container map (after modification)

2.1.2 Waste collection route management

DSMAS will manage the container information in each district used by each ME as well as the waste collection routes.

DSMAS does not fully understand which MEs are using which containers or what collection routes are being used for secondary collection. Therefore, monitoring was not conducted effectively. In considering effective and efficient collection avoiding the collection of empty containers, etc. an understanding of the containers used by MEs and secondary collection and transportation routes that consider MEs' collection route is required. The concept of effective and efficient collection as shown in Table 10 was discussed with the C/P. Besides, a new container collection plan including a list of MEs' containers and collection routes for each district was prepared with the C/P based on discussion and the MEs survey.

Table 10 Waste Collection Route Management

Item	Content
Designation of containers managed by MEs	· In principle, one ME per container will be designated and ME will be responsible for the management of the designated container. · However, if the geographical situation of the area or the refusal of residents makes it necessary for more than one ME to manage the same container, the policy will be that a maximum of two MEs will use the container. · Where multiple MEs use the same container on the same day and high volume of waste is expected to be discharged, additional containers will be installed as long as possible.
Change to 6m3 container	· Monitoring trial have shown that 6m3 containers are efficiently collected with a high waste loading rate because they are collected by compactor truck. Therefore, some 12m3 containers will be replaced to 6m3 containers (for compactor truck collection). · Instead of replacing all 12m3 containers with 6m3 containers, the 12m3 containers that can be replaced will be converted to 6m3 containers for collection by compactor trucks, taking into consideration the quality of waste, such as pruned refuse and sand contamination, waste collection and transportation routes, and MEs' container usage conditions (such as containers that are used by MEs on only a few days of the week). · The change to 6m3 containers with compactor truck collection will be implemented in the Nlhamanculo and KaMaxaquene districts, which are more urbanized and less susceptible to sand.
Secondary collection and transportation method	· Waste collection hours for secondary collection shall be within 7 p.m.to 7 a.m. · 6m3 containers shall be collected at least once a day for hygiene purposes. · 12m3 containers are not collected on days of the week when they are not used by MEs. However, each morning the MEs will check to see if the container for which they are responsible is full of waste, and if it needs to be collected, they will request an extra and additional collection (extra and additional collection on a request basis from the MEs).
Market waste containers	· Some market should use their own container only for market waste and market containers will not be shared with MEs. · Market containers will be managed by the market office. This will be applied only for organized market.

Source: JICA project team

The container collection plan was developed by the following procedure based on the container MAP modified.

- The 12m3 container collection route was determined based on the container list and the closeness between containers along the road considering the travel distances and time from each container point to Hulene dumping site by Google map.
- The 6m3 container collection route was also created based on the container list and the closeness between containers along the road. Then, the travel distances and time from each group of containers (one trip) to Hulene dumping site by Google map.
- For the 6m3 container collection route, the number of containers per trip was estimated based on the current waste density of the compactor trucks.

As an example, a container map and List of MEs routes including the container usage by the days of the week in Nlhamanculo district is shown in Figure 12 and Table 11. The container collection plan is also shown in Table 12 (other districts are presented in Appendix 1).

From the next waste collection service contract, this information should be presented in the TOR and primary and secondary collection contract management should be implemented.

- Future considerations
  - Waste collection by compactor trucks should also be promoted to introduce payment on a waste ton basis in areas where the urbanization is progressing, such as Nlhamanculo and KaMaxaquene Districts. However, the unit price proposed by WCSP may be higher than the current price. Therefore, it is recommended to introduce it as TOR condition for one district only, and compare the unit price proposed on a per-ton basis with the unit price on a per-trip basis. If the ton basis is efficient, it would be effective to extend the ton basis payment to other districts.
  - It was recommended that the compactor truck collection would be conducted at least once a day from a hygiene aspect. However, the daily collection is not necessary if the container arrangement is appropriate to the local waste generation, and if the mixing of business waste, whose generation is difficult to predict, can be reduced. It would be ideal if a collection route of WCSP could be developed that only collects containers discharged by MEs collection on a set day of the week, and this should be the goal in the future (Table 12 – See the column of Total for 6m3 containers).
  - Regarding the collection of market waste, in the next TOR, it will be included in the household waste collection route. However, if the World Bank project (PTUM) is to promote waste reduction by recycling organic material of market into compost, it is desirable to change the contract and set up a collection route only for market waste so that market waste is not mixed with household waste.

Source: JICA project team

Figure 12 Container Map (After Modification), Case of Nlhamanculo

Table 11 List of ME containers, including the container usage by the days of the week (After Modification), Case of Nlhamanculo

			NLHAMANKULO		2nd Collection Plan							Total																		
Nr.	New	Distrito	Microempresa	Nome do ponto de contentor	S	T	Q	Q	F	S		S	T	Q	Q	F	S		S	T	Q	Q	F	S		1 MEs	S	T	Q	Q	F	S	2 MEs
1	6	Nhamankulo		CETA 1-Centro de Saude de Xipamanine - Av. Joaquim Chissano	1	1	1	1	1	1		1	1	0	1	1	0		A	B			A	B		AEROPORTO A							
2	6	Kamaxaquene		51.Av. Angola Kia-1	1	1	1	1	1	1		0	1	0	0	1	0			B				B		AEROPORTO A							
3	6	Kamaxaquene		51.Av. Angola Kia-2	1	1	1	1	1	1		0	1	0	0	1	0			B				B		AEROPORTO A							
4	12	Nhamankulo	AEROPORTO A	Igreja Assembleia-Rua Gago Coutinho	1	1	0	0	1	0		0	1	0	0	1	0			B				B		AEROPORTO A							
5	12	Nhamankulo		Escola Unidade 18 -Rua Gago Coutinho	1	0	1	0	0	1		0	0	1	0	0	1				C				C		AEROPORTO A							
6	12	Nhamankulo		Rua Gago Coutinho - Igreja Catolica	1	0	1	0	0	1		0	0	1	0	0	1				C				C		AEROPORTO A							
7	12	Nhamankulo		007-Rua Gago Coutinho	1	0	1	0	0	1		0	0	1	0	0	1				C				C		AEROPORTO A							
4	6	Nhamankulo		Mercado Vulcano 2- Rua Gago Coutinho	1	1	1	1	1	1		2	2	2	2	2	2		A	B	C	A	B	C		AEROPORTO B	A	B	C	A	B	C	Mercado Vulcano
1	12	Nhamankulo		Entrada da Base Aerea - Av. 19 de Outubro	1	0	0	1	0	0		1	0	0	1	0	0		A				A			AEROPORTO B							
2	12	Nhamankulo		Campo Base Aerea - Av. 19 de Outubro	1	1	0	1	1	0		1	1	0	1	1	0		A	B			A	B		AEROPORTO B							
3	6	Nhamankulo		CETA 2-Centro de Saude de Xipamanine - Av. Joaquim Chissano	1	1	1	1	1	1		1	1	0	1	1	0		A	B			A	B		AEROPORTO B							
5	12	Nhamankulo	AEROPORTO B	Escola Unidade 18 -Rua Gago Coutinho	1	1	0	0	1	0		0	1	0	0	1	0			B				B		AEROPORTO B							
6	6	Nhamankulo		Av. Mocambique- jardim Zoologico 1	1	1	1	1	1	1		0	1	0	0	1	0			B				B		AEROPORTO B							
7	6	Nhamankulo		Av. Mocambique- jardim Zoologico 2	1	1	1	1	1	1		0	1	0	0	1	0			B				B		AEROPORTO B							
8	6	Nhamankulo		CETA 3-Centro de Saude de Xipamanine - Av. Joaquim Chissano	1	1	1	1	1	1		0	1	1	0	1	1			B	C			B	C		AEROPORTO B							
9	12	Nhamankulo		10- Esquadra - Rua de Xipamanine	1	0	1	0	0	1		0	0	1	0	0	1				C				C		AEROPORTO B							
1	6	Nhamankulo		NEW for Chamanculo A-1	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		CHAMANCULO A							
2	6	Nhamankulo	CHAMANCULO A	NEW for Chamanculo A-2	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		CHAMANCULO A							
3	6	Nhamankulo		Colombia - Rua Major Teixeira Pinto-1	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		CHAMANCULO A							
4	6	Nhamankulo		Colombia - Rua Major Teixeira Pinto-2	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		CHAMANCULO A							
1	6	Nhamankulo		Zanza-1 Rua Marcelino dos Santos	1	1	1	1	1	1		1	1	0	1	1	0		A	B			A	B		CHAMANCULO B							
2	6	Nhamankulo		Zanza-2 Rua Marcelino dos Santos-2	1	1	1	1	1	1		1	1	0	1	1	0		A	B			A	B		CHAMANCULO B							
4	6	Nhamankulo	CHAMANCULO B	Ufa-1 Rua 2.276	1	1	1	1	1	1		0	1	1	0	1	1			B	C			B	C		CHAMANCULO B							
5	6	Nhamankulo		Ufa-2 Rua 2.276	1	1	1	1	1	1		0	1	1	0	1	1			B	C			B	C		CHAMANCULO B							
3	12	Nhamankulo		Cape-Cape-Campo - Rua 2.282	1	0	1	0	0	1		0	0	1	0	0	1				C				C		CHAMANCULO B							
1	12	Nhamankulo		Cape-Cape-Campo - Rua 2.282	1	0	0	1	0	0		1	0	0	1	0	0		A				A			CHAMANCULO C							
2	6	Nhamankulo		Terminal da Junta-1	1	1	1	1	1	1		0	1	0	0	1	0			B				B		CHAMANCULO C							
3	6	Nhamankulo	CHAMANCULO C	Terminal da Junta-2	1	1	1	1	1	1		0	1	0	0	1	0			B				B		CHAMANCULO C							
4	6	Nhamankulo		Lhanguene-Av. Mozambique-1	1	1	1	1	1	1		0	1	1	0	1	1			B	C			B	C		CHAMANCULO C							
5	6	Nhamankulo		Lhanguene-Av. Mozambique-2	1	1	1	1	1	1		0	1	1	0	1	1			B	C			B	C		CHAMANCULO C							
1	6	Nhamankulo	CHAMANCULO D	Zixaxa 1- Rua do Zixaxa Nr. 2.302	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		CHAMANCULO D							
2	6	Nhamankulo		Zixaxa 2- Rua do Zixaxa Nr. 2.302	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		CHAMANCULO D							
1	6	Nhamankulo	MAFALALA	Xibamate 3- Av. De Angola	1	1	1	1	1	1		0	1	1	0	1	1			B	C			B	C		MAFALALA							
1	6	Nhamankulo		Saida da ponte Maputo Katembe - Av. 24 de Julho	1	1	1	1	1	1		2	1	1	2	1	1		A				A			MALANGA	A	B	C	A	B	C	Add collection for informal
2	6	Nhamankulo		STAE - Av. 24 de Julho	1	1	1	1	1	1		1	0	0	1	0	0		A				A			MALANGA							
3	6	Nhamankulo		Igreja Anglicana	1	1	1	1	1	1		1	0	0	1	0	0		A				A			MALANGA							
4	6	Nhamankulo		NEW for Chamanculo A-1	1	1	1	1	1	1		1	0	0	1	0	0		A				A			MALANGA							
5	6	Nhamankulo		Coca-cola-Rua lago Maramba-1	1	1	1	1	1	1		0	1	0	0	1	0			B				B		MALANGA							
6	6	Nhamankulo		Coca-cola-Rua lago Maramba-2	1	1	1	1	1	1		0	1	0	0	1	0			B				B		MALANGA							
7	6	Nhamankulo	MALANGA	Rotunda 16 de Junho-1 Av. OUA	1	1	1	1	1	1		0	1	0	0	1	0			B				B		MALANGA							
8	6	Nhamankulo		Rotunda 16 de Junho-2 Av. OUA	1	1	1	1	1	1		0	1	0	0	1	0			B				B		MALANGA							
9	6	Nhamankulo		Mega CASH and CARRY	1	1	1	1	1	1		0	0	1	0	0	1				C				C		MALANGA							
10	6	Nhamankulo		Up-Av. Trabalho-1	1	1	1	1	1	1		0	0	1	0	0	1				C				C		MALANGA							
11	6	Nhamankulo		Up-Av. Trabalho-2	1	1	1	1	1	1		0	0	1	0	0	1				C				C		MALANGA							
12	6	Nhamankulo		LOUMAR1	1	1	1	1	1	1		0	0	1	0	0	1				C				C		MALANGA							
13	6	Nhamankulo		LOUMAR2	1	1	1	1	1	1		0	0	1	0	0	1				C				C		MALANGA							
1	6	Nhamankulo		Campo de Mahafil-Rua Mateteu	1	1	1	1	1	1		1	0	0	1	0	0		A				A			MINKADJUINE							
2	6	Nhamankulo	MINKADJUINE	Rua dos Irmaos Ruby/Parque Xipamanine-1	1	1	1	1	1	1		0	0	1	0	0	1				C				C		MINKADJUINE							
3	6	Nhamankulo		Xibamate 1- Av. De Angola	1	1	1	1	1	1		0	1	1	0	1	1			B	C			B	C		MINKADJUINE							
1	6	Nhamankulo		Xibamate 2- Av. De Angola	1	1	1	1	1	1		1	0	0	1	0	0		A				A			MUNHUANA							
2	12	Nhamankulo	MUNHUANA	Rua do Zimabwe	1	1	0	0	1	0		0	1	0	0	1	0			B				B		MUNHUANA							
3	12	Nhamankulo		S谷 Joaquim Rua Zambeze	1	0	1	1	0	1		1	0	1	1	0	1		A		C	A		C		MUNHUANA							
1	6	Nhamankulo		Naggi 1-Rua Gago Coutinho	1	1	1	1	1	1		1	1	0	1	1	0		A	B			A	B		UNIDADE 7							
2	6	Nhamankulo	UNIDADE 7	Naggi 2-Rua Gago Coutinho	1	1	1	1	1	1		1	1	0	1	1	0		A	B			A	B		UNIDADE 7							
3	6	Nhamankulo		Mercado Vulcano 1- Rua Gago Coutinho	1	1	1	1	1	1		1	2	2	1	2	2			B	C			B	C		UNIDADE 7	A	B	C	A	B	C	Mercado Vulcano
1	12	Nhamankulo		Rua do Zimabwe	1	0	0	1	0	0		1	0	0	1	0	0		A				A			XIPAMANINE							
2	6	Nhamankulo		Rua dos Irmaos Ruby/Parque Xipamanine-1	1	1	1	1	1	1		1	0	0	1	0	0		A				A			XIPAMANINE							
3	6	Nhamankulo	XIPAMANINE	Rua dos Irmaos Ruby/Parque Xipamanine-2	1	1	1	1	1	1		1	0	0	1	0	0		A				A			XIPAMANINE							
4	6	Nhamankulo		Retiro-Rua da Fatima	1	1	1	1	1	1		0	1	0	0	1	0			B				B		XIPAMANINE							
5	6	Nhamankulo		Escola Unidade 16-Rua da Fatima	1	1	1	1	1	1		0	1	0	0	1	0			B				B		XIPAMANINE							
6	6	Nhamankulo		Bazuca - Rua Irmaos Ruby	1	1	1	1	1	1		1	1	2	1	1	2				C				C		XIPAMANINE	A	B	C	A	B	C	Add collection for informal
1	6	Nhamankulo	Mercado Fajardo	Mercado Fajardo 1	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		Mercado Fajardo							
2	6	Nhamankulo		Mercado Fajardo 2	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		Mercado Fajardo							
1	6	Nhamankulo	Mercado Malanga	Mercado Malanga 1	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		Mercado Malanga							
2	6	Nhamankulo		Mercado Malanga 2	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		Mercado Malanga							
1	6	Nhamankulo	Mercado Xipamanine	Mercado Xipamanine-1 Rua Zixaxa	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		Mercado Xipamanine							
2	6	Nhamankulo		Mercado Xipamanine-2 Rua Zixaxa	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		Mercado Xipamanine							
3	6	Nhamankulo		Mercado Xipamanine-3 Rua Zixaxa	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		Mercado Xipamanine							
4	6	Nhamankulo		Mercado Xipamanine-4 Rua Zixaxa	1	1	1	1	1	1		1	1	1	1	1	1		A	B	C	A	B	C		Mercado Xipamanine							
				KATEMBE																												
1	6	Katembe		Chibantchane	1		1		1			1	1	0	1	1	0		A	B			A	B		CHALI							
2	6	Katembe	CHALI	Firmino	1		1		1			1	1	0	1	1	0		A	B			A	B		CHALI							
3	6	Katembe		Espiga D'ouro	1		1		1			0	0	1	0	0	1				C				C		CHALI							
4	6	Katembe		Mercado Chali	1		1		1			0	0	1	0	0	1				C				C		CHALI							
1	6	Katembe		Complexo Guimaraes	1		1		1			1	0	0	1	0	0		A				A			GUACHENI							
2	6	Katembe	GUACHENI	EPC	1		1		1			1	0	0	1	0	0		A				A			GUACHENI							
3	6	Katembe		Raul	1		1		1			0	1	1	0	1	1			B	C			B	C		GUACHENI							
1	6	Katembe		Ponto-Final (perto do Quartel)	1		1		1			1	0	0	1	0	0		A				A			INCASSANE							
2	6	Katembe	INCASSANE	Assucena	1		1		1			0	1	0	0	1	0			B				B		INCASSANE							
3	6	Katembe		Cemiterio-Incassane	1		1		1			1	0	1	1	0	1		A		C	A		C		INCASSANE							

Source: JICA project team

Source: JICA project team

Figure 13 Map of container collection routes (After Modification), Case of Nlhamanculo

Table 12 Container collection plan (After Modification), Case of Nlhamanculo

	Now	New	Chamnculo CONT NAME (12m3)	Longitude	Latitude	2nd Collection Plan S T Q Q F S	Total S T Q Q F S	S T Q Q F S	1 MEs	S T Q Q F S	2 MEs	Mercado	Problem	Business		Container llegada 0:10 Salida	FDS llegada 0:10 Salida	Containers 0:00 km 0:00	Hulene 19:00 km 22:00	
1	12	12	Igreja Assembleia-Rua Gago Coutinho	32.568471	-25.931993	1 1 0 0 1 0	0 1 0 0 1 0	B B	AEROPORTO A							19:00 0:10 19:10	19:29 0:10 19:39		0:19 5.4 0:14 0:19	
2	12	12	Escola Unidade 18 -Rua Gago Coutinho	32.566439	-25.932545	1 1 1 0 1 1	0 1 1 0 1 1	C C	AEROPORTO A	B B	AEROPORTO B					19:58 0:10 20:08	20:27 0:10 20:37		0:19 5.6 0:14 0:19	
3	12	12	Rua Gago Coutinho - Igreja Catolica	32.571065	-25.931221	1 0 1 0 0 1	0 0 1 0 0 1	C C	AEROPORTO A					V(small)		20:56 0:10 21:06	21:25 0:10 21:35		0:19 5.1 0:14 0:19	
4	12	12	007-Rua Gago Coutinho	32.573491	-25.930688	1 0 1 0 0 1	0 0 1 0 0 1	C C	AEROPORTO A							21:53 0:10 22:03	22:15 0:10 22:25		0:18 4.9 0:12 0:12	
5	12	12	Entrada da Base Aerea - Av. 19 de Outubro	32.562085	-25.922761	1 0 0 1 0 0	1 0 0 1 0 0	A A	AEROPORTO B							22:46 0:10 22:56	23:12 0:10 23:22		0:21 6.9 0:16 0:16	
6	12	12	Campo Base Aerea - Av. 19 de Outubro	32.562580	-25.930900	1 1 0 1 1 0	1 1 0 1 1 0	A B A B	AEROPORTO B							23:43 0:10 23:53	0:09 0:10 0:19		0:21 6.1 0:16 0:16	
7	12	12	10- Esquadra - Rua de Xipamanine	32.562421	-25.935345	1 0 1 0 0 1	0 0 1 0 0 1	C C	AEROPORTO B							0:41 0:10 0:51	1:07 0:10 1:17		0:22 6.4 0:16 0:16	
8	12	12	Rua do Zimabwe	32.566486	-25.941054	1 1 0 1 1 0	1 1 0 1 1 0	A A	XIPAMANINE	B B	MUNHUANA					1:43 0:10 1:53	2:12 0:10 2:22		0:26 7.7 0:19 0:19	
9	12	12	Sã Joaquim Rua Zambeze	32.568872	-25.943809	1 0 1 1 0 1	1 0 1 1 0 1	C A C	MUNHUANA							2:51 0:10 3:01	3:20 0:10 3:30		0:29 7.2 0:19 0:19	
10	12	12	Cape-Cape-Campo - Rua 2.282	32.555710	-25.943592	1 0 1 1 0 1	1 0 1 1 0 1	A A	CHAMANCULO C	C C	CHAMANCULO B		V(overload)			3:56 0:10 4:06	4:26 0:10 **4:36**		0:26 7.6 0:20 0:20	
10	**120m3**	**120m3**				10 4 6 5 4 6	5 4 6 5 4 6												**62.9**	**175min**
1	12	6	Mercado Vulcano 1- Rua Gago Coutinho	32.562462	-25.933316	1 1 1 1 1 1	1 2 2 1 2 2	B C B C	UNIDADE 7	A B C A B C	Mercado Vulcano	V			T01-1	**19:00** 0:10 19:10		0:00 0 0:00		
2		6	Mercado Vulcano 2- Rua Gago Coutinho	32.562462	-25.933316	1 1 1 1 1 1	2 2 2 2 2 2	A B C A B C	AEROPORTO B	A B C A B C	Mercado Vulcano	V			T01-2	19:10 0:10 19:20		0:00 0 0:00 0:00		
3	12	6	Zixaxa 1- Rua do Zixaxa Nr. 2.302	32.560600	-25.935774	1 1 1 1 1 1	1 1 1 1 1 1	A B C A B C	CHAMANCULO D						T01-3	19:22 0:10 19:32		0:02 0.45 0:02 0:02		
4		6	Zixaxa 2- Rua do Zixaxa Nr. 2.302	32.560600	-25.935774	1 1 1 1 1 1	1 1 1 1 1 1	A B C A B C	CHAMANCULO D						T01-4	19:32 0:10 19:42	20:04 0:10 20:14	0:00 0 0:00 0:00	0:22 6.4 0:16 0:22	
5	12	6	Naggi 1-Rua Gago Coutinho	32.556682	-25.935110	1 1 1 1 1 1	1 1 0 1 1 0	A B A B	UNIDADE 7				V(overload)	V(carpintalia)	T02-1	**20:36** 0:10 20:46			0:22 6.6 0:17 0:22	
6		6	Naggi 2-Rua Gago Coutinho	32.556682	-25.935110	1 1 1 1 1 1	1 1 0 1 1 0	A B A B	UNIDADE 7						T02-2	20:46 0:10 20:56		0:00 0 0:00 0:00		
7	12	6	Terminal da Junta-1	32.550818	-25.935218	1 1 1 1 1 1	0 1 0 0 1 0	B B	CHAMANCULO C				V(overload)	V(big)	T02-3	20:58 0:10 21:08		0:02 0.6 0:02 0:02		
8		6	Terminal da Junta-2	32.550818	-25.935218	1 1 1 1 1 1	0 1 0 0 1 0	B B	CHAMANCULO C						T02-4	21:08 0:10 21:18	21:42 0:10 21:52	0:00 0 0:00 0:00	0:24 7.5 0:20 0:24	
9	12	6	Lhanguene-Av. Mozambique-1	32.545892	-25.940547	1 1 1 1 1 1	0 1 1 0 1 1	B C B C	CHAMANCULO C					V	T03-1	**22:12** 0:10 22:22			0:22 8.1 0:20 0:20	
10		6	Lhanguene-Av. Mozambique-2	32.545892	-25.940547	1 1 1 1 1 1	0 1 1 0 1 1	B C B C	CHAMANCULO C						T03-2	22:22 0:10 22:32		0:00 0 0:00 0:00		
11	6	6	Mega CASH and CARRY	32.541927	-25.946280	1 1 1 1 1 1	0 0 1 0 0 1	C C	MALANGA						T03-3	22:37 0:10 22:47		0:05 1.5 0:05 0:05		
12	12	6	Up-Av. Trabalho-1	32.543945	-25.944700	1 1 1 1 1 1	0 0 1 0 0 1	C C	MALANGA					V	T03-4	22:52 0:10 23:02	23:24 0:10 23:34	0:05 1.1 0:05 0:05	0:29 8.8 0:22 0:22	
13		6	Up-Av. Trabalho-2	32.543945	-25.944700	1 1 1 1 1 1	0 0 1 0 0 1	C C	MALANGA						T04-1	**23:54** 0:10 0:04			0:22 8.6 0:20 0:20	
14	12	6	Ufa-1 Rua 2.276	32.552701	-25.948462	1 1 1 1 1 1	0 1 1 0 1 1	B C B C	CHAMANCULO B						T04-2	0:08 0:10 0:18		0:04 1.1 0:04 0:04		
15		6	Ufa-2 Rua 2.276	32.552701	-25.948462	1 1 1 1 1 1	0 1 1 0 1 1	B C B C	CHAMANCULO B						T04-3	0:18 0:10 0:28		0:00 0 0:00 0:00		
16	12	6	Coca-cola-Rua lago Maramba-1	32.550864	-25.950301	1 1 1 1 1 1	0 1 0 0 1 0	B B	MALANGA					V	T04-4	0:31 0:10 0:41	1:05 0:10 1:15	0:03 0.45 0:03 0:03	0:31 9.8 0:24 0:24	
17		6	Coca-cola-Rua lago Maramba-2	32.550864	-25.950301	1 1 1 1 1 1	0 1 0 0 1 0	B B	MALANGA						T05-1	**1:38** 0:10 1:48			0:26 9.7 0:23 0:23	
18	12	6	Rotunda 16 de Junho-1 Av. OUA	32.553406	-25.953362	1 1 1 1 1 1	0 1 0 0 1 0	B B	MALANGA					V	T05-2	1:50 0:10 2:00		0:02 0.45 0:02 0:02		
19		6	Rotunda 16 de Junho-2 Av. OUA	32.553406	-25.953362	1 1 1 1 1 1	0 1 0 0 1 0	B B	MALANGA						T05-3	2:00 0:10 2:10		0:00 0 0:00 0:00		
20	6	6	Saida da ponte Maputo Katembe - Av. 24 de Julho	32.556133	-25.955219	1 1 1 1 1 1	2 1 1 2 1 1	A A	MALANGA	A B C A B C	Add collection for informal	V(informal)	V(overload)		T05-4	2:11 0:10 2:21	2:44 0:10 2:54	0:01 0.35 0:01 0:01	0:35 9.2 0:23 0:23	
21	6	6	LOUMAR1	32.556625	-25.958017	1 1 1 1 1 1	0 0 1 0 0 1	C C	MALANGA						T06-1	**3:17** 0:10 3:27			0:27 9.8 0:23 0:23	
22	6	6	LOUMAR2	32.558002	-25.959057	1 1 1 1 1 1	0 0 1 0 0 1	C C	MALANGA						T06-2	3:28 0:10 3:38		0:01 0.17 0:01 0:01		
23	6	6	STAE - Av. 24 de Julho	32.559685	-25.957378	1 1 1 1 1 1	1 0 0 1 0 0	A A	MALANGA						T06-3	3:41 0:10 3:51		0:03 0.9 0:03 0:03		
24	6	6	Igreja Anglicana	32.560860	-25.955959	1 1 1 1 1 1	1 0 0 1 0 0	A A	MALANGA				V(scater)		T06-4	3:53 0:10 4:03	4:25 0:10 **4:35**	0:02 0.3 0:02 0:02	0:34 8.7 0:22 0:22	
25	6	6	Mercado Malanga 1	32.558517	-25.953579	1 1 1 1 1 1	1 1 1 1 1 1	A B C A B C	Mercado Malanga			V			T07-1	**19:00** 0:10 19:10			0:27 9.6 0:22	
26	6	6	Mercado Malanga 2	32.558636	-25.953621	1 1 1 1 1 1	1 1 1 1 1 1	A B C A B C	Mercado Malanga			V			T07-2	19:10 0:10 19:20		0:00 0 0:00 0:00		
27		6	NEW for Chamanculo A-1	32.558160	-25.952179	1 1 1 1 1 1	2 1 1 2 1 1	A B C A B C	CHAMANCULO A	A A	MALANGA				T07-3	19:22 0:10 19:32		0:02 0.23 0:02 0:02		
28		6	NEW for Chamanculo A-2	32.558160	-25.952179	1 1 1 1 1 1	1 1 1 1 1 1	A B C A B C	CHAMANCULO A						T07-4	19:32 0:10 19:42	20:15 0:10 20:25	0:00 0 0:00 0:00	0:33 9 0:23 0:33	
29	6	6	Mercado Fajardo 1	32.560551	-25.954491	1 1 1 1 1 1	1 1 1 1 1 1	A B C A B C	Mercado Fajardo			V		V(Baraca)	T08-1	**20:55** 0:10 21:05			0:30 9.7 0:24 0:30	
30	6	6	Mercado Fajardo 2	32.560303	-25.954346	1 1 1 1 1 1	1 1 1 1 1 1	A B C A B C	Mercado Fajardo			V		V(Baraca)	T08-2	21:05 0:10 21:15		0:00 0 0:00 0:00		
31	12	6	Colombia - Rua Major Teixeira Pinto-1	32.564843	-25.955253	1 1 1 1 1 1	1 1 1 1 1 1	A B C A B C	CHAMANCULO A						T08-3	21:20 0:10 21:30		0:05 1 0:04 0:05		
32		6	Colombia - Rua Major Teixeira Pinto-2	32.564843	-25.955253	1 1 1 1 1 1	1 1 1 1 1 1	A B C A B C	CHAMANCULO A						T08-4	21:30 0:10 21:40	21:59 0:10 22:09	0:00 0 0:00 0:00	0:30 8 0:19 0:19	
33	6	6	Campo de Mahafil-Rua Mateteu	32.565144	-25.951962	1 1 1 1 1 1	1 0 0 1 0 0	A A	MINKADJUINE						T09-1	**22:30** 0:10 22:40			0:23 7.8 0:21 0:21	
34	6	6	Retiro-Rua da Fatima	32.564850	-25.949942	1 1 1 1 1 1	0 1 0 0 1 0	B B	XIPAMANINE						T09-2	22:41 0:10 22:51		0:02 0.24 0:01 0:01		
35	6	6	Escola Unidade 16-Rua da Fatima	32.561401	-25.949450	1 1 1 1 1 1	0 1 0 0 1 0	B B	XIPAMANINE						T09-3	22:53 0:10 23:03		0:02 0.35 0:02 0:02		
36	12	6	Zanza-1 Rua Marcelino dos Santos	32.559326	-25.946500	1 1 1 1 1 1	1 0 1 1 0 0	A B A B	CHAMANCULO B					V	T09-4	23:06 0:10 23:16	23:36 0:10 23:46	0:03 0.6 0:03 0:03	0:26 7.7 0:20 0:20	
37		6	Zanza-2 Rua Marcelino dos Santos-2	32.559326	-25.946500	1 1 1 1 1 1	1 1 0 1 1 0	A B A B	CHAMANCULO B						T10-1	**0:06** 0:10 0:16			0:24 7.8 0:20 0:20	
38	6	6	Bazuca - Rua Irmaos Ruby	32.562431	-25.940529	1 1 1 1 1 1	1 1 2 1 1 2	C C	XIPAMANINE	A B C A B C	Add collection for informal	V(informal)	V(overload)		T10-2	0:22 0:10 0:32		0:06 1.6 0:06 0:06		
39	12	6	Rua dos Irmaos Ruby/Parque Xipamanine-1	32.563955	-25.944543	1 1 1 1 1 1	1 0 1 1 0 1	A A	XIPAMANINE	C C	MINKADJUINE	V(informal)		V	T10-3	0:35 0:10 0:45		0:03 0.45 0:03 0:03		
40		6	Rua dos Irmaos Ruby/Parque Xipamanine-2	32.563955	-25.944543	1 1 1 1 1 1	1 0 0 1 0 0	A A	XIPAMANINE						T10-4	0:45 0:10 0:55	1:15 0:10 1:25	0:00 0 0:00 0:00	0:26 7.6 0:20 0:20	
41	12	6	Mercado Xipamanine-1 Rua Zixaxa	32.562923	-25.946209	1 1 1 1 1 1	1 1 1 1 1 1	A B C A B C	Mercado Xipamanine			V			T11-1	**1:46** 0:10 1:56			0:26 7.9 0:21 0:21	
42		6	Mercado Xipamanine-2 Rua Zixaxa	32.563271	-25.946194	1 1 1 1 1 1	1 1 1 1 1 1	A B C A B C	Mercado Xipamanine			V			T11-2	1:56 0:10 2:06		0:00 0 0:00 0:00		
43	12	6	Mercado Xipamanine-3 Rua Zixaxa	32.563271	-25.946194	1 1 1 1 1 1	1 1 1 1 1 1	A B C A B C	Mercado Xipamanine			V			T11-3	2:06 0:10 2:16		0:00 0 0:00 0:00		
44		6	Mercado Xipamanine-4 Rua Zixaxa	32.563271	-25.946194	1 1 1 1 1 1	1 1 1 1 1 1	A B C A B C	Mercado Xipamanine			V			T11-4	2:16 0:10 2:26	2:48 0:10 2:58	0:00 0 0:00 0:00	0:30 7.8 0:22 0:22	
45	12	6	Xibamate 1- Av. De Angola	32.570200	-25.948600	1 1 1 1 1 1	0 1 1 0 1 1	B C B C	MINKADJUINE						T12-1	**3:14** 0:10 3:24			0:20 7.1 0:16 0:16	
46	12	6	Xibamate 2- Av. De Angola	32.570500	-25.948400	1 1 1 1 1 1	1 0 0 1 0 0	A A	MUNHUANA						T12-2	3:24 0:10 3:34		0:00 0 0:00 0:00		
47		6	Xibamate 3- Av. De Angola	32.570500	-25.948400	1 1 1 1 1 1	0 1 1 0 1 1	B C B C	MAFALALA						T12-3	3:34 0:10 3:44		0:00 0 0:00 0:00		
48	12	6	CETA 1-Centro de Saude de Xipamanine - Av. Joaquim Chissano	32.566179	-25.937561	1 1 1 1 1 1	1 1 0 1 1 0	A B A B	AEROPORTO A				V(overload)		T12-4	3:48 0:10 3:58	4:16 0:10 **4:26**	0:04 1.6 0:04 0:04	0:23 6.8 0:18 0:18	
49		6	CETA 2-Centro de Saude de Xipamanine - Av. Joaquim Chissano	32.566179	-25.937561	1 1 1 1 1 1	1 1 0 1 1 0	A B A B	AEROPORTO B						T13-1	**19:00** 0:10 19:10			0:20 7.3 0:16	
50		6	CETA 3-Centro de Saude de Xipamanine - Av. Joaquim Chissano	32.566179	-25.937561	1 1 1 1 1 1	0 1 1 0 1 1	B C B C	AEROPORTO B						T13-2	19:10 0:10 19:20		0:00 0 0:00 0:00		
51	12	6	Av. Mocambique- jardim Zoologico 1	32.556915	-25.927295	1 1 1 1 1 1	0 1 0 0 1 0	B B	AEROPORTO B						T13-3	19:25 0:10 19:35		0:05 1.8 0:04 0:05		
52	-	6	Av. Mocambique- jardim Zoologico 2	32.556915	-25.927295	1 1 1 1 1 1	0 1 0 0 1 0	B B	AEROPORTO B						T13-4	19:35 0:10 19:45	20:14 0:10 20:24	0:00 0 0:00 0:00	0:29 7.8 0:20 0:29	
52	**300m3**	**312m3**				52 52 52 52 52 52	33 43 34 33 43 34													
1	6	6	Ponto-Final (perto do Quartel)	32.524292	-25.988365	1 0 1 1 0	1 0 0 1 0 0	A A	INCASSANE						T14-1	**21:12** 0:10 21:22		0:00 0 0:00	0:48 21.5 0:40 0:48	
2	6	6	Assucena	32.531355	-25.993878	1 1 0 1 0	0 1 0 0 1 0	B B							T14-2	21:27 0:10 21:37		0:05 1.5 0:05 0:05		
3	6	6	Cemiterio-Incassane	32.530023	-26.006760	1 0 1 1	1 0 1 1 0 1	A C A C							T14-3	21:43 0:10 21:53		0:06 1.5 0:06 0:06		
4	6	6	Mercado Chali	32.559395	-26.008022	1 0 1 0 1	0 0 1 0 0 1	C C	CHALI						T14-4	22:02 0:10 22:12		0:09 3.3 0:09 0:09		
5	6	6	Chibantchane	32.568661	-26.013409	1 1 1 1 0	1 1 0 1 1 0	A B A B							T14-5	22:16 0:10 22:26	23:04 0:10 23:14	0:04 1.2 0:04 0:04	0:45 19.1 0:38 0:38	
6	6	6	Firmino	32.564775	-26.032139	1 1 1 1 0	1 1 0 1 1 0	A B A B							T15-1	**23:54** 0:10 0:04		0:00 0 0:00	0:45 21.7 0:40 0:40	
7	6	6	Espiga D'ouro	32.570944	-26.020809	1 0 1 0 1	0 0 1 0 0 1	C C							T15-2	0:11 0:10 0:21		0:07 1.9 0:07 0:07		
8	6	6	Complexo Guimaraes	32.557790	-25.980115	1 0 1 1 0	1 0 0 1 0 0	A A							T15-3	0:30 0:10 0:40		0:09 4.1 0:09 0:09		
9	6	6	EPC	32.557865	-25.983403	1 0 1 1 0	1 0 0 1 0 0	A A	GUACHENI						T15-4	0:42 0:10 0:52		0:02 0.45 0:02 0:02		
10	6	6	Raul	32.557116	-25.993233	1 1 1 0 1	0 1 1 0 1 1	B C B C							T15-5	0:56 0:10 1:06	1:41 0:10 **1:51**	0:04 1.3 0:04 0:04	0:43 18.9 0:35 0:35	
10	**60m3**	**60m3**				6 0 6 0 6 9	4 3 2 4 3 2											**0:46** **0:46**		
62	**480m3**	**492m3**				58 52 58 52 58 52	37 46 36 37 46 36											**30.49** **107min**	**286.3**	**675min**

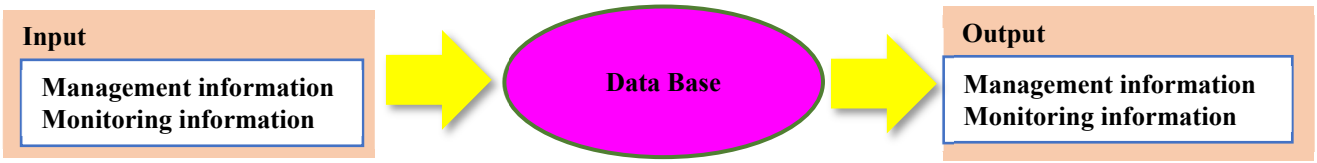
Source: JICA project team

2.1.3 Data management

Based on the waste collection and transportation information management described above and the waste collection and transportation monitoring management to be described later, it is necessary to manage various types of data. Table 13 shows a list of possible data.

All data will also need to be updated and data management will be necessary when there are any changes. These data management tasks require data management skills, and personnel with that kind of skills need to be assigned.

At present, RGC is assumed to be an appropriate section to be in charge of data management. However, in the future, a data management department which manage various data inputs and outputs, including updating of data will be required for DSMAS.



Source: JICA project team

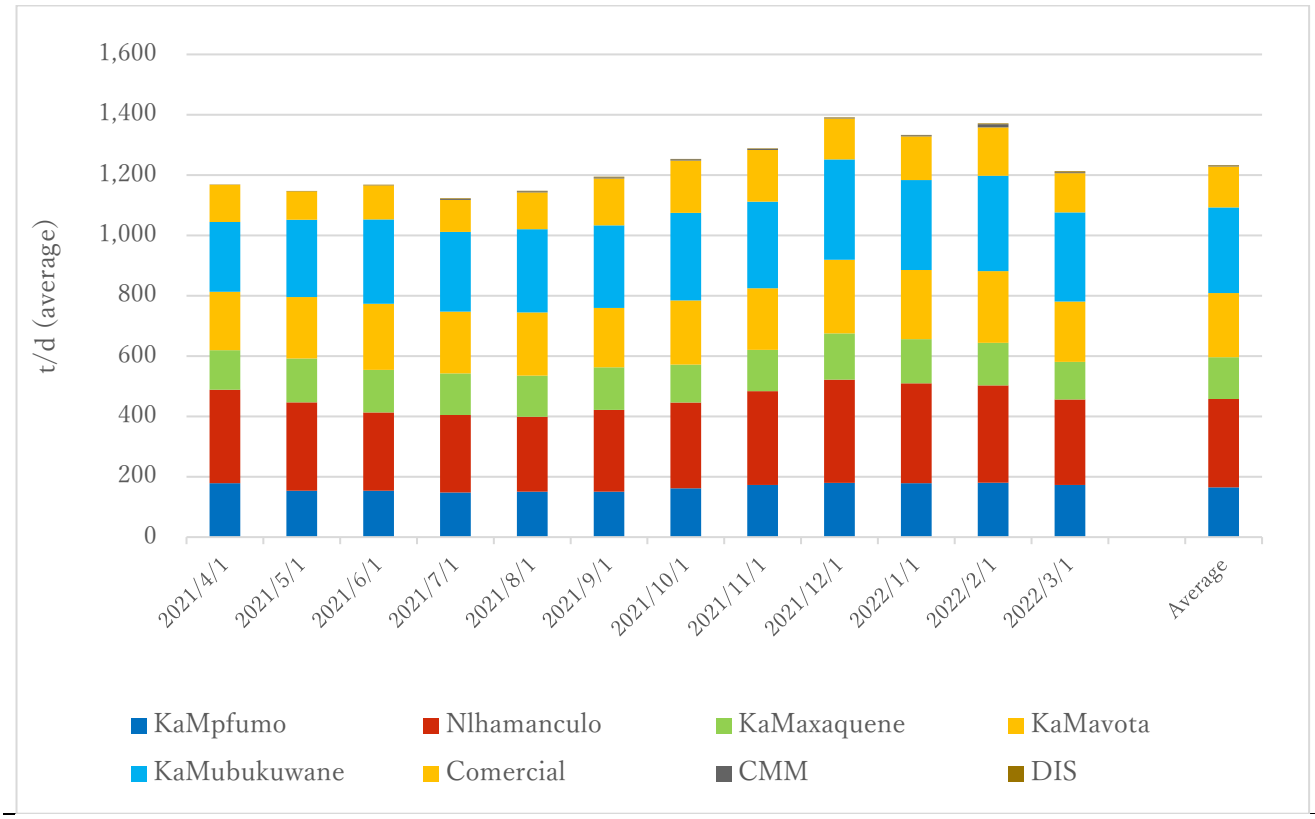
Figure 14 data base manegament

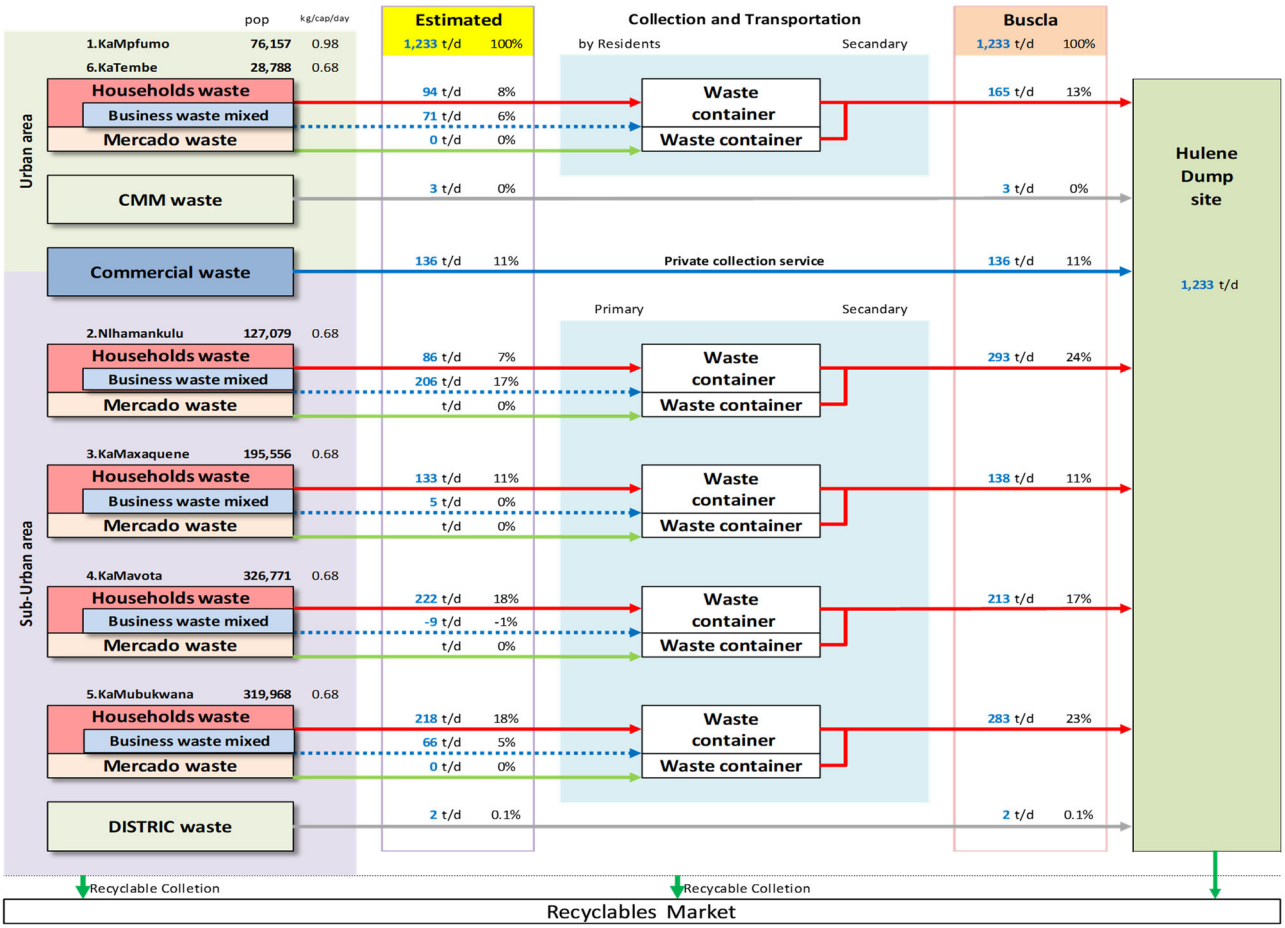
Table 13 Type of Required Data for Management

Data type	Input	Output
Management information	· Container location data · MEs data (per neighborhood) · MEs data per container · WCSP data · WCSP waste collection route data · Collection equipment data	· Container map · MEs collection area map · WCSP collection route sheet
Monitoring information	· Weighbridge data (waste volume, by waste type, by District, containers, collection equipment, WCSP) · Waste collection data (MEs, WCSPs) · Data of problem & countermeasure	· Waste volume Data (by waste Type, by District, Day, Month, Year) · Waste collection and transport implementation information by MEs & WCSPs · List of problematic containers

Source: JICA project team

As an example, Figure 15 shows an output image of waste flow and waste volume trends which is expected to be generated from the data management.



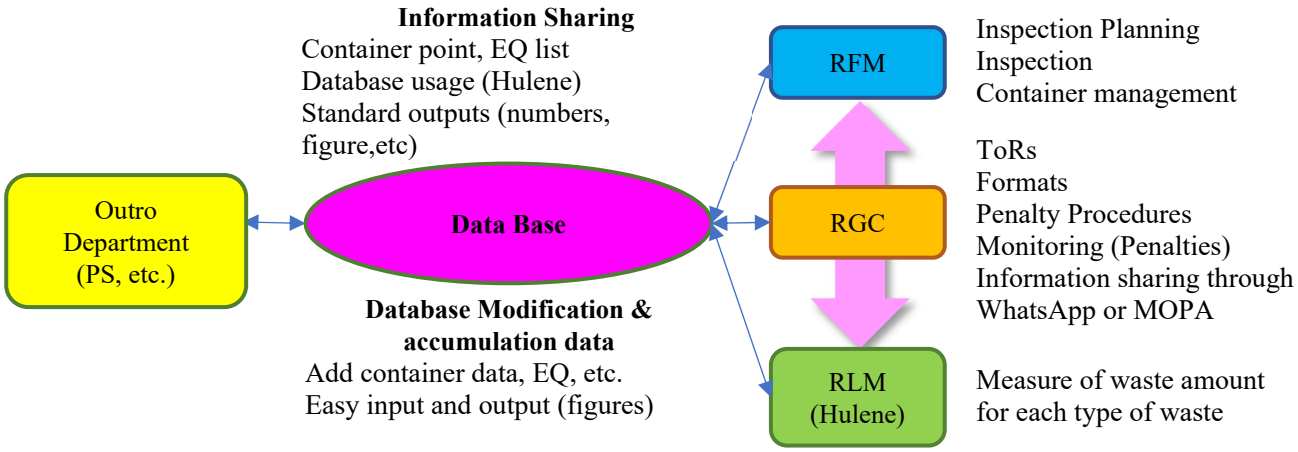


Source: JICA project team

Figure 15 Output Image of Waste Flow and Waste Volume Trends

2.1.4 Information Sharing

RGC, RFM, and RLM will hold weekly meetings to share information on waste collection service monitoring and identified issues and countermeasures as shown in Figure 16. During the monitoring trial, weekly meetings have been held among the RGC, RFM, and RLM. Although the main purpose of the meetings was to share monitoring results and sharing of problems occurring in the field, the improvement of C/Ps' understanding about waste collection service management was observed. Therefore, such information sharing activities should be continued.



Source: JICA project team

Figure 16 Information Sharing among the Relevant Sections of DSMAS

2.2 Waste collection and transportation monitoring management

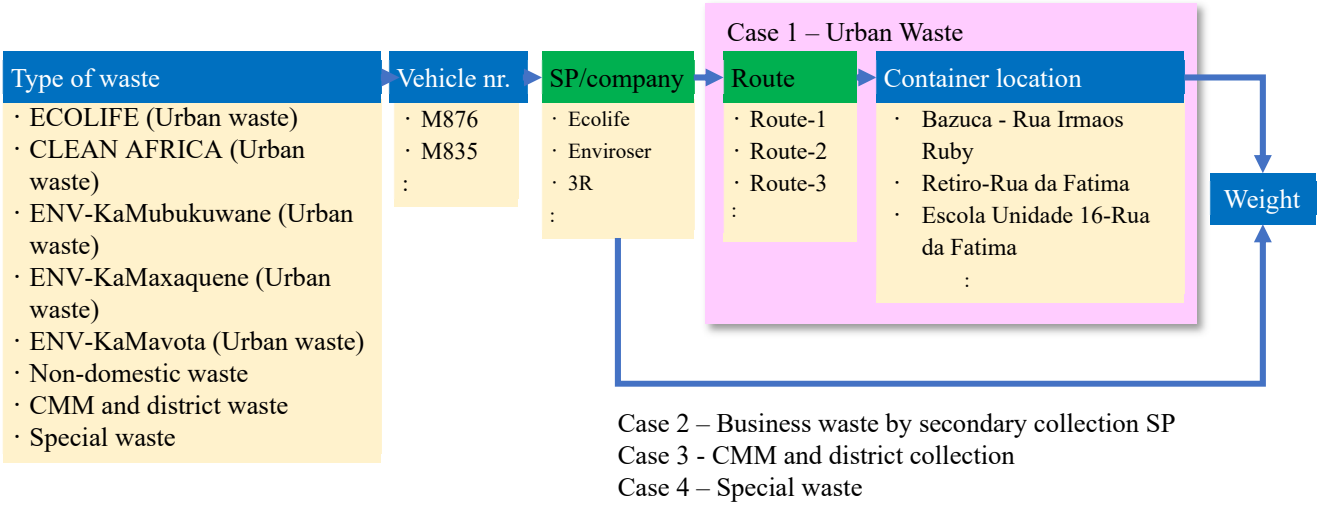
The second strategy is "waste collection and transportation monitoring management," as the waste collection service in Maputo City is currently mainly entrusted to private WCSPs, therefore management of entrusted waste collection service is important. The contents of the strategy are weighbridge data management, information collection from MEs & WCSPs, and problem identification. This also includes a monitoring system using ICT.

2.2.1 Weighbridge data management

(1) Input of collected container information

Currently, the waste collection route sheet received from WCSPs at the time of weighing the waste volume at the weighbridge includes the collected container information. This collected container information should also be inputted into the weighbridge data. If this method becomes possible, container points with high or low waste volumes can be identified, and more efficient collection can be achieved by investigating their reasons and taking countermeasures.

In this context, data input for 12m3 containers is easy because the waste collection and transportation is independent for each container point, while data input for 6m3 containers requires ingenuity because the waste from multiple containers is collected and transported by one compactor truck.



Source: JICA project team

Figure 17 Image of data input in weighbridge system

(2) Equipment Registration

To register new collection equipment, the WCSPs must submit a report on the new collection equipment to the RGC. After sharing that information within DSMAS, weight of collection vehicles not loaded with waste should be measured and registered at the weighbridge.

(3) Support for weighbridge operators

- Enforcement of appropriate labor shifts

Working hours should be properly managed because accurate data input is discouraged by long working hours.

- Education for operators

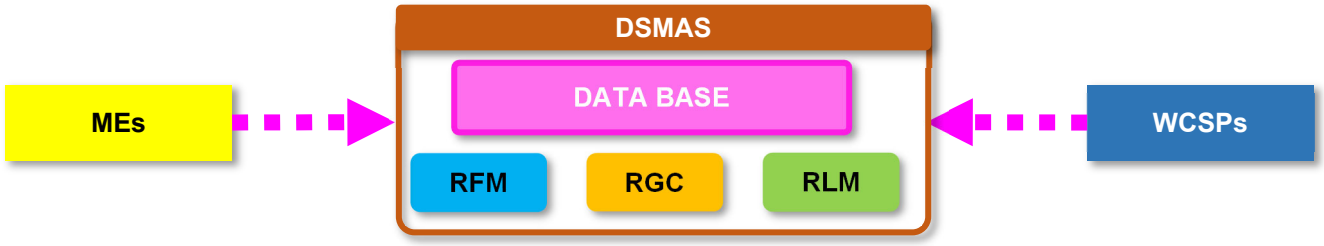
Training on waste types and data input/output must be provided to operators periodically.

(4) Internet

Considering the penalty procedures to be implemented, the weighbridge data must be checked daily. In the monitoring trial, the data was shared within DSMAS through WhatsApp installed in smartphones. However, it is strongly recommended that the data should be collected and managed on daily basis by the weighbridge connected to the internet.

2.2.2 Waste collection and transportation monitoring for MEs and WCSPs

It is not efficient for DSMAS to monitor all waste collection service by itself. Monitoring information on waste collection and transportation will be transmitted daily by MEs and WCSPs to DSMAS. By comparing the received data, DSMAS will be able to confirm the differences in information transmitted by MEs and WCSPs, and identify the areas/containers where problems have occurred. This method makes monitoring more efficient as actors involved in waste collection service will monitor each other's operations. The information exchange will be monitored through the WhatsApp group created by DSMAS or ICT system.



Source: JICA project team

Figure 18 Waste collection and transportation monitoring for MEs and WCSPs

(1) Potential for ICT-based monitoring and management systems

As mentioned in the previous sections, it will be more efficient if MEs and WCSPs will send daily waste collection and transportation performance information to DSMAS, and DSMAS will compare and analyze that information so that each actor can monitor and check each other's service operations. Therefore, the use of ICT system such as MOPA in the contract management of primary and secondary collection service has a potential to reduce the burden of collection and transportation service monitoring in the contract management.

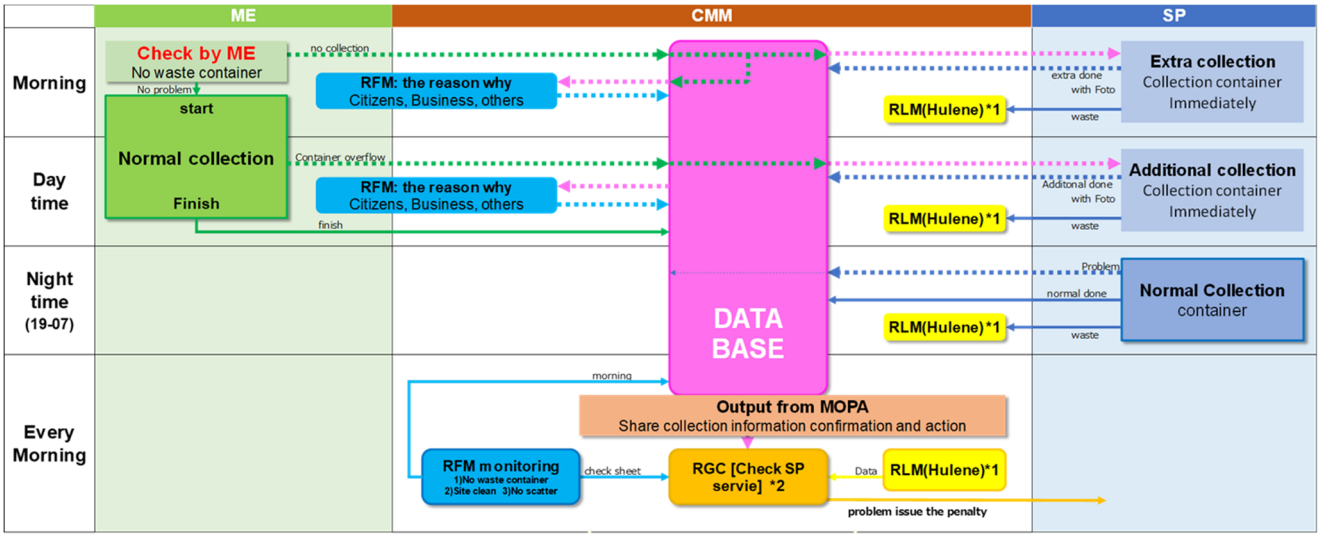
In the monitoring trial activities, WhatsApp was used for collection and transportation service monitoring in the contract management work by DSMAS. However, it was also confirmed that WhatsApp is basically an information sharing tool, and that it is not efficient for data accumulation and analysis, as it requires data management work by RGC staff, including data entry and tabulation into MS-Excel and updating container information. In addition, container maps require a data manager with the ability to handle mapping software.

Therefore, it is necessary to use the ICT system as a monitoring system for the collection and transportation services of DSMAS from the point of view of data management security and efficiency, including data input and output, data accumulation and updating, including mapping data.

For this purpose, the project team discussed the future collection service monitoring and management method by utilizing the MOPA system (or an information platform utilizing ICT with similar functions), and organized the monitoring and management methods (See Figure 19 and Table 14.) and the output image of the daily reports as shown in Table 15.

When it was in operation, the main source of information for MOPA was the citizens, the neighborhood offices, district offices, etc. Therefore, the MOPA system was not used as a monitoring tool for contract management of waste collection and transportation services by DSMAS.

However, after discussing the specifications of a new MOPA system for contract management with UX, MOPA's operational service provider, the system was found to be feasible.



Source: JICA project team

Figure 19 Workflow of Monitoring and Management of Waste Collection Services Using ICT System

Table 14 Collection and monitoring methods by MOAP in Sub-urban

actor	content	
MEs	Collection	· Primary waste collection service is implemented by ME in five Municipal Districts that constitute the sub-urban area. · Each ME is responsible for one Neighbourhood. · The primary waste collection service is implemented between 7:00 a.m. - 3:00 p.m. · ME organizes primary waste collection service by dividing the collection area into three zones: Monday/Thursday, Tuesday/Friday, and Wednesday/Saturday. Therefore, the container used depends on the day of the week. · ME has management responsibility for the allocated containers.
	Monitoring	· The ME checks the containers under its responsibility every morning before the start of the primary waste collection service, and requests Extra collection from WCSPs through MOPA when the secondary waste collection service is required. · MEs request WCSP for Additional collection service through MOPA when the container overflows during the primary waste collection service (7:00~15:00). · At the end of the primary waste collection service, the completion of work shall be report to MOPA.
PSRR	Collection	· The secondary waste collection service is implemented by WCSP in five Municipal Districts that constitute the sub-urban area. · The secondary waste collection service is implemented by the WCSPs defined for each District. · The secondary waste collection service is implemented by WCSP as Normal collection between 7:00pm and 7:00am according to the container collection plan. · 6m3 containers are collected at least once a day. The 12m3 containers are collected on the days set by the collection plan. · Secondary waste collection service is implemented by a roll-on-off truck for 12m3 containers and by a compactor truck for 6m3 containers. · Extra collection and Additional collection will be conducted when requested by ME through MOPA, during the ME normal working period.
	Monitoring	· When Normal collection is implemented, WCSP sends the complete information for each container to MOPA. · During normal collection, if there are problematic containers and/or additional collections, the WCSP sends that information to MOPA. · When Extra collection and Additional collection are implemented, WCSP sends the completed information to MOPA.

		· WCSP will send a photo and deliver a hard copy of the previous day's container collection route sheet to MOPA by 9:00 a.m.
RFM	Daily activities	· The RFM checks the container situation on-site every morning starting at 7:00 a.m. and report the results to the RGC by 9:00 a.m.
	When a problem occurs	· When the extra and/or additional collection request is received from the ME, the RFM checks the site, identifies the cause, and takes measures to solve the problem if necessary (the information is shared with the RGC). · If there are more than 2-times Normal collections by WCSP in 1 container, the RFM check the site, identify the cause, and take measures to solve the problem if necessary (information will be shared with the RGC).
	Information management	· Participate in weekly meetings of RFM, RLM, and RGC to share information.
RLM	Daily activities	· RLM manages the acceptance of waste to the dumping site (e.g., waste volume measurement, etc). · The RLM sends weighbridge data to the RGC by 9:00 AM every morning.
	Information management	· Participate in weekly meetings of RFM, RLM, and RGC to share information. · The RLM will register to the weighbridge system when there are updates of WCSP's equipment and other items through formal procedures.
RGC	Daily activities	· The RGC will review output information from MOPA every morning. If there is a penalty, the RGC informs the WCSP.
	Information management	· Participate in weekly meetings of RFM, RLM, and RGC to share information. · If there are any changes to the work plan (container collection plan, equipment, etc.), the RGC will update the work plan information (including MOPA information) under formal procedures. · When the work plan is updated, the RGC also take the responsibility of updating the weighbridge system information to the RLM and updating the monitoring information to the RFM. The RGC will also share updated information to MEs and WCSPs as necessary.

Source: JICA project team

Table 15 Image of Daily & Monthly Report to be Output from the ICT System

Daily Report DATE: 2022.XX.XX. 9:00

	DIS		CONT NAME	BAIRRO	Extra(7-8) ME trip	Extra(7-8) SP trip	Extra(7-8) RFM why	additional(8-19) ME trip	additional(8-19) SP trip	additional(8-19) RFM why	Normal(19-7) ME	Normal(19-7) SP trip	Normal(19-7) RFM why	Total ME	Total SP	difference
1	12m3	Nihamankulo	CETA-Centro de Saude de Xipamanine - Av.	AEROPORTO B	1	1	Citizen	1	1	Busines	1	1		3	3	
2	12m3	Nihamankulo	Escola Unidade 18 -Rua Gago Coutinho	AEROPORTO A, AEROPORTO B				1	1	Other	1	1		2	2	
3	12m3	Nihamankulo	Igreja Assembleia-Rua Gago Coutinho	AEROPORTO A							1	1		1	1	
4	12m3	Nihamankulo	Rua Gago Coutinho - Igreja Catolica	AEROPORTO A				2	2	Busines	1	1		3	3	
5	12m3	Nihamankulo	007-Rua Gago Coutinho	AEROPORTO A							1	1		1	1	
6	12m3	Nihamankulo	Entrada da Base Aerea - Av. 19 de Outubro	AEROPORTO B							1	1		1	1	
7	12m3	Nihamankulo	Campo Base Aerea - Av. 19 de Outubro	AEROPORTO B							1	1		1	1	
8	12m3	Nihamankulo	Mercado Vulcano - Rua Gago Coutinho	AEROPORTO B							1	1		1	1	
9	12m3	Nihamankulo	10ª Esquadra - Rua de Xipamanine	AEROPORTO B,CHAMANCULO D							1	1		1	1	
10	12m3	Nihamankulo	Rua dos Irmaos Ruby/Parque Xipamanine	XIPAMANINE							1	2	Busines	1	2	-1
11	12m3	Nihamankulo	Rua do Zimabwe	MUNHUANA, XIPAMANINE							1	1		1	1	
12	12m3	Nihamankulo	Sã Joaquim Rua Zambeze	MUNHUANA							1	1		1	1	
13	12m3	Nihamankulo	Xibamate 1- Av. De Angola	MUNHUANA, MAFALALA							1	1		1	1	
14	12m3	Nihamankulo	**Xibamate 2- Av. De Angola**								1	1		1	1	
15	12m3	Nihamankulo	Colombia - Rua Major Teixeira Pinto	CHAMANCULO A							1	1		1	1	
16	12m3	Nihamankulo	Zanza - Rua Marcelino dos Santos	CHAMANCULO B, XIPAMANINE							1	1		1	1	
17	12m3	Nihamankulo	Ufa- Rua 2.276	CHAMANCULO B							1	1		1	1	
18	12m3	Nihamankulo	Cape-Cape-Campo - Rua 2.282	CHAMANCULO C							1	1		1	1	
19	12m3	Nihamankulo	Terminal da Junta	CHAMANCULO C							1	1		1	1	
20	12m3	Nihamankulo	Lhanguene-Av. Moçambique	CHAMAMCULO C							1	1		1	1	
21	12m3	Nihamankulo	Zixaxa - Rua do Zixaxa Nr. 2.302	CHAMANCULO D							1	1		1	1	
22	12m3	Nihamankulo	Rotunda 16 de Junho- Av. OUA	MALANGA							1	1		1	1	
23	12m3	Nihamankulo	Coca-cola-Rua lago Maramba	MALANGA							1	1		1	1	
24	12m3	Nihamankulo	Up-Av. Trabalho	CHAMANCULO C, MALANGA							1	1		1	1	
25	12m3	Nihamankulo	Naggi-Rua Gago Coutinho	UNIDADE 7							1	1		1	1	
26	12m3	Nihamankulo	Mercado Xipamanine - Rua Zixaxa 1	XIPAMANINE							1	1		1	1	
27	12m3	Nihamankulo	Mercado Xipamanine - Rua Zixaxa 2	XIPAMANINE							1	1		1	1	
162			**Total**		1	1		4	4		27	28		32	33	-1
			RLM data(from Hulene)		1			4			27				32	
1	6m3	Nihamankulo	Retiro-Rua da Fatima	XIPAMANINE, MINKADJIME							1	1		1	1	
2	6m3	Nihamankulo	Escola Unidade 16-Rua da Fatima	XIPAMANINE							1	1		1	1	
3	6m3	Nihamankulo	Bazuca - Rua Irmaos Ruby	XIPAMANINE	1	1	Busines	2	2	Other	1	1		4	4	
4	6m3	Nihamankulo	Campo de Mahafil-Rua Mateteu	MINKADJIME, CHAMANCULO D							1	1		1	1	
5	6m3	Nihamankulo	Mercado Fajardo 1	MALANGA, CHAMANCULO A	1	1	Other	1		Busines	1	1		3	2	1
6	6m3	Nihamankulo	Mercado Fajardo 2	MALANGA, CHAMANCULO A	1	1	Busines				1	1		2	2	
7	6m3	Nihamankulo	Mercado Malanga 1	MALANGA				1	1	citizen	1	1		2	2	
8	6m3	Nihamankulo	Mercado Malanga 2	MALANGA							1	1		1	1	
9	6m3	Nihamankulo	Igreja Anglicana	MALANGA							1	1		1	1	
10	6m3	Nihamankulo	Saida da ponte Maputo Katembe - Av. 24 de	MALANGA	1	1	Other	1	1	Other	1	1		3	3	
11	6m3	Nihamankulo	STAE - Av. 24 de Julho	MALANGA							1	0		1	0	1
12	6m3	Nihamankulo	Mega CASH and CARRY	MALANGA							1	0		1	0	1
13	6m3	Nihamankulo	LOUMAR1	MALANGA							1	1		1	1	
14	6m3	Nihamankulo	LOUMAR2	MALANGA							1	1		1	1	
15	6m3	Katembe	Chibantchane	CHALI							1	1		1	1	
16	6m3	Katembe	Espiga D'ouro	CHALI							1	1		1	1	
17	6m3	Katembe	Firmino	CHALI							1	1		1	1	
18	6m3	Katembe	Mercado Chali	CHALI				1	1	Busines	1	1		2	2	
19	6m3	Katembe	Raul	GUACHENI							1	1		1	1	
20	6m3	Katembe	EPC	GUACHENI							1	1		1	1	
21	6m3	Katembe	Complexo Guimaraes	GUACHENI							1	1		1	1	
22	6m3	Katembe	Ponto-Final (perto do Quartel)	INCASSANE							1	1		1	1	
23	6m3	Katembe	Assucena	INCASSANE							1	1		1	1	
24	6m3	Katembe	Cemiterio-Incassane	INCASSANE, CHAMISSAVA							1	1		1	1	
144			**Total**		4	4	0	6	5	0	24	22	0	34	31	3
			RLM data(from Hulene)		1			1			5				7	

	DIS		CONT NAME	BAIRRO	Normal 2nd collection plan sum week	*1 S	T	Q	Q	F	S
1	12m3	Nihamankulo	CETA-Centro de Saude de Xipamanine - Av.	AEROPORTO B	6	1	1	1	1	1	1
2	12m3	Nihamankulo	Escola Unidade 18 -Rua Gago Coutinho	AEROPORTO A, AEROPORTO B	3	1	1	0	0	1	0
3	12m3	Nihamankulo	Igreja Assembleia-Rua Gago Coutinho	AEROPORTO A	3	1	0	1	0	0	1
4	12m3	Nihamankulo	Rua Gago Coutinho - Igreja Catolica	AEROPORTO A	3	1	0	1	0	0	1
5	12m3	Nihamankulo	007-Rua Gago Coutinho	AEROPORTO A	3	1	0	1	0	0	1
6	12m3	Nihamankulo	Entrada da Base Aerea - Av. 19 de Outubro	AEROPORTO B	2	1	0	0	1	0	0
7	12m3	Nihamankulo	Campo Base Aerea - Av. 19 de Outubro	AEROPORTO B	4	1	1	0	1	1	0
8	12m3	Nihamankulo	Mercado Vulcano - Rua Gago Coutinho	AEROPORTO B	6	1	1	1	1	1	1
9	12m3	Nihamankulo	10ª Esquadra - Rua de Xipamanine	AEROPORTO B,CHAMANCULO D	3	1	0	1	0	0	1
10	12m3	Nihamankulo	Rua dos Irmaos Ruby/Parque Xipamanine	XIPAMANINE	4	1	0	1	1	0	1
11	12m3	Nihamankulo	Rua do Zimabwe	MUNHUANA, XIPAMANINE	2	1	0	0	1	0	0
12	12m3	Nihamankulo	Sã Joaquim Rua Zambeze	MUNHUANA	4	1	0	1	1	0	1
13	12m3	Nihamankulo	Xibamate 1- Av. De Angola	MUNHUANA, MAFALALA	5	1	1	1	0	1	1
14	12m3	Nihamankulo	**Xibamate 2- Av. De Angola**		5	1	1	1	0	1	1
15	12m3	Nihamankulo	Colombia - Rua Major Teixeira Pinto	CHAMANCULO A	6	1	1	1	1	1	1
16	12m3	Nihamankulo	Zanza - Rua Marcelino dos Santos	CHAMANCULO B, XIPAMANINE	6	1	1	1	1	1	1
17	12m3	Nihamankulo	Ufa- Rua 2.276	CHAMANCULO B	5	1	1	1	0	1	1
18	12m3	Nihamankulo	Cape-Cape-Campo - Rua 2.282	CHAMANCULO C	6	1	1	1	1	1	1
19	12m3	Nihamankulo	Terminal da Junta	CHAMANCULO C	3	1	1	0	0	1	0
20	12m3	Nihamankulo	Lhanguene-Av. Moçambique	CHAMAMCULO C	5	1	1	1	0	1	1
21	12m3	Nihamankulo	Zixaxa - Rua do Zixaxa Nr. 2.302	CHAMANCULO D	6	1	1	1	1	1	1
22	12m3	Nihamankulo	Rotunda 16 de Junho- Av. OUA	MALANGA	3	1	1	0	0	1	0
23	12m3	Nihamankulo	Coca-cola-Rua lago Maramba	MALANGA	3	1	1	0	0	1	0
24	12m3	Nihamankulo	Up-Av. Trabalho	CHAMANCULO C, MALANGA	3	1	0	1	0	0	1
25	12m3	Nihamankulo	Naggi-Rua Gago Coutinho	UNIDADE 7	4	1	1	0	1	1	0
26	12m3	Nihamankulo	Mercado Xipamanine - Rua Zixaxa 1	XIPAMANINE	6	1	1	1	1	1	1
27	12m3	Nihamankulo	Mercado Xipamanine - Rua Zixaxa 2	XIPAMANINE	6	1	1	1	1	1	1
162			**Total**		115	27	18	19	14	18	19
			RLM data(from Hulene)								
1	6m3	Nihamankulo	Retiro-Rua da Fatima	XIPAMANINE, MINKADJIME	3	1	1	0	0	1	0
2	6m3	Nihamankulo	Escola Unidade 16-Rua da Fatima	XIPAMANINE	3	1	1	0	0	1	0
3	6m3	Nihamankulo	Bazuca - Rua Irmaos Ruby	XIPAMANINE	3	1	0	1	0	0	1
4	6m3	Nihamankulo	Campo de Mahafil-Rua Mateteu	MINKADJIME, CHAMANCULO D	2	1	0	0	1	0	0
5	6m3	Nihamankulo	Mercado Fajardo 1	MALANGA, CHAMANCULO A	6	1	1	1	1	1	1
6	6m3	Nihamankulo	Mercado Fajardo 2	MALANGA, CHAMANCULO A	6	1	1	1	1	1	1
7	6m3	Nihamankulo	Mercado Malanga 1	MALANGA	6	1	1	1	1	1	1
8	6m3	Nihamankulo	Mercado Malanga 2	MALANGA	6	1	1	1	1	1	1
9	6m3	Nihamankulo	Igreja Anglicana	MALANGA	2	1	0	0	1	0	0
10	6m3	Nihamankulo	Saida da ponte Maputo Katembe - Av. 24 de	MALANGA	2	1	0	0	1	0	0
11	6m3	Nihamankulo	STAE - Av. 24 de Julho	MALANGA	2	1	0	0	1	0	0
12	6m3	Nihamankulo	Mega CASH and CARRY	MALANGA	3	1	0	1	0	0	1
13	6m3	Nihamankulo	LOUMAR1	MALANGA	3	1	0	1	0	0	1
14	6m3	Nihamankulo	LOUMAR2	MALANGA	3	1	0	1	0	0	1
15	6m3	Katembe	Chibantchane	CHALI	4	1	1	0	1	1	0
16	6m3	Katembe	Espiga D'ouro	CHALI	3	1	0	1	0	0	1
17	6m3	Katembe	Firmino	CHALI	4	1	1	0	1	1	0
18	6m3	Katembe	Mercado Chali	CHALI	3	1	0	1	0	0	1
19	6m3	Katembe	Raul	GUACHENI	5	1	1	1	0	1	1
20	6m3	Katembe	EPC	GUACHENI	2	1	0	0	1	0	0
21	6m3	Katembe	Complexo Guimaraes	GUACHENI	2	1	0	0	1	0	0
22	6m3	Katembe	Ponto-Final (perto do Quartel)	INCASSANE	2	1	0	0	1	0	0
23	6m3	Katembe	Assucena	INCASSANE	3	1	1	0	0	1	0
24	6m3	Katembe	Cemiterio-Incassane	INCASSANE, CHAMISSAVA	4	1	0	1	1	0	1
144			**Total**		82	24	10	12	14	10	12
			RLM data(from Hulene)		0						

monthly Report DATE: 2022.XX.XX. 9:00

	DIS		CONT NAME	BAIRRO	Problem by MEs	Business mix	Mercado	Extra(7-8) ME trip	Extra(7-8) SP trip	Extra(7-8) RFM why	additional(8-19) ME trip	additional(8-19) SP trip	additional(8-19) RFM why	Normal(19-7) ME	Normal(19-7) SP trip	Normal(19-7) RFM why	Total ME	Total SP	difference
1	12m3	Nihamankulo	CETA-Centro de Saude de Xipamanine - Av.	AEROPORTO B	V(overload)			4	4	*	3	3	*	27	27		34	34	
2	12m3	Nihamankulo	Escola Unidade 18 -Rua Gago Coutinho	AEROPORTO A, AEROPORTO B							3	3	*	14	14		17	17	
3	12m3	Nihamankulo	Igreja Assembleia-Rua Gago Coutinho	AEROPORTO A										14	14		14	14	
4	12m3	Nihamankulo	Rua Gago Coutinho - Igreja Catolica	AEROPORTO A		V(small)					2	2	*	14	14		16	16	
5	12m3	Nihamankulo	007-Rua Gago Coutinho	AEROPORTO A										14	14		14	14	
6	12m3	Nihamankulo	Entrada da Base Aerea - Av. 19 de Outubro	AEROPORTO B							1	1	*	9	9		10	10	
7	12m3	Nihamankulo	Campo Base Aerea - Av. 19 de Outubro	AEROPORTO B										18	18		18	18	
8	12m3	Nihamankulo	Mercado Vulcano - Rua Gago Coutinho	AEROPORTO B			V							27	27		27	27	
9	12m3	Nihamankulo	10ª Esquadra - Rua de Xipamanine	AEROPORTO B,CHAMANCULO D										14	14		14	14	
10	12m3	Nihamankulo	Rua dos Irmaos Ruby/Parque Xipamanine	XIPAMANINE		V	V(informal)				2	2	*	18	20	*	20	22	-2
11	12m3	Nihamankulo	Rua do Zimabwe	MUNHUANA, XIPAMANINE										9	9		9	9	
12	12m3	Nihamankulo	Sã Joaquim Rua Zambeze	MUNHUANA										18	18		18	18	
13	12m3	Nihamankulo	Xibamate 1- Av. De Angola	MUNHUANA, MAFALALA										23	23		23	23	
14	12m3	Nihamankulo	**Xibamate 2- Av. De Angola**											23	23		23	23	
15	12m3	Nihamankulo	Colombia - Rua Major Teixeira Pinto	CHAMANCULO A										27	27		27	27	
16	12m3	Nihamankulo	Zanza - Rua Marcelino dos Santos	CHAMANCULO B, XIPAMANINE		V					2	2	*	27	27		29	29	
17	12m3	Nihamankulo	Ufa- Rua 2.276	CHAMANCULO B										23	23		23	23	
18	12m3	Nihamankulo	Cape-Cape-Campo - Rua 2.282	CHAMANCULO C	V(overload)									27	27		27	27	
19	12m3	Nihamankulo	Terminal da Junta	CHAMANCULO C	V(overload)	V(big)					2	2	*	14	15	*	16	17	-1
20	12m3	Nihamankulo	Lhanguene-Av. Moçambique	CHAMAMCULO C		V								23	23		23	23	
21	12m3	Nihamankulo	Zixaxa - Rua do Zixaxa Nr. 2.302	CHAMANCULO D										27	27		27	27	
22	12m3	Nihamankulo	Rotunda 16 de Junho- Av. OUA	MALANGA		V					1	1		14	14		15	15	
23	12m3	Nihamankulo	Coca-cola-Rua lago Maramba	MALANGA		V					1	1		14	14		15	15	
24	12m3	Nihamankulo	Up-Av. Trabalho	CHAMANCULO C, MALANGA		V								14	14		14	14	
25	12m3	Nihamankulo	Naggi-Rua Gago Coutinho	UNIDADE 7	V(overload)	V(carpintalia)								18	18		18	18	
26	12m3	Nihamankulo	Mercado Xipamanine - Rua Zixaxa 1	XIPAMANINE			V							27	27		27	27	
27	12m3	Nihamankulo	Mercado Xipamanine - Rua Zixaxa 2	XIPAMANINE			V							27	27		27	27	
162			**Total**					4	4		17	17		524	527		545	548	-3
			RLM data(from Hulene)					4			9			116				129	
1	6m3	Nihamankulo	Retiro-Rua da Fatima	XIPAMANINE, MINKADJIME										14	14		14	14	
2	6m3	Nihamankulo	Escola Unidade 16-Rua da Fatima	XIPAMANINE										14	15	*	14	15	-1
3	6m3	Nihamankulo	Bazuca - Rua Irmaos Ruby	XIPAMANINE	V(overload)		V(informal)	7	7	*	4	4	*	14	14		25	25	
4	6m3	Nihamankulo	Campo de Mahafil-Rua Mateteu	MINKADJIME, CHAMANCULO D										9	9		9	9	
5	6m3	Nihamankulo	Mercado Fajardo 1	MALANGA, CHAMANCULO A		V(Baraca)	V	4	4	*	8	8	*	27	27		39	39	
6	6m3	Nihamankulo	Mercado Fajardo 2	MALANGA, CHAMANCULO A		V(Baraca)	V	4	4	*				27	27		31	31	
7	6m3	Nihamankulo	Mercado Malanga 1	MALANGA			V				5	5	*	27	28	*	32	33	-1
8	6m3	Nihamankulo	Mercado Malanga 2	MALANGA			V							27	27		27	27	
9	6m3	Nihamankulo	Igreja Anglicana	MALANGA	V(scater)									9	9		9	9	
10	6m3	Nihamankulo	Saida da ponte Maputo Katembe - Av. 24 de	MALANGA	V(overload)		V(informal)	4	4	*	3	3	*	9	9		16	16	
11	6m3	Nihamankulo	STAE - Av. 24 de Julho	MALANGA										9	10	*	9	10	-1
12	6m3	Nihamankulo	Mega CASH and CARRY	MALANGA							2	2	*	14	14		16	16	
13	6m3	Nihamankulo	LOUMAR1	MALANGA							2	2	*	14	14		16	16	
14	6m3	Nihamankulo	LOUMAR2	MALANGA										14	14		14	14	
15	6m3	Katembe	Chibantchane	CHALI										18	18		18	18	
16	6m3	Katembe	Espiga D'ouro	CHALI										14	14		14	14	
17	6m3	Katembe	Firmino	CHALI										18	18		18	18	
18	6m3	Katembe	Mercado Chali	CHALI							3	3	*	14	14		17	17	
19	6m3	Katembe	Raul	GUACHENI										23	23		23	23	
20	6m3	Katembe	EPC	GUACHENI										9	9		9	9	
21	6m3	Katembe	Complexo Guimaraes	GUACHENI										9	9		9	9	
22	6m3	Katembe	Ponto-Final (perto do Quartel)	INCASSANE										9	9		9	9	
23	6m3	Katembe	Assucena	INCASSANE										14	14		14	14	
24	6m3	Katembe	Cemiterio-Incassane	INCASSANE, CHAMISSAVA										18	18		18	18	
144			**Total**					19	19		27	27		374	377		420	423	-3
			RLM data(from Hulene)					1			1			5				7	

Source: JICA project team

2.2.3 Identification of problems

In the case of identifying problematic area or containers by the monitoring of comparing data received from MEs and WCSPs, the reason for the problem should be confirmed in detail by RFM and countermeasures shall be taken.

Since the accumulation of information on the occurred problems will become possible, the tendency of problems and the areas where problems are likely to occur will be better understood, and effective measures can be taken.

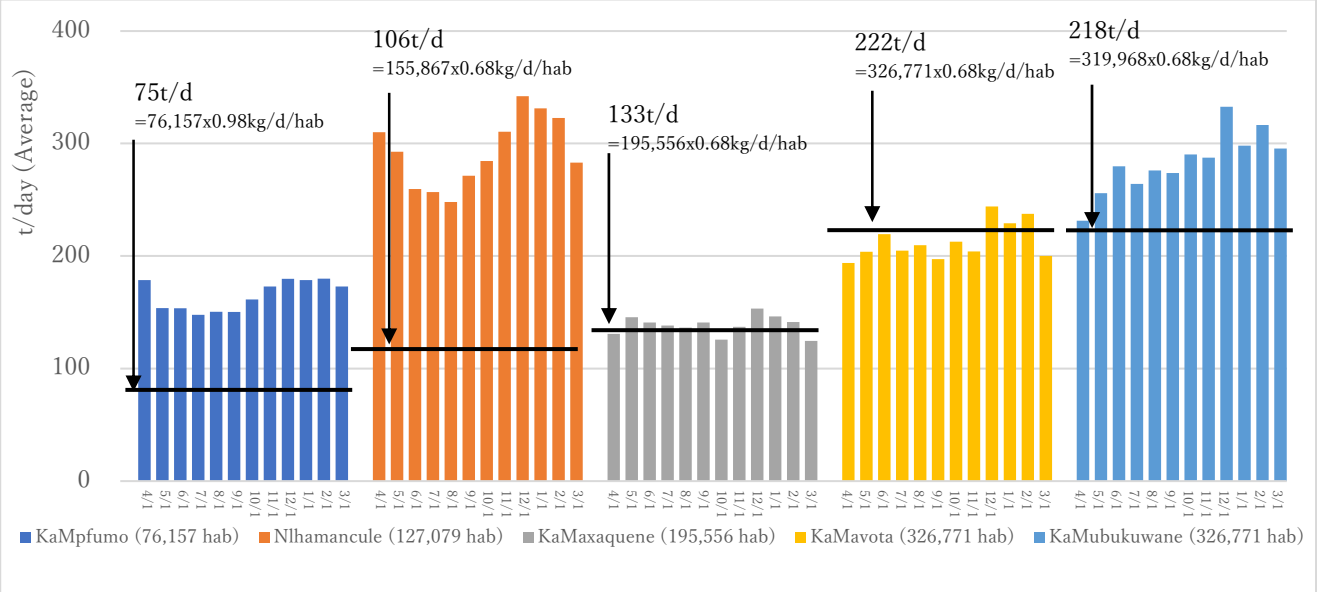
2.3 Waste reduction

The third strategy is defined as "waste reduction" because waste reduction is a permanent challenge due to the need to extend the life of landfills. Furthermore, waste transportation costs are expected to increase due to the long distance to be transported when the new landfills will be in operation. The contents of waste reduction strategy consist of business waste management and market waste management.

2.3.1 Business waste management

(1) Current Status and Issues

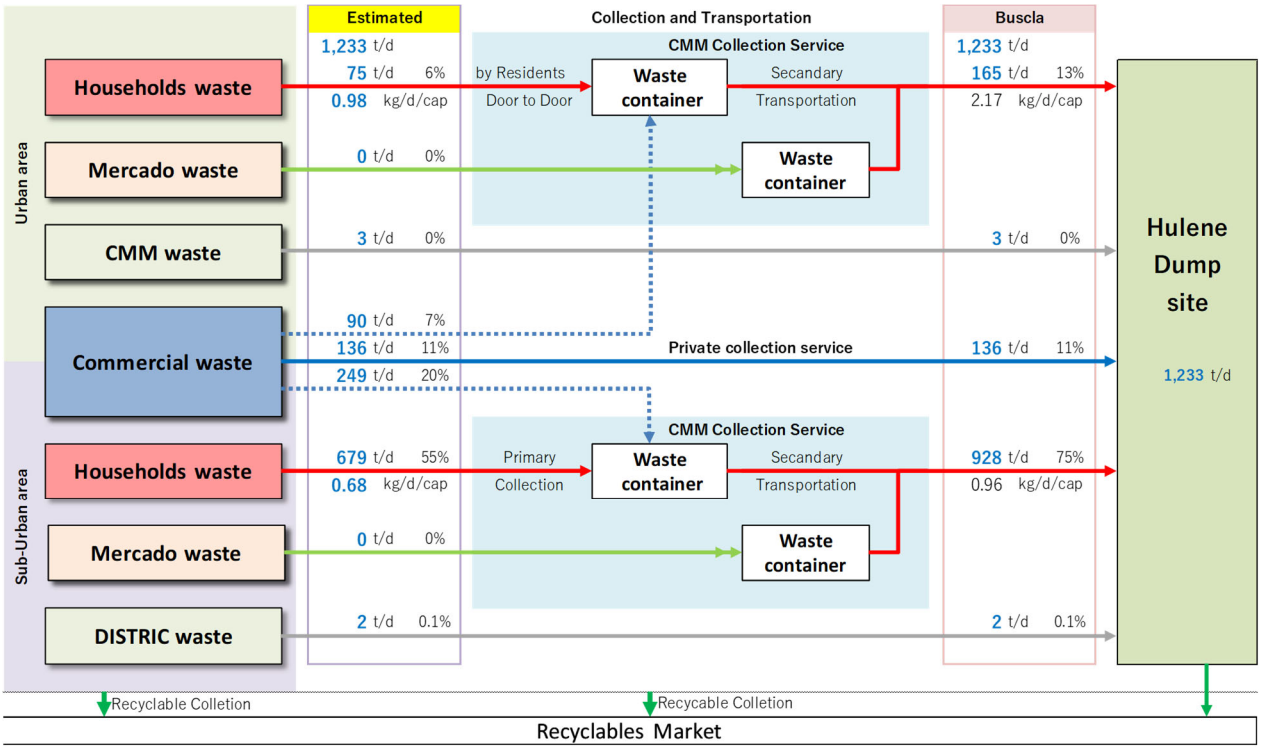
The waste amount above the black line in Figure 20 is expected to be business waste based on the estimated amount of household waste generation calculated by the population and waste generation rate (kg/day/person) for each district.



Source: JICA project team

Figure 20 Possibility of Business Waste Contamination in Municipal Waste by District

It is estimated that approximately 340 tons/day (about 30% of total municipal waste) of business waste is mixed with household waste based on the waste flow analysis for the entire Maputo City as shown in Figure 21.



Source: JICA project team

Figure 21 Municipal Solid Waste Management Flow in Maputo City

Decree and regulation related to business waste are shown in Table 16.

Table 16 Decree and regulation related to business waste

Decrees and resolutions	Content
Decree 94_2014	Article 4 General Principles of Solid Waste Management **g) Polluter pay principle** – It is the polluter duty to bear the costs for the repairing of damage caused by him to the environment. This principle is also part of the Environmental law and Resolution 86_2008 – Article 4b) – Basic principle.
Resolution 86/AM/2008 of May 22nd	Article 4 – Basic principle a) Principle of Broad Participation (PAP) The cleaning system of Maputo Municipality is not only task of the Maputo Municipal Council, and it should be the responsibility of private sector, the society as a whole and of all citizens, especially. b) It is the obligation of the polluter to bear the costs of remediation of damage caused to the environment by the polluter d) Producers' responsibility principle (PRP) Public or private USW producer is responsible for the respective collection, transportation, treatment and final disposal. Article 10 Specific obligations of the entities that produce or handle USW 1. Apart from the obligations in the previous articles, USW producing or manufacturing entities have the following specific obligations, as much as the economic feasibility allows: a) Minimize the production of any category of USW; Article 20 - Collection contracts • 1. Public and private producers are obliged to contract a USW collection service if they produce quantities equal to or greater than 25 kg or 50 litres daily. • 2. For this purpose, the producers mentioned in the item above may contract collection services from Maputo Municipal Services or provide proof of a contract with a duly licensed private entity, called "proof of service".

Source: JICA project team

In case the business waste is mixed in with the household waste and they are collected by the WCSPs entrusted by CMM, CMM will need to pay the cost of collecting the business waste, which should be paid by the business waste generators in the regulation.

However, many businesses are unaware of the laws and regulations regarding business waste management, and furthermore, it is difficult for DSMAS to manage business waste due to regulations that allow the volume of business waste to be discharged into containers up to 25 kg or 50 litres.

Considering CMM's expenditures for waste collection, it is necessary that business waste to be collected by the licensed PSP contracted with each business waste generator. In addition, if the capacity of secondary collection service exceeds due to the mixing of business waste, which is difficult to assume the amount of waste, environmental and hygiene problems such as overflowing containers and scattering of waste may occur.

(2) The business waste management in future

Based on the above, regarding the future management of business waste, it was agreed with DSMAS following contents.

- Business Waste Management Policy
  - Reduction of landfill waste.
  - Reduce waste generation and promote recycling.
  - Guiding waste that can be recycled in the private sector to the private sector.
  - Promoting awareness of waste reduction by the waste generators themselves by promoting contracts with licensed PSP.
  - Elimination the current 25 kg limit (Article 20 of the resolution nr. 86/AM/2008, of May 22nd) that businesses can discharge their waste into public containers

Currently, in Article 20 (Collection Contracts) of the resolution nr. 86/AM/2008, businesses that generate less than 25 kg or 50 liters of waste can discharge waste into public containers installed by the CMM. It is proposed that this rule be changed to prohibit businesses from discharging waste into public containers, regardless of the amount of waste. It is expected that a reduction of business waste amount will promote a reduction of landfill waste amount, as well as a reduction of the collection cost paid by CMM.

- Mandatory contracts with licensed PSP for business waste collection

It is proposed that all businesses will be required to have a contract with licensed PSPs as the condition for obtaining or renewing business operation licenses. Businesses shall also submit contract information to CMM. CMM will manage this data.

- Provide information and education to businesses.

Furthermore, it was discussed with the C/Ps that information, education and communication activity should be provided by REAS and RFM when business licenses are issued or renewed.

Without sufficient information, cooperation of businesses cannot be obtained. Adequate information and education are important to obtain cooperation from businesses and should be provided actively and continuously in every possible way. Methods and contents of information provision are show in Table 17.

Table 17 Providing information to promote cooperation from businesses

Items	Content
Information	· Laws and regulations regarding business waste · City information: Issues related to waste management and the need for cooperation from businesses (e.g., waste reduction, recycling, and producer pays). · City's approach: Issues related to waste disposal ⇒ Need for cooperation from businesses (waste reduction, recycling, burden on the generator, etc.) · Businesses' responsibilities for waste management. · Penalties · Information of licensed PSPs (contact list): If licensed PSPs have a price list, etc., it would be effective to provide such information. · Information of private recycle company (contact list):

Method, Location, etc.	· Vídeo, panfleto, sinalização exterior, SMS, Internet, SNS (social networking services).
Implementer	REAS, RFM

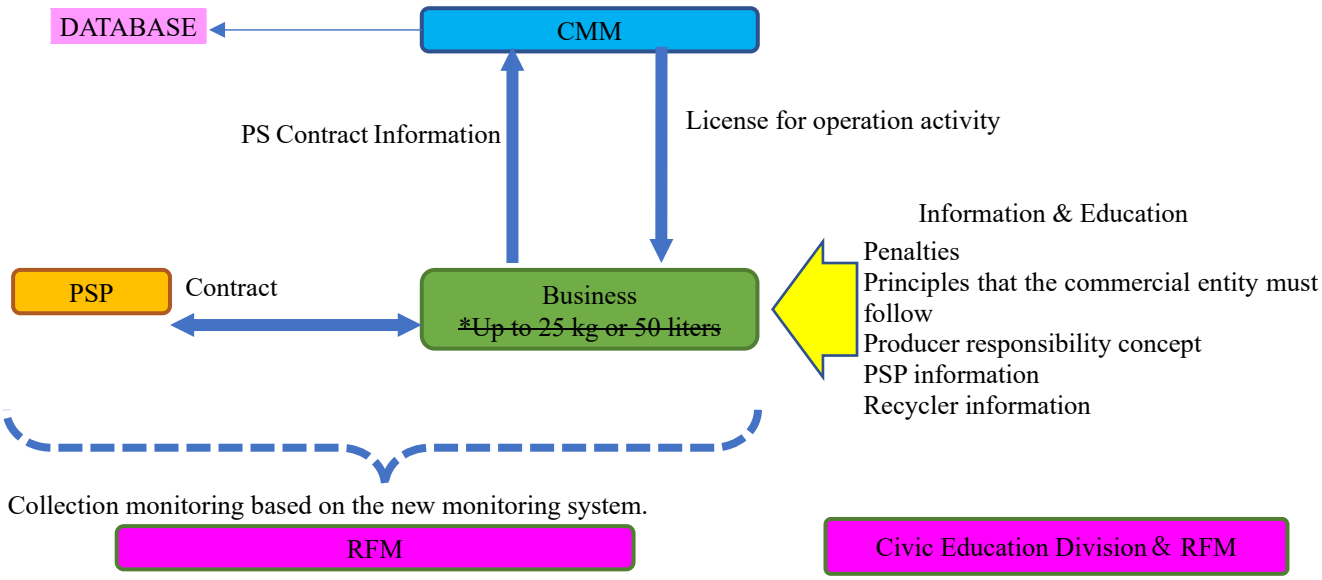
Source: JICA project team

providing information on waste volume and recycling to businesses at the time of waste collection and billing by licensed PSPs could be a source for businesses to consider reducing their waste collection costs. This activity could encourage businesses to reduce waste amount and recycle.

This approach may reduce profits for the licensed PSPs. However, it is effective for waste generators to reduce their waste collection cost. Therefore, licensed PSPs that can provide this service have the potential to increase the number of clients.

- Strengthening Inspections by RFM

RFM's inspection in the field should be strengthened based on these conditions.



Source: JICA project team

Figure 22 Proposed Business Waste Management in Future

- Measures to be taken by each area for business waste

The following measures for business waste management were proposed for each area.

- Suburban area
  - In the suburban area, the methods proposed in the waste collection and transportation monitoring (information collected from MEs and WCSPs and daily RFM inspection activities) will be implemented to identify problematic containers. Field inspections of problematic containers will be conducted by RFM to identify the reasons for the problems and implement countermeasures.
  - If the cause of the problem is identified as business waste, RFM and REAS will educate the business waste generators about their responsibilities and encourage them to have contract with licensed PSPs for business waste collection.
- Urban area

- In the urban area, the door-to-door collection will be proposed in the future. Implementation of door-to-door collection will help to avoid business waste discharged into containers as well as to identify the business which discharge their waste to the door-to-door collection service.
- When businesses that have discharged to door-to-door collection service are identified, RFM and REAS will educate them about their responsibilities and encourage them to have contract with licensed PSPs for business waste collection.

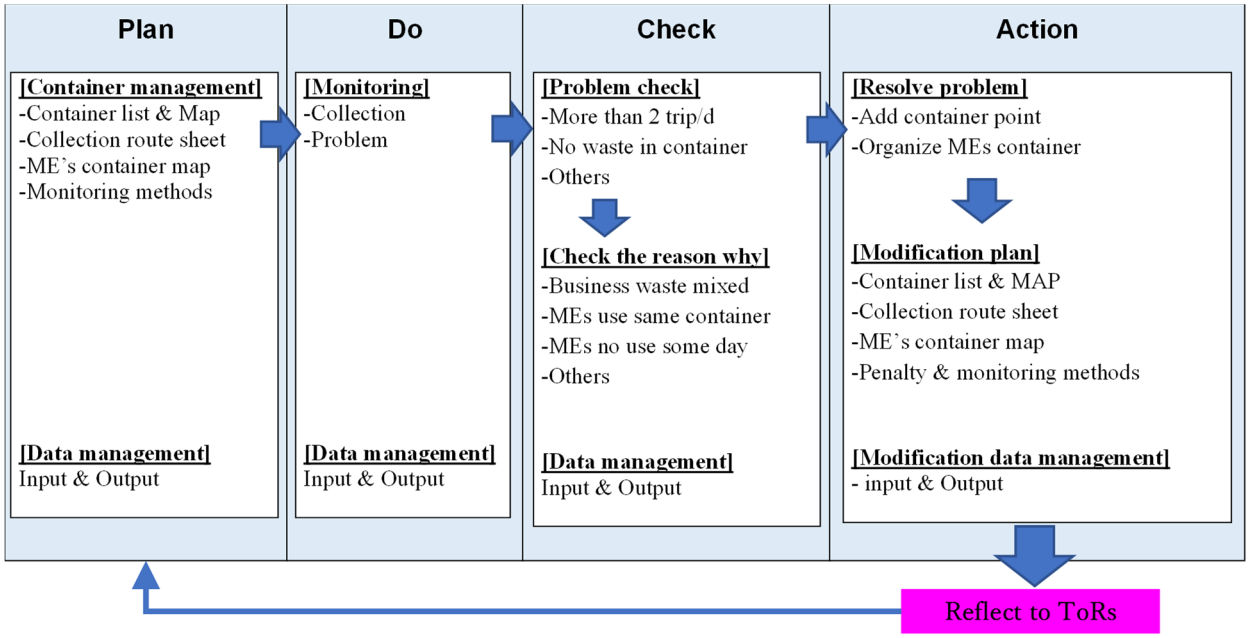
2.3.2 Market waste management

As explained in the waste collection and transportation information management, the strategy is to have market waste managed by the markets themselves. In the future, when organic waste from market will be recycled by composting, etc., it can also be part of waste reduction measures.

2.4 PDCA Cycle

Since the problems are diversified due to changes in population and waste volume, it is important to implement collection management systematically, always modifying the monitoring activities in the PDCA cycle (Plan - Do - Check -Action).

In addition, it is important to implement PDCA-cycle operations in the management of the next collection service contract. Procedures of PDCA activities in WCSP management operations in suburban districts is shown in Figure 23.



Source: JICA project team

Figure 23 PDCA Activities in WCSPs Management in Suburban Districts

3. COLLECTION IMPROVEMENT PLANS BY AREA

3.1 Suburban area

In order to implement contract management, a systematic waste collection method is needed. It is recommended that contract management is conducted using the collection routes and monitoring methods developed through the monitoring trial.

While WhatsApp is useful for communicating and sharing information, it is not suitable for the data output and accumulation of information, so it is strongly recommended to introduce ICT system such as MOPA, which has database function for input and output data, and mapping functions.

3.2 Urban area

Currently, waste collection and transportation in urban areas is carried out during the night and is considered to be functioning adequately. However, as mentioned above, business waste contamination and waste scattering around containers due to waste pickers' resource collection activities are major problems. These problems will not be solved as long as there are containers available for disposing waste 24 hours a day. The following three measures are proposed to tackle these problems in urban area.

3.2.1 Business waste contamination

The aforementioned measures for business waste will be implemented to deal with waste pickers and scattered waste. This will also be an important measure as it is expected to reduce waste.

3.2.2 Door-to-door collection

From a cost aspect, it is considered necessary to change from the current daily collection to three times or twice a week collection. However, since this change would reduce convenience for residents, and furthermore, since the change in collection method might cause confusion in waste discharge, it is essential to provide residents with sufficient explanations and promote cooperation from residents.

As planned in the Action Plan of the Waste Management Master Plan, it is recommended the door-to-door collection to be implemented as a pilot project. In order to implement a pilot project, it is recommended to select an area where residents have a high awareness of the environment and are cooperative toward the city's projects. It is also necessary to provide sufficient explanations before implementing the project on a pilot basis. Based on the results of the pilot project, it is recommended to gradually expand the activity to other areas.

Furthermore, since door-to-door collection is highly compatible with segregated collection, it is desirable to consider applying segregated collection depending on the response of residents. However, since segregated collection after source separation by residents will increases collection cost, it is recommended to consider ways to reduce collection costs by collaborating with recycling companies, etc.

(1) Waste collection for apartments

In areas where there are many apartments, etc., it is recommended that each apartment should set up private waste containers on their premises or other collection points and should promote waste collection as stated in "Article 11 of Resolution 89/AM/2008 of May 22,"

This measure is expected to avoid business waste contamination and waste scattering around containers due to waste pickers' resource collection activities and promote waste reduction through recycling as same as business waste measures.

Table 18 Comparison of waste collection methods

		Door to Door	Station	Container	ME (Door to Door) + Container
Method		* Residents discharge waste in front of their houses on time. And it is collected. * waste is discharged by bags or trash cans * Residents must comply with waste discharge at the fixed time	* Residents discharge waste to the station. And it is collected. * waste is discharged by bags or trash cans * Residents must comply with waste discharge at the fixed time	* Residents carry waste to containers: same as the current Urban area * waste is discharged to container * waste discharge time is free	* Residents are discharged when ME arrives: Same as the current Suburban area * waste is discharged depends on ME collection method
Service for Resident	**Discharge time**	* Waste must be discharged at a fixed time. (Bell collection is one of countermeasure)	* Waste must be discharged at a fixed time. There is also bell collection as a countermeasure.	* There is no discharge time setting	* There is a setting of discharge time
	Collection time	* Collection time is not suitable at midnight (effect of waist picker)	* Collection time is not suitable at midnight (effect of waist picker)	* Midnight collection is OK	1st collection in the morning / 2nd collection in daytime. Or, the 1st collection in evening, 2nd collection in night.
	Discharge point	* Waste is discharged in front of the house	* Needs cooperation to carry waste to station.	* Needs cooperation to carry waste to station.	* waste is discharged in front of the house
	Discharge management	-	* Cooperation such as station cleaning is required among residents.	* Originally, cooperation is required among residents.	-
	Evaluation	**High** ***Medium (If 3 days/week collection, citizens will feel a decline in service)**	**Medium**	**Medium**	**High**
Improper discharge (scattering, etc.)	**Management of discharge point**	* No need to clean or manage the collection site.	* Station cleaning and management required.	* Containers need to be cleaned and managed.	* Containers need to be cleaned and managed.
	scattering	* There is a collection time setting, so it is hard to scatter. * There is little improper discharge.	* There is a collection time setting, so it is hard to scatter. * Scatter until collection.	* Since it can be discharged for 24 hours, it cannot be controlled and is easily scattered. * Scatter until collection.	* Since it can be discharged for 24 hours, it cannot be controlled and is easily scattered. * Scatter until collection.
	Identifying the problem emitter	*Easy	* Difficult	* Impossible	* Impossible
	Evaluation	**High**	**Medium**	**Low**	**Low**
Measures for businesses waste	**Measures**	* It is easy to identify the businesses and possible measures for businesses waste.	* Tracking is possible if it is too bad	* Difficult to take business measures because it can be discharged 24 hours a day	* Difficult to take business measures because it can be discharged 24 hours a day
	Evaluation	**High**	**Medium**	**Low**	**Low**
Other	**waste reduction**	* Leads to proper waste separation and waste reduction.	-	-	-
	Resource separation	* Easy to check * Easy to identify unclassified resident	* Difficult to check * Difficult to identify unclassified resident	* Difficult to check * Impossible to identify unclassified resident	* Easy to check * Easy to identify unclassicfied resident
	Evaluation	**High**	**Medium**	**Low**	**Medium**
DSMAS	**DSMAS burden**	* Thorough announcement of discharge method to residents and businesses is required (DSMAS must be determined to accomplish this job)	* Thorough announcement of discharge method to residents and businesses is required (DSMAS must be determined to accomplish this job)	* Same as current status	* Combination management of primary collection and secondary collection is required.
	Collection equipment	* Compactor is preferred because it can be compressed and transported in large quantities	* Compactor is preferred because it can be compressed and transported in large quantities	* Compactor is preferred because it can be compressed and transported in large quantities	
	Evaluation	**Low**	**Low**	**Same as Current status**	**Same sa current status**
Cost	**Collection distance**	* The collection distance is longer than other collection methods.	* Collection distance is shorter than Door to Door	* Collection distance is shorter than Door to Door	* Collection distance is shorter than Door to Door
	Container O & M	-	-	* Container O & M required	* Container O & M required
	cost	**High** ***Medium (If 3 days/week collection, citizens will feel a decline in service)**	**Medium**	**Medium**	**Low**

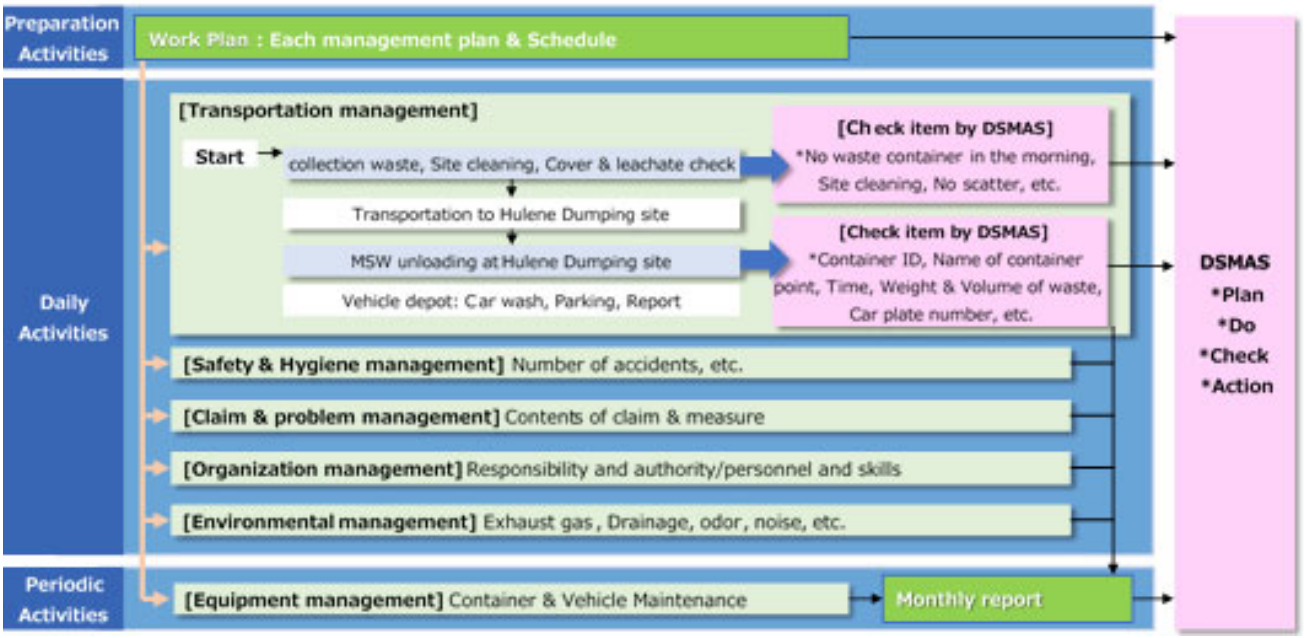
Source: JICA project team

3.3 Examine revision of the contracts with the WCSPs for improving waste collection service

3.3.1 Study of WCSP contract management procedures

The original plan was to first develop a draft improvement plan for waste collection and transportation services based on the results of the current situation and issue analysis and based on this plan to review the management of the collection service contract with WCSP.

However, since DSMAS was in the process of transitioning to a new waste collection and transportation system based on the collection service contract with WCSPs signed in May 2020, the project team supported the improvement of contract management operations for the collection service contract with WCSPs prior to the development of the draft improvement plan and the lessons learned from these activities was incorporated into the proposed improvement plan for waste collection and transportation services. The project team reviewed the basic procedures for managing WCSP contracts and organized them as shown in Figure 24. These contents will be reflected in the monitoring items and monthly report format for the next TORs.



Source: JICA project team

Figure 24 DSMAS Procedures for Management of Collection Service Contracts

Based on analysis of waste collection service contract technical specifications and the aforementioned review of the WCSP contract management operational procedures, the new collection contract specifications were analyzed and organized as shown in Table 19. As described in the analysis of the current status of waste collection and transportation services, various types of information essential for proper monitoring of waste collection and transportation services were found to be lacking. It is recommended to DSMAS to use this table to confirm the contents of the TOR in the next TOR preparation.

Table 19 Analysis on the TOR for Waste Collection and Transportation Service Contract Specifications

Specification items & condition	Work plan	Pre-Service Confirmation	3.4 monitoring		Contract Management		3.5 inspection	3.7 penalty
			Collection Site	Hulene	3.4.2monthy report	Emergency report		
2.5 Conditions of service: collection time and frequency, collection points								
2.6 Equipment: containers, collection vehicles, other equipment, monitoring vehicles								
2.7 Operations: registration relations, environment and safety								

2.7.3 Maintenance: vehicles, containers, replacement conditions, logbooks, other books								
2.8 Staffing: minimum requirements, personnel, facilities								
2.9 Health and safety: protective equipment, fire protection, accident prevention								
3.6. Complain management								

Note) The number in the table matches with the number in the contract TOR.

Source: JICA project team

3.3.2 Activities for improving WCSP contract management

The TORs for the new waste collection service entrusting contract indicate the following procedures to be followed after contracting with the awarded large-scale WCSPs: (1) submission of a work plan by WCSP, (2) finalization of the work plan after confirmation by CMM, (3) notification of commencement of waste collection service to the concerned parties, (4) preparation of waste collection services through equipment procurement and collection worker training, and (5) commencement of the services.

However, due to the prolonged process of selection and contracting of the large-scale WCSPs by CMM, as well as the impact of COVID-19 pandemic, waste collection services by the awarded large-scale WCSPs have already been implemented without following the above procedures.

Therefore, the project team provided necessary support and guidance to DSMAS to ensure that the contract management operations of the WCSPs will be carried out in accordance with the contracts. The activities related to contract management work with WCSPs is shown in Table 20. The monitoring trial was conducted basing on this activity.

Table 20 Activities Related to WCSP Contract Management

Items for Contract Management	Tasks for Contract Management
1. Review of work plan contents	· Review the TOR of the contract · Request WCSPs to submit work plan based on the review results
2. Review the submitted work plan by WCSPs	· Review the work plan and ask additional questions.
3. On-site inspection of work plan contents	· On-site inspection of container locations, collection routes, equipment, and equipment IDs, etc., by RFM
4. Examination of penalty management	· Checking the penalty system and discussing operation methods
5. Examination of a monitoring system	· Examination of monitoring items/data and reporting formats at Hulene Dumping Site. · Examination of RFM's monitoring items and reporting formats.
6. Examination of monthly report format submitted by WCSP	· Review and examination of monthly report format

Source: JICA Project Team

3.3.3 TOR for the next WCSP contract

Based on the collection improvement plan, the following items will be added to the TOR for the next contract. The purpose of adding these items is for DSMAS to strategically monitor and manage waste collection services by the WSCP.

(1) Container collection plan

1) Container list & map

*Container list and MAP for each District including container location information and ME information will be provided by DSMAS. The previous TOR for all districts presented the same attachment of container list (45 units of 12m3 containers and 15 units of 6m3 containers). Thus, the list of containers per district used in the contract was created by the WCSPs themselves due to the lack of such information.

2) Container collection plan

*Container collection plan for each District including information such as container collection route, container collection time, ME information will be provided by DSMAS. The previous TOR did not have a container list information, so container collection route and collection time information were not presented.

3) Conditions for Container Collection

- WCSPs will collect pre-designated containers one time a day on each day of the week between 7:00 p.m. and 7:00 a.m. (12m3 containers are collected on a specific day of the week, while 6m3 containers are collected once a day in principle for all containers *except in the Katembe area).
- If the WCSP fails to collect designated containers, DSMAS will collect a fine from the WCSPs.
- If additional collection requests are received from the ME or market, additional collection will be conducted between AM7-PM7.
- DSMAS will not pay for containers for which additional collection is conducted even though there is no request from the MEs or the markets for additional collection.

*Based on the above information, bidders (WCSPs) shall propose a container collection plan and container collection route sheet according to the submission format.

*Although the TOR shows a container collection plan, it should be clearly stated in the TOR that container collection plan in TOR is for reference only and that the bidder (WCSP) can propose a more efficient collection route, container type (change from 12m3 to 6m3 container for recovery by compactor truck), etc.

(2) Information sharing (monitoring procedures)

- WCSPs send collection completion report through MOPA when it has collected containers.
- WCSPs conducts additional collection based on requests from MEs and markets through MOPA, and transmits collection completion report through MOPA.

*DSMAS will utilize ME&WCSP Waste Collection and Transportation Monitoring method in the Collection Management Improvement Plan to monitor secondary collection of WCSP.

The purpose of conducting additional collection based on requests from MEs and markets is to avoid unnecessary additional collection and to allow DSMAS to identify containers that require additional collection, investigate the causes, and take countermeasures.

(3) Work plan modification

A new penalty should be established for the workplan change.

Request WCSPs to follow the workplan modification procedures in the following 3 cases:

1) When WCSPs request to add or change the location or type of container or container collection route.

- WCSP shall submit the written request (hard copy) to CMM (The submission format should use the container collection plan).
- Based on the submitted document, CMM will review it with DSMAS, WCSP, ME, District and neighbors office (including citizens), and CMM will send the permission and the revised collection route sheet to the WCSP.
- After CMM issues the permission, WCSP can begin waste collection service using the new collection route sheet.
- If this procedure is not followed and additions or changes are made, CMM will issue a penalty in accordance with the Penalty Rules.

2) When WCSPs request to add or changes collection equipment/vehicle.

- WCSP shall submits the written request (Hard copy) to CMM (The submission format should use the collection equipment sheet).
- Based on the submitted documents, CMM will check the contents, and if there are no problems, CMM issues a permission to WCSP.
- After CMM issues the permit, WCSP registers the new equipment in the weighbridge system.
- After registering the new equipment in the weighbridge system, WCSP can start waste collection service with the new equipment.
- If this procedure is not followed and additions or changes are made, CMM will issue a penalty in accordance with the Penalty Rules.

3) When WCSPs request to make other changes to the work plan.

- For any other changes to the work plan, WCSP shall submit a written request (hard copy) to CMM (any format is acceptable).
- Based on the submitted document, WCSP will hold discussions with CMM.

*The procedure for the work plan modification was not provided in the previous TOR, and changes were being implemented by WCSP without information sharing to DSMAS.

(4) Document submission form

1) Workplan format

- Container collection plan
- Container collection route sheet
- Collection equipment sheet/Supervisor's equipment sheet
- Organizational chart and Personnel list sheet
- Collection equipment maintenance schedule sheet
- Container maintenance schedule sheet
- Safety management schedule sheet

2) Monthly report format

- Collection results (collection route sheet)
- Safety Management Report (information on safety management practices, incidents, etc., if implemented)
- Complaint/Problem Management Report (information on complaints and problems, information on countermeasures implemented)
- Organization Management (information on changes in organization, personnel, etc., if any)
- Material Maintenance Report (information on maintenance of equipment, etc., if implemented)

*The workplan submission forms to be submitted in the bid and monthly report format was not provide in the previous TOR and waste collection service by WCSP was implemented without the submission of these documents. The forms are shown in Appendix 2.

(5) Cost estimation

Although the bid price of WCSPs is not within DSMAS's control, DSMAS requires WCSPs to attach breakdown of the bid price and the basis for calculation in order to facilitate the contract price negotiation. The items listed in Table 21 should be considered.

Table 21 Items of breakdown of bid price and the basis for calculation

Item		Basis for calculation	
CAPEX	Collection Vehicle Costs	· By collection equipment: unit price x number of vehicles	Depreciation
	Container cost	· By container: unit price x number of containers	Depreciation
OPEX	Personnel cost	· Drivers: unit price x number of drivers · Workers: unit price x number of workers · Administration: unit price per class x number of persons per class · Others: unit price per class x number of persons per class	
	Equipment replacement cost	· Container, etc.	
	Consumables (fuel, tires, oil, etc.)	· Fuel: unit price x fuel consumption x distance, etc. · Tires: unit price x replacement distance x distance, etc. · Oil: unit price x fuel consumption x distance, etc.	
	Maintenance cost	· Spare parts cost · Maintenance cost	
	Safety equipment, etc		
	Fixed and administrative costs	· Licenses · Administrative expense	
	Profit	·	

Source: JICA Project Team

(6) Penalty procedures

As part of its daily operations, DSMAS will analyze information reported through MOPA from WCSPs, MEs, and markets. If WCSPs are found to be in default of obligations in their contracts, DSMAS will implement penalty procedures against WCSPs.

(7) Other additional information (Penalty items)

The following conditions will be added and penalty procedures will be implemented if the WCSPs do not fulfill them.

- The minimum weight to conduct waste collection for each 12m3 container is set at 3 tons. If the weight of the waste is less than this, it is not accepted as collected.
- When containers are needed to remove for maintenance, etc., alternative containers shall be placed.
- Clearly distinguish business waste collection vehicles from household waste collection vehicles. WCSPs shall provide backup collection vehicles in case of emergencies such as breakdown of vehicles.
- A new penalty should be established for the workplan change.

(8) Others

- The Container collection Plan presented in TOR designates containers to be used by MEs and markets and a plan to encourage their own container management. Therefore, when the next contract for secondary collection service is started, it will be important to educate MEs on how to manage containers and how to contact MOPA.
- In urbanized areas such as Nlhamanculo and KaMaxaquene Districts, introduction of payment based on weight of waste shall be considered. However, since service price cost estimation proposed by WCSP

might be higher than the current service price, weight-based payment system should be introduced only in one district, KaMaxaquene in the next TOR. If weight-based payment system is confirmed to be cost effective than the current trip-based payment system, it should be expanded to other districts in the future.

4. CONSIDERATION OF WASTE TRANSPORTATION METHODS TO THE NEW FINAL DISPOSAL SITES

The commencement of service of the Katembe and Mathlemele sanitary landfills is expected to have a significant impact on the WCSP's collection and transportation services and contracting costs, due to the increase in the distance of waste collection and transportation. Therefore, a study was conducted regarding the method of transporting waste to the new landfill site.

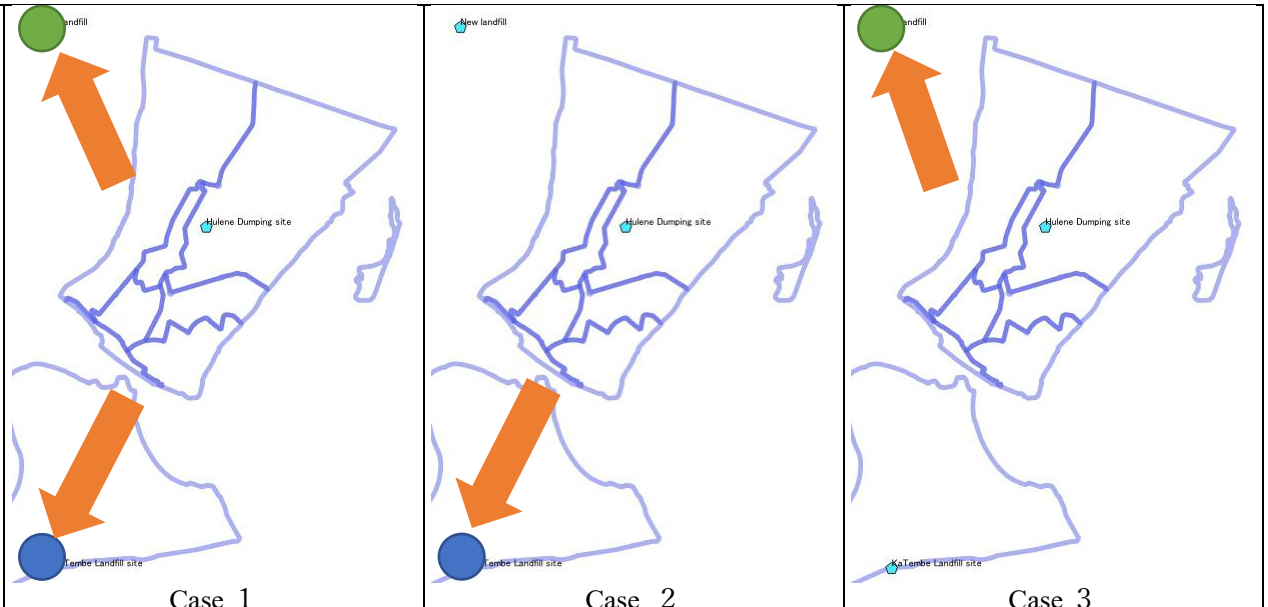
4.1 Examined waste transportation methods

There are two types of waste transportation methods. In one of the cases, waste will be transported directly to the Katembe and/or Mathlemele landfills by WCSPs. In the other case, the waste will be transported to a transfer station facility located at Hulene dumping site and it is reloaded into larger-load capacity vehicles and then transported to Katembe and/or Mathlemele landfills, since the transfer station facility can contribute to efficient waste transport under certain conditions. The necessity of transfer station facility was considered based on the cost of transportation as well as the cost of construction and operation of the transfer station facility.

The three cases considered are as follows. Besides the analysis was conducted by considering with and without paying the toll fee charged at Katembe Bridge.

- Case 1: Both Mathlemele landfill and Katembe landfill in operation
- Case 2: Only Katembe landfill in operation
- Case 3: Only Mathlemele landfill in operation.

Case	Case 1	Case 2	Case 3
Toll fee	With	With	—
	Without	Without	Without



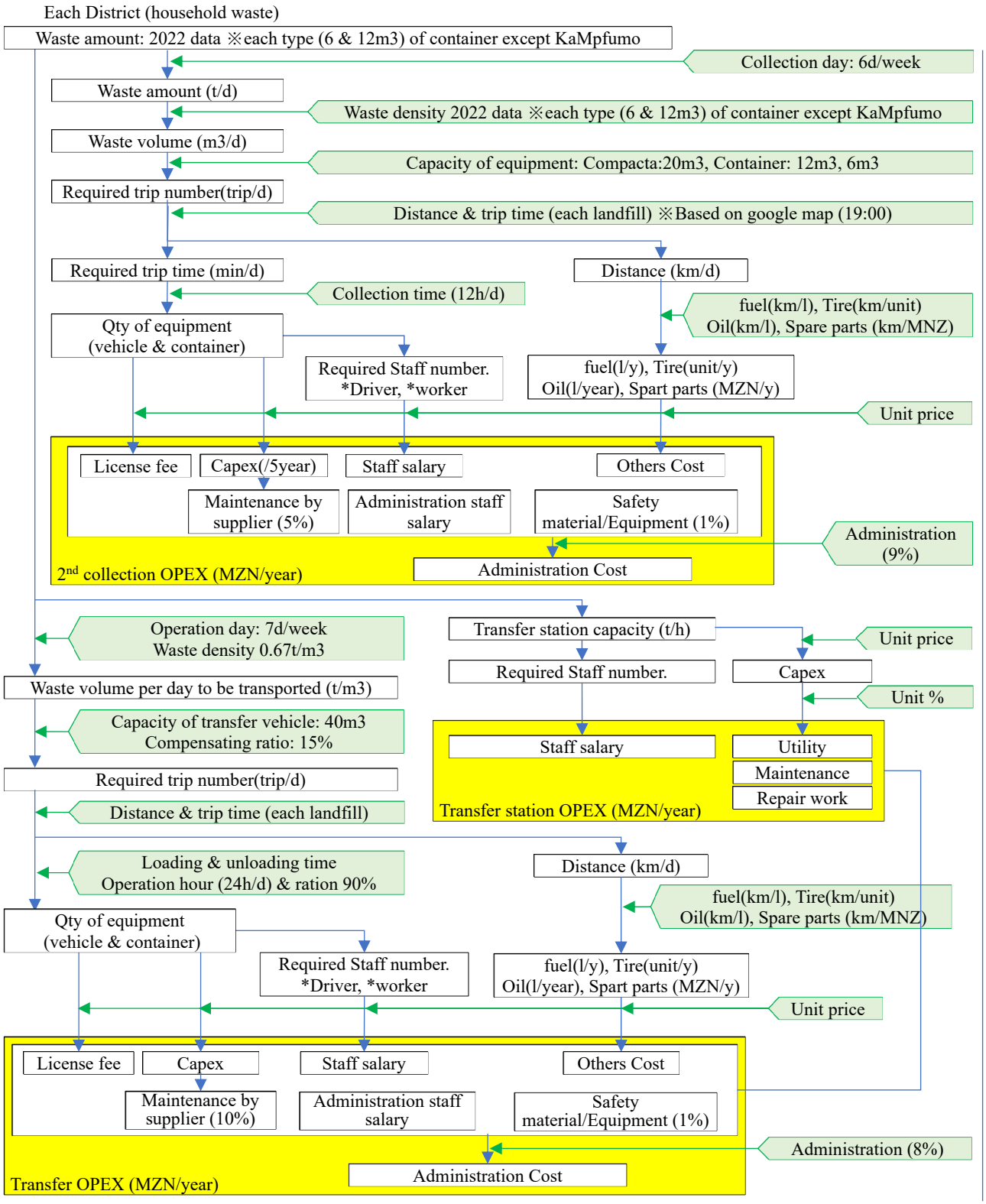
Source: JICA project team

Figure 25 Cases Examined

4.2 Cost comparison of each case

4.2.1 Condition for cost calculation

The cost calculation flow and conditions are shown in Figure 26 and Table 22.



Source: JICA project team

Figure 26 Cost calculation flow of transfer facilities

Table 22 Basis for calculation

Item		Basis for calculation
Waste	Waste amount	The target waste is household waste. The waste amount is based on weighbridge data for each District (April 2021 to March 2022). Future waste amounts is not taken into account.
	Waste density	The waste density of 12 m3 container and compactor vehicle each district was calculated from weighbridge data (April 2021 to March 2022).
Future landfill	· Mathlemele and Katembe Landfills · Katembe Landfill: World Bank project expected to be in service around 2026. · - MATREMELE landfill: Still unknown, development delayed due to resettlement issues. · Therefore, estimates are based on the following cases: (1) both the MATREMELE and KATEMBE landfill site are operational, (2) only the MATREMELE landfill site is operational, (3) only the KATEMBE landfill site is operational	
Transfer station	Transfer Station Locations	Hulene dumping site
	Transfer station operating hours	24 hours
	Transfer station cost	Data used to estimate transfer station facilities in Asia
	Transfer Vehicle capacity	40m3
Secondary collection condition	Collection Area	Estimate for each of 6 Districts (1 urban District and 5 suburban Districts where contracts are currently),
	Collection day	6 days/week
	Container number	Estimates for both 12m3 and 6m3 are based on the number of existing containers and container points.
	Time & distance to landfill site	Distance and time from existing waste collection routes to each landfill for urban areas, and distance and time from existing containers to each landfill for suburban areas were measured by Google Maps.
	Time of secondary collection	12 hours from 19:00-7:00 (calculations were based on 10.5 hours considering a total of 1.5 hours/daybreak).
Equipment for secondary collection	Secondary collection equipment	Collection equipment (vehicles and containers) are assumed to be new purchases, divided by 5 (years), and calculated as one year's worth.
	Roll-on-off	10,000mil MZN/vehicle (*from World Bank)
	Compacter	14,000mil MZN/vehicle (*MAN from Ecolife)
	Container12m3	450mil MZN/unit(*from Enviroserv)
	Container5.5m3	160 mil MZN/unit(*from Ecolife)
	Container1.1m3	31 mil MZN/unit(*from Ecolif)
Staff	Driver	270 mil MZN/year/person (*from World Bank)
	Worker	142 mil MZN/year/person (*from World Bank)
	Manager	811 mil MZN/year/person (*from World Bank)
	Engineer	541 mil MZN/year/person (*from World Bank)
	Inspection	270 mil MZN/year/person (*from World Bank)
	Clerk	270 mil MZN/year/person (*from World Bank)
Others	Fuel consumption rate	For collection vehicle 2 km/l, for transfer truck 1.5km/l
	Fuel cost	73 MZN/l
	Tire mileage	15,000 km (*from Ecolife)
	Number of tires	10 units/vehicle
	Purchase cost of tire	40 mil MZN/unit
	Engine oil consumption	250km/l
	Engine oil cost	91 MZN/l
Maintenance	Spare parts	9.1 MZN/km
	by supplier	5% of purchase cost
Safety Material / Equipment		1% of CAPEX
Fixed Expenses / Administrative Costs		9% of CAPEX
KaTembe bridge fee		1200 MZN
Inflation		Inflation is not considered.
Other		See Appendix 3

Source: JICA project team

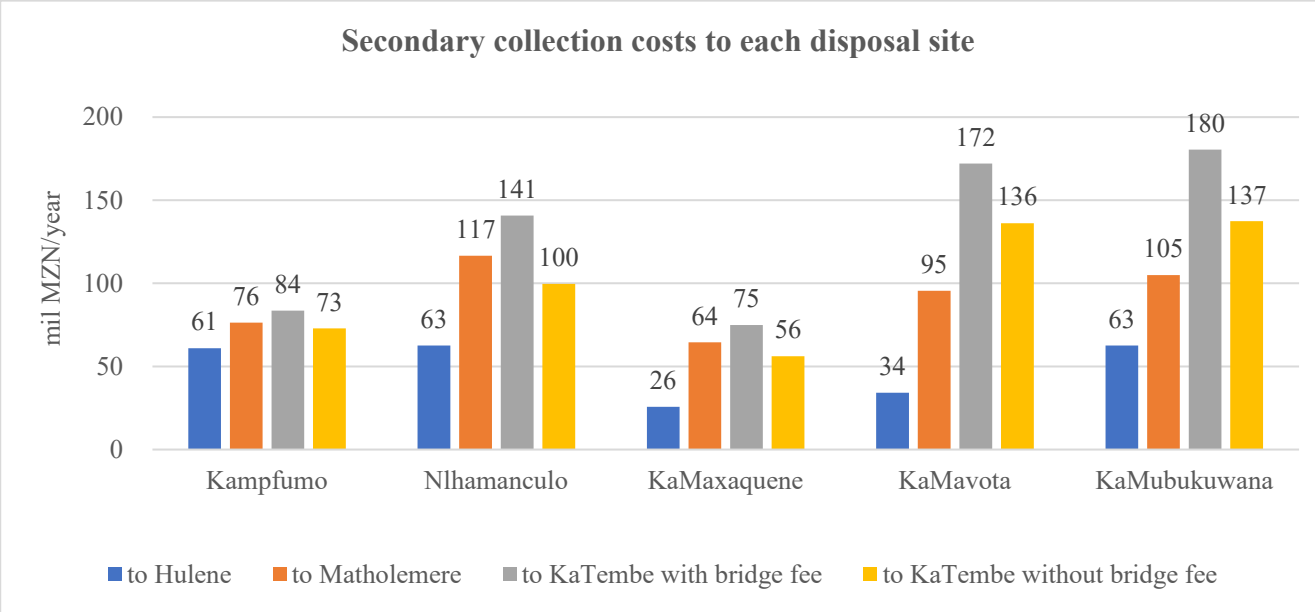
4.2.2 Calculation result

The calculation results of the calculations are as follows. Detailed calculation results are attached in Appendix 3.

(1) Comparison of direct transport from each District to each landfill

The figure below shows the cost of collection compared to the case where secondary collection is carried directly from each District to each landfill. The results show the following.

- In the case with KaTembe Bridge toll fee, all District are cheap to direct transport to Mathlemele landfill.
- In the case without KaTembe Bridge toll fee, transport to KaTembe landfill is cheap for KaMpfumo, Nlhamanculo, and KaMaxaquene Districts.
- For transportation to KaTembe landfill, without KaTembe Bridge toll fee is cheaper.
- Regarding transportation costs from KaMavota District, the difference in costs to Hulene and to each landfill is larger than other Districts.



Source: JICA project team

Figure 27 Comparison of direct collection from Each District to each landfill

Using the above results, possible patterns were considered for each case. The cheapest pattern for each case was then selected.

The results of the calculations are shown below.

(2) CASE1: Both Mathlemele landfill and Katembe landfill in operation

1) With paying the toll fee charged at Katembe Bridge

Pattern 2, which waste will be transported directly to the MATREMELE landfill by WCSPs, will be the most economical. It would be 184% more expensive than the current situation.

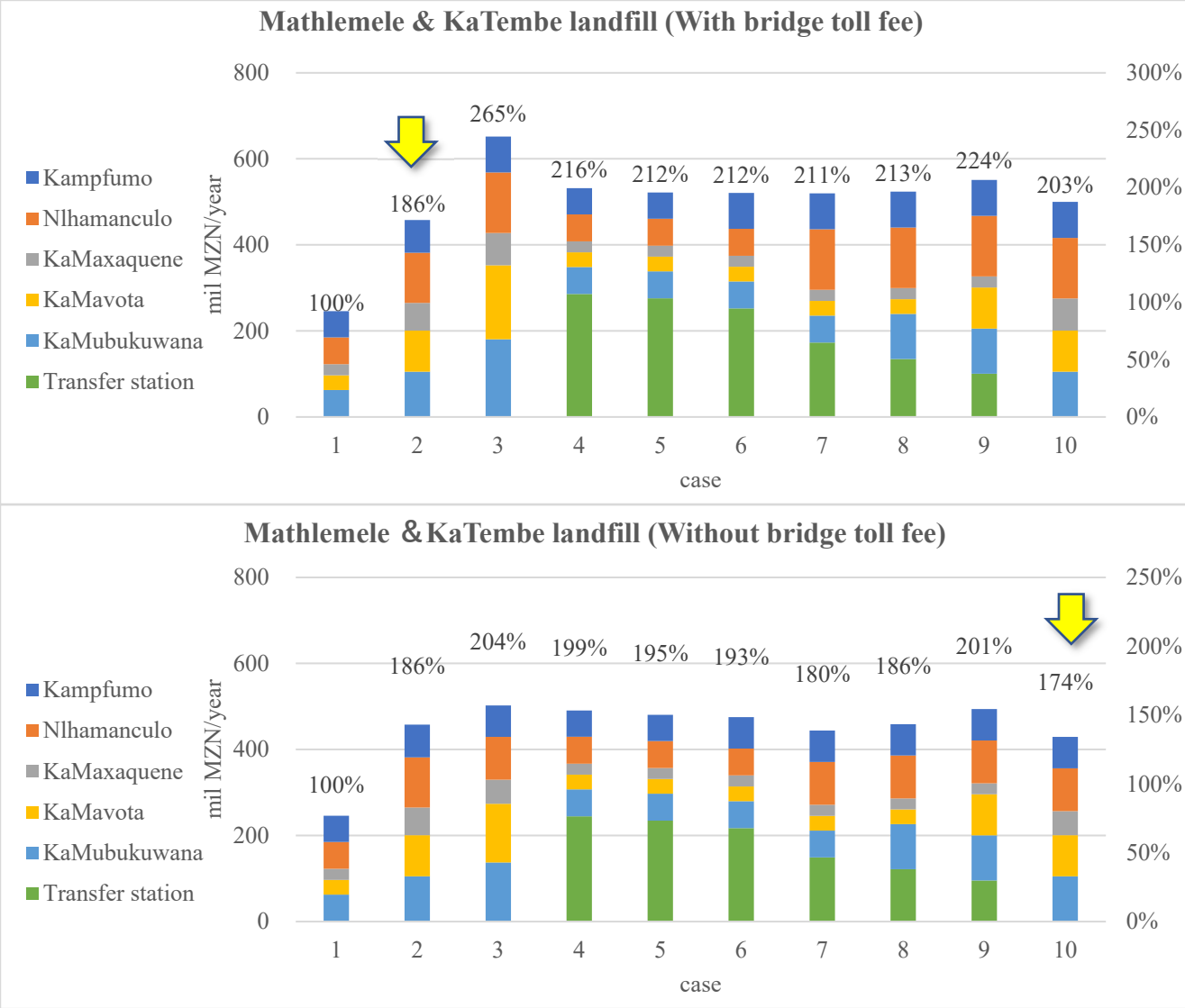
2) Without paying the toll fee charged at Katembe Bridge

Pattern 10, which waste will be transported directly from KaMavota and KaMubukuwane District to Mathlemele landfill by WCPSs, and waste will be transported directly from KaMpfumo, KaMaxaquene and Nlhamanculo District to Mathlemele landfill by WCPSs, will be the most economical. It would be 173% more expensive than the current situation.

Table 23 Both Mathlemele and Katembe landfill in operation

Pattern District	1 Actual	2	3	4	5	6	7	8	9	10
KaMpfumo	Hulene	Mat	KaT	TS->Mat	TS->KaT	KaT	KaT	KaT	KaT	KaT
Nlhamanculo	Hulene	Mat	KaT	TS->Mat	TS->KaT	TS->Mat	KaT	KaT	KaT	KaT
KaMaxaquene	Hulene	Mat	KaT	TS->Mat	TS->KaT	TS->Mat	TS->Mat	TS->Mat	TS->Mat	KaT
KaMavota	Hulene	Mat	KaT	TS->Mat	TS->KaT	TS->Mat	TS->Mat	TS->Mat	Mat	Mat
KaMubukuwane	Hulene	Mat	KaT	TS->Mat	TS->KaT	TS->Mat	TS->Mat	Mat	Mat	Mat
Transfer station capacity(t/d)	1,093	0	0	1,093	1093	928	635	351	138	0

Source: JICA project team



Source: JICA project team

Figure 28 Both Mathlemele and Katembe landfill in operation (Upper: with bridge toll fee, Lower: without bridge toll fee)

(3) CASE2: Only KaTembe landfill in operation

In the case only the KaTembe Landfill were in operation, regardless of whether the Katembe Bridge toll fee is paid, Pattern 4, which waste will be transported directly to KaTembe landfill from KaMpfumo and Nlhamanculo districts and waste will be transported to KaTembe landfill via transfer station from other areas (KaMaxaquene, KaMavota, and KaMubukuwane), will be the most economical.

In that case, it would be 202% more expensive than the current situation if the KaTembe Bridge toll fee is paid, or 171% more expensive than the current situation if the KaTembe Bridge toll fee is not paid.

Table 24 Only KaTembe landfill in operation

pattern District	1 Actual	2	3	4	5	6	7	8	9
KaMpfumo	Hulene	TS->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT	DT->KaT
Nlhamanculo	Hulene	TS->KaT	TS->KaT	DT->KaT	DT->KaT	TS->KaT	DT->KaT	DT->KaT	DT->KaT
KaMaxaquene	Hulene	TS->KaT	TS->KaT	TS->KaT	DT->KaT	TS->KaT	TS->KaT	DT->KaT	DT->KaT
KaMavota	Hulene	TS->KaT	TS->KaT	TS->KaT	TS->KaT	TS->KaT	TS->KaT	DT->KaT	TS->KaT
KaMubukuwane	Hulene	TS->KaT	TS->KaT	TS->KaT	TS->KaT	DT->KaT	DT->KaT	TS->KaT	DT->KaT

Source: JICA project team

Source: JICA project team

Figure 29 CASE2: Only KaTembe landfill in operation (Upper: with bridge toll fee, Lower: without bridge toll fee)

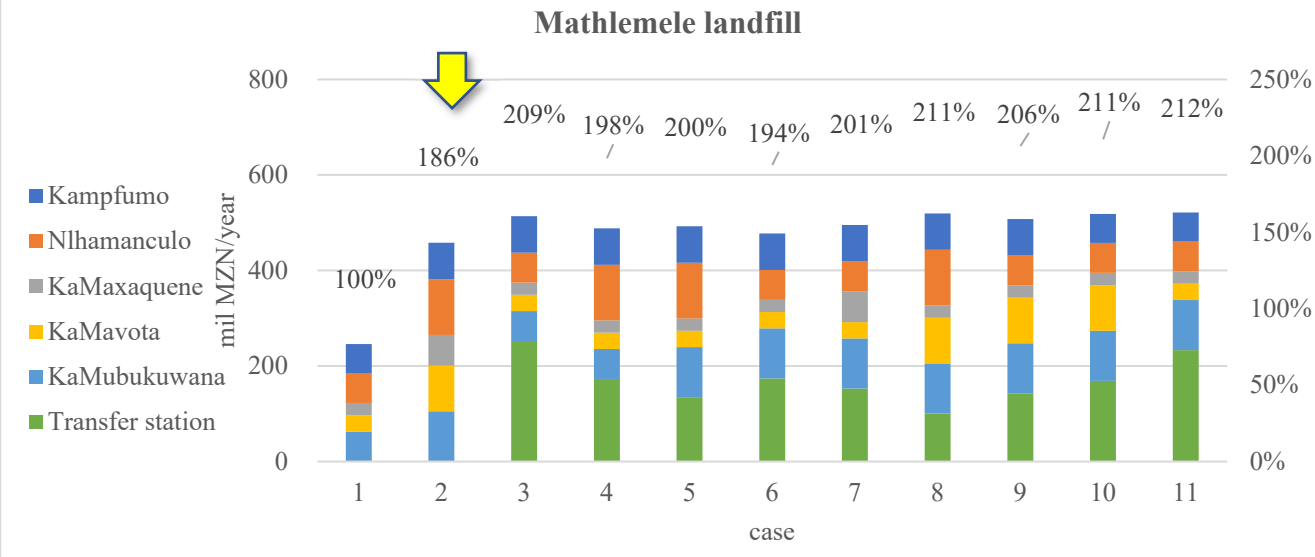
(4) CASE3: Only Mathlemele landfill in operation

If only the Mathlemele Landfill is in operation, there is no need to pay the toll fee at the KaTembe Bridge. Pattern 2, which waste will be transported directly to the Mathlemele landfill by WCSPs, will be the most economical. It would be 186% more expensive than the current situation.

Table 25 CASE3: Only Mathlemele landfill in operation

Pattern District	1 Actual	2	3	4	5	6	7	8	9	10	11
KaMpfumo	Hulene	Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	TS->Mat	TS->Mat
Nlhamanculo	Hulene	Mat	TS->Mat	DT->Mat	DT->Mat	TS->Mat	DT->Mat	DT->Mat	TS->Mat	TS->Mat	TS->Mat
KaMaxaquene	Hulene	Mat	TS->Mat	TS->Mat	TS->Mat	TS->Mat	DT->Mat	TS->Mat	TS->Mat	TS->Mat	TS->Mat
KaMavota	Hulene	Mat	TS->Mat	TS->Mat	TS->Mat	TS->Mat	TS->Mat	DT->Mat	DT->Mat	DT->Mat	TS->Mat
KaMubukuwane	Hulene	Mat	TS->Mat	TS->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat	DT->Mat
Transfer station capacity(t/d)	0	0	928	635	351	644	506	138	431	596	809

Source: JICA project team



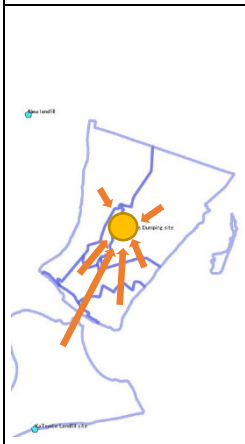
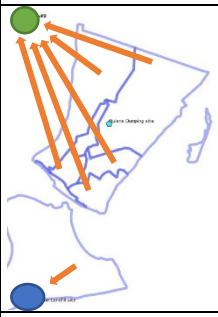
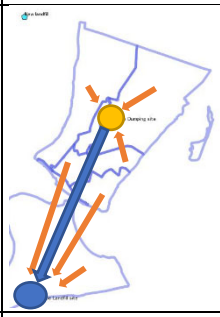
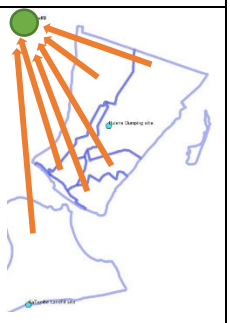
Source: JICA project team

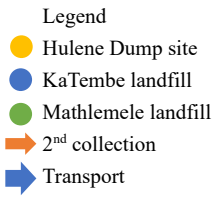
Figure 30 CASE3: Only Mathlemele landfill in operation

4.2.3 Results of examination

The results of the estimation for each case are shown in Figure 31.

- Compared to the current situation, the cost of waste transportation will be approximately doubled in all cases.
- In the case where no toll is imposed on the KaTembe Bridge, the cost increase is suppressed, and the optimal case differs depending on whether or not a toll is imposed.
- In the case where the KaTembe Bridge toll fee is paid, the least expensive case is to deliver all waste directly to Mathlemele landfill.
- If the case the KaTembe Bridge toll fee is not paid, the least expensive case is that the waste from KaMpfumo and Nlhamanculo Districts will be directly transported to KaTembe landfill, while waste from the other Districts is transported to the KaTembe Landfill via a transfer station facility at Hulene dumping site.

Current		Case1	Case2	Case3
	With Toll Fee			—
	Cost	186%	202%	
	Without Toll Fee			
Cost 100%	Cost	174%	171%	186%



Source: JICA project team

Figure 31 Comparison of Waste Transportation Cost in Each Case

Based on the results of the above study, CMM/DSMAS should continue to consider the following issues

- Whether or not a toll is imposed on the Katembe Bridge will have a significant impact on future waste transportation cost. Therefore, it is recommended that CMM/DSMAS discuss with the National Road Authority, which is responsible for the management of the Katembe Bridge, the possibility of reducing or exempting the Katembe Bridge tolls for the municipal waste collection and transportation service, which is a public service.
- Reducing transportation costs through waste reduction is an important issue, as waste transportation costs will certainly increase from the current level. The introduction of material recovery facilities and composting facilities, which are currently being considered under the World Bank supported project (PTUM), will greatly contribute to reducing waste transportation cost.
- In this estimation, the transfer station facility is considered to be installed at the closed site of Hulene dumping site, but it is necessary to examine whether the necessary conditions, such as the required area and ground strength, can be satisfied.
- The size of waste transportation vehicles may be limited by the specifications of the weighbridge to be installed at the Mathlemele or Katembe landfills.
- The width of the access roadway from Hulene dumping site to the Mathlemele or Katembe landfills may limit the size of waste transportation vehicles.
- It is necessary to confirm the size and weight limits of waste transportation vehicles that can travel on the Katembe bridge. (According to the results of interviews with the operator, there are no vehicle size or weight restrictions.)

5. APPENDIX