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

Project Completion Report

December 2023

Japan International Cooperation Agency (JICA)

Nippon Koei Co., Ltd.

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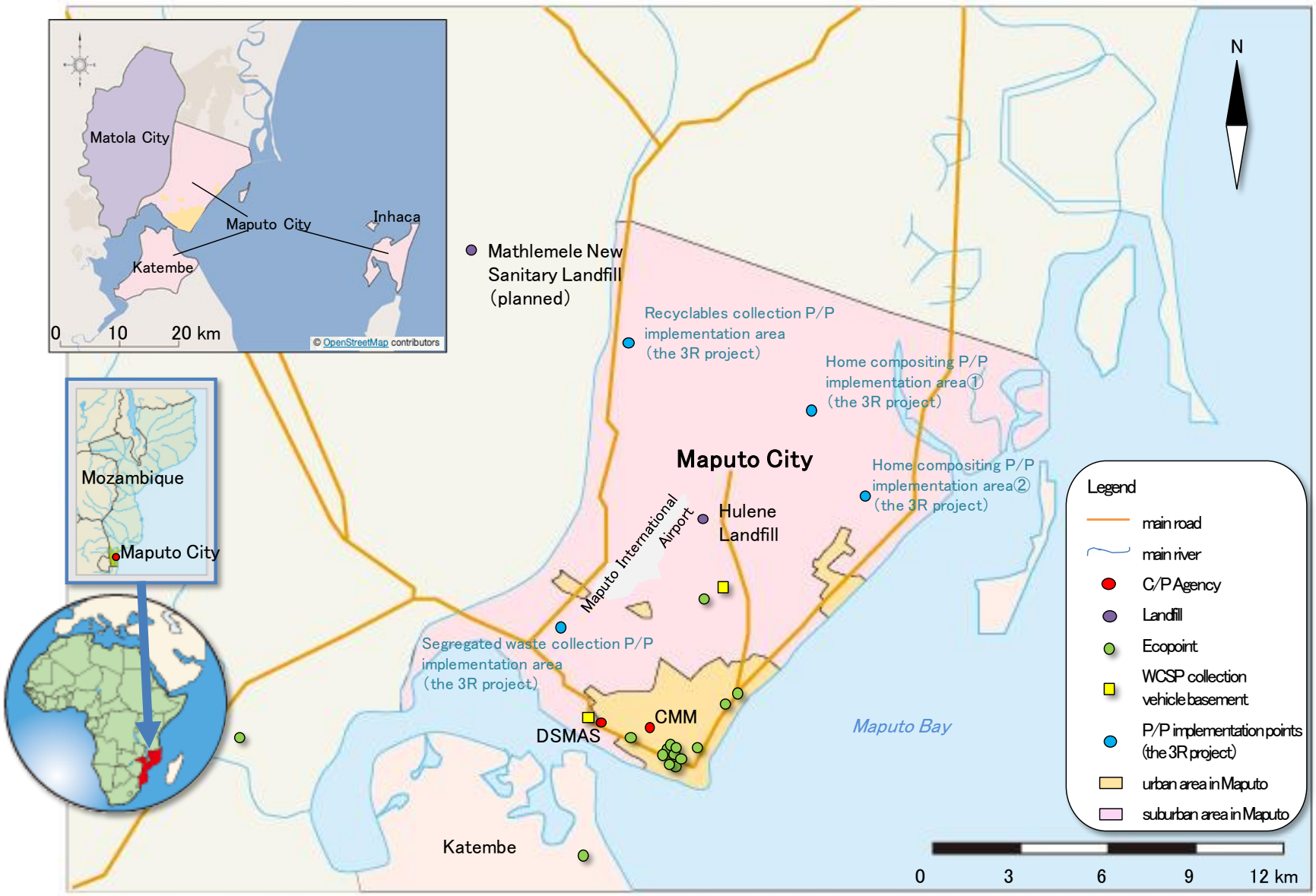

Source: JICA Project Team

Figure : Project area

Summary

1. Project Outline

This technical cooperation project was implemented from November 2019 to October 2023, with the Directorate of Environment and Waste Management (DSMAS) of the Municipal Council of Maputo (CMM) as the Mozambican implementing agency, with the project purpose that "the capacity for implementing integrated solid waste management (ISWM) is enhanced based on the SWM Master Plan (M/P) of Maputo City, and the capacity development experience is summarized under the name of the 'Maputo Model'".

The Japan International Cooperation Agency (JICA) Project Team consisting of DSMAS and the JICA Expert Team (JET), in collaboration with the Ministry of Land and Environment (MTA), the Municipality of Matola, the Ministry of Education and Human Development (MINEDH), the National Association of Municipalities of Mozambique (ANAMM), the National Solid Waste Management Federation (ANGER) and other relevant organizations, implemented the project activities related to the seven outputs based on the project design matrix (PDM). The results of the project activities are summarized in this project completion report.

2. Results of the Project Activities

2.1 Overall Activities

The results of overall activities such as the capacity assessment at the beginning and end of the project, the history of PDM and plan of operation (PO) revisions, the joint coordination committee (JCC) meetings and regular progress meetings, the publicity activities such as Project Brief Notes (Vol. 1-3), and the various reports preparation, were summarized.

Although it was originally planned to conduct a training in Japan as well as in a third country, it was unfortunately inevitable to cancel these trainings due to the global spread of the new coronavirus infection (COVID-19).

2.2 Activities for Output 1 (Action Plan and Monitoring of the M/P)

Based on the SWM M/P of Maputo City, which was developed through the "Project for the Promotion of Sustainable 3R Activities in Maputo City," and was implemented for about four and a half years from March 2013 by CMM and JICA, the DSMAS developed the Action Plan (A/P) for the M/P and established the M/P Monitoring System (M/S) to implement various measures for improving ISWM in the city.

In formulating the Action Plan (A/P), the necessary revisions were made based on the 2018 approved version of the M/P, and the consistency with the higher-level plans such as the CMM's Five-Year Development Plan (PDM: 2019-2023) and the CMM's Annual Action Plan. Based on the formulated A/P, DSMAS took the initiative to conduct the A/P monitoring to confirm the progress of the M/P measures.

In establishing the monitoring system (M/S), the necessary revisions were made based on the 2018 approved version of the M/P, and specific numerical targets were set to evaluate the achievement of the M/P measures. In addition, the M/P monitoring team was formed within DSMAS. Based on the above, the M/P monitoring team conducted M/P monitoring in December 2022 after receiving relevant information from the DSMAS staff in charge of each M/P measure.

In 2023, five years after the approval of the M/P, a mid-term review of the M/P was conducted in accordance with Decree 94/2014 (Regulation on Urban Solid Waste Management). The relevant staff of DSMAS reviewed each chapter of the M/P on their own and the review results were discussed among the JICA Project Team. The results of the M/P mid-term reviews were organized into the "Mid-term Review Report of the Master Plan", and DSMAS is expected to conduct the M/P revision works based on this review report.

2.3 Activities for Output 2 (Improvement of Collection and Transportation Service Management)

The detailed study on the status of municipal solid waste (MSW) collection and transportation services in Maputo City, the monitoring activities of the entrusted MSW collection service operation in the suburban district of Maputo City, and the survey on the actual status of primary collection services were conducted, and these could identify the various issues related to the management of MSW collection and transportation services in Maputo City.

Considering the issues identified above, the standard operating procedures for the contract management of waste collection service providers (WCSPs) by DSMAS were organized and the items to be added to the next terms of references (TORs) of entrusting contract for WCSPs were recommended. Furthermore, to reduce the burden related to the monitoring of MSW collection and transportation services by DSMAS, which is an information and communications technology or ICT-based monitoring management system was examined. In addition, the MSW transportation method was studied assuming that the new sanitary landfill will be in operation, since the Hulene dumping site is planned to be closed and the Katembe Landfill and/or the Mathlemele Landfill will be put into service soon.

Based on the results of the above activities, the “Plan for Improvement of Waste Collection and Transportation Service in Maputo City”, consisting of the three policies, namely: 1) information management, 2) monitoring management, and 3) waste reduction, was developed as the overall outcome of the Output 2 activities.

2.4 Activities for Output 3 (Promotion of Recycling)

Based on the study on the status of recycling activities in Maputo City and the experiences and lessons learned from the recycling promotion activities conducted in the previous JICA technical cooperation project, the source separation pilot project (PP) targeting paper, plastic, metal, glass, and hazardous waste was conducted at the DSMAS office, the CMM City Hall, and district office.

In introducing the PP, the JICA Project Team designed and procured the waste segregation bins and baskets, and prepared and installed the waste segregation signboards for each target recyclable waste. In addition, waste segregation trainings were conducted to obtain the staff’s participation and cooperation in source separation. Continuous monitoring of the amount of recovered recyclable waste was conducted, and the recovered recyclable waste was handed over to the existing recycling companies. Based on the findings and lessons learned from a series of source separation PP practices, the “Draft Regulation on Promotion of Source Separation and Recycling in Maputo City” was prepared.

In addition, a survey was conducted to identify recycling-related actors (recycling companies and non-governmental organization (NGOs)) to strengthen the network of recycling-related actors operating in and around Maputo City. A total of 38 recycling-related actors were identified in the vicinity of Maputo City, and it was understood that an average of 8,270 t/year (22.7 t/day) of recyclable waste was recovered. At the same time, a "Recycler Map" was created, which provides the information on existing recycling-related actors, including their locations, contact information, and types of recyclable waste items they handle.

Moreover, the networking meetings were held seven times in total with the recycling-related actors identified in the above survey. Following the discussions at the meetings, it was recommended that DSMAS and recycling-related actors organize a permanent meeting body and continue to hold recycling forums even after the project is completed.

2.5 Activities for Output 4 (Operation and Management of Sanitary Landfill)

The “Guidelines for Operation and Management of Sanitary Landfills” were prepared with the intention of being utilized by Mozambican relevant organizations in operation and management of sanitary landfills. Besides, the training was conducted for DSMAS, MTA, and Matola City officers to deepen their

understanding regarding sanitary landfill operation and management practices. A total of 56 officers from DSMAS, MTA, and Matola City participated in the training.

In addition, the progresses of safety improvement measures for the closure of the Hulene dumping site and development of new sanitary landfills at Katembe and Mathlemele were studied and confirmed throughout the project period.

2.6 Activities for Output 5 (Financial, Organizational, and Institutional Improvements)

For financial improvement, the JICA Project Team reviewed, verified, and analyzed DSMAS's revenue and expenditure data in detail, and organized the financial balance and its future projections of the MSWM sector in Maputo City. The annual financial balance of operational expenses of the MSWM sector in CMM for 2016-2022 has a deficit of MZN 158 million to MZN 390 million, which required an average of 58% cost subsidy from the CMM's general budget. Currently, the CMM is planning to invest in a sanitary landfill development with the support of the World Bank (WB), which is expected to further deteriorate the financial balance of the MSWM sector.

To address the above financial risks, the "Financial Sustainability Strategy of Solid Waste Management in Maputo City" was developed to: 1) correct the problems with the current system, 2) ensure transparency in transactions, and 3) ensure that residents, businesses, and related institutions share the fair share of waste management costs. To ensure the financial sustainability of the MSWM sector in Maputo City, the strategy-recommended measures to increase revenue consist of a revision of the MSW cleaning fee, a change in the collection method of the cleaning tax for business waste generators, and a change in the collection method of the tipping fee at the final disposal site.

For organizational improvement, the JICA Project Team analyzed DSMAS's organizational structure and the job descriptions of each department and section, and recommended organizational development measures to strengthen contract management, financial management, and planning and monitoring functions. For human resource development, the JICA Project Team developed a database of the DSMAS staff that can be used for human resource management and proposed the measures for human resource development of the DSMAS staff. The outcomes of these activities were compiled into the "Organizational and Human Resources Development Plan of DSMAS".

For institutional improvement, the JICA Project Team analyzed the legal framework related to waste management in Mozambique and Maputo City, and examined the institutional framework needed to realize incentive programs to promote recycling and cost recovery measures such as cleaning tax reform, and then identify the policy gaps with the current CMM ordinance and resolutions. The outcomes of these activities were compiled into the "Plan for Updating the Regulations related to SWM in Maputo City".

2.7 Activities for Output 6 (Promotion of Environmental Education and Public Awareness)

A core working group for environmental education and public awareness was established within DSMAS, and the activities were carried out while regularly sharing information with MTA, MINEDH, and NGOs involved in environmental education and public awareness activities.

In the area of environmental education for children, while making use of the existing environmental club activities, the new activities such as environmental picture diary and Spo Gomi activities were undertaken to expand the content of the activities.

For citizens of Maputo City, the JICA Project Team supported the "Cleanest Neighborhood Contest" activities held annually by the CMM. In addition, the JICA Project Team developed the educational materials on source separation and 5Rs as well as conducted the training for the governmental officers through source separation PP at the DSMAS Office, CMM City Hall, district offices, and Matola City Office.

2.8 Activities for Output 7 (Compilation of Maputo Model)

The knowledge and experience, which DSMAS obtained by promoting ISWM through a series of project activities were compiled into the ‘Maputo Model’. The model was prepared in MS PowerPoint format with each topic briefly summarized on a single slide for easy reference by the policymakers and waste management officers in Mozambican municipalities. Detailed documents, manuals, and tools developed through the project activities were also attached as reference materials for the ‘Maputo Model’.

In addition, through the coordination meetings with MTA, ANAMM, Matola City, and ANGER, the dissemination plan of the "Maputo Model" was prepared, and the national seminar was held on 21 July 2023 to share the ‘Maputo Model’ with the municipalities in the country.

3. Achievements of the Project

This chapter summarized the history of the PDM and PO revisions and the assessment of achievement levels of the indicators set in the PDM. Regarding the Project Purposes, five out of the seven indicators were achieved, and with regard to the Outputs, eighteen out of twenty indicators set were achieved. Hence, overall, the Project Purposes and Outputs were evaluated as almost achieved due to the ownership and commitment of the C/Ps.

4. Results of the Joint Review

In this chapter, the project evaluation based on the Development Assistance Committee (DAC) evaluation criteria was conducted by the joint review of DSMAS and JET. The project was rated "very high" for Relevance and Coherence, and "high" for Effectiveness, Impact, Efficiency, and Sustainability.

In addition, the key factors that contributed to the implementation and outcomes of the project, the project risk management evaluation, and the lessons learned through each output activity were summarized.

5. Recommendations for Achievement of the Overall Goals

In this chapter, the prospects and recommendations for achieving the Overall Goals were examined and summarized.

In addition, the recommendations for DSMAS to continue and improve each output activity were summarized, and DSMAS's activity plan and implementation structure for achieving the Overall Goals were examined, and the monitoring plan from the end of the project up to ex-post evaluation was prepared.

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Abbreviations

Organizational Term	
ACCP	African Clean Cities Platform
AMEPS	Mozambican Association of Microenterprises for Service Provision
ANAMM	National Association of Mozambican Municipalities
ANGER	National Solid Waste Management Federation
CMM	City Council of Maputo
DAC	Development Assistance Committee
DARHF	Department of Administration, Human Resources and Finance, DSMAS
DGFO	Department of Fleet Management and Workshops
DGIA	Department of Environmental Management and Inspection, DSMAS
DGRSU	Department of Urban Solid Waste Management, DSMAS
DINAB	National Directorate of Environment, MTA
DPM	Department of Planning and Monitoring
DSMAS	Directorate of Municipal Service of Environment and Waste
DSMCI	Directorate of Municipal Services of Communication and Information
EDM	Mozambique Public Enterprise of Electricity
FNDS	Sustainable Development National Fund, MTA
GIZ	German Agency for International Cooperation (Formerly GTZ)
JICA	Japan International Cooperation Agency
MINEDH	Ministry of Education and Human Development
MOH	Ministry of Health
MTA	Ministry of Land and Environment
RAF	Administration and Finance Section, DSMAS
REA	Environmental and Sanitation Education Section, DSMAS
RFM	Supervision Section, DSMAS
RGC	Contract Management Section, DSMAS
RLM	Municipal Dumping Site Section, DSMAS
RRP	Public Removal Section, DSMAS
WB	The World Bank
Technical Term	
BCP	Business Continuity Plan
COVID-19	Coronavirus Disease 2019
GPS	Global Positioning System
ICT	Information and Communication Technology
ISWM	Integrated Solid Waste Management
IT	Information Technology
ME	Micro-enterprise (Primary Waste Collection Service Provider)
MOPA	Participatory Monitoring
MRF	Materials Recovery Facility
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
NGO	Non-governmental Organization
ODA	Official Development Assistance
OJT	On-the-job Training
PDCA	Plan-Do-Check-Action
PdS	Proof of Service
PSP	Private Service Provider
PTUM	Maputo Urban Transformation Project, funded by the World Bank
QGIS	QGIS is a free and open-source cross-platform desktop geographic information system (GIS) application
SOP	Standard Operating Procedure
SWM	Solid Waste Management
WCSP	Waste Collection Service Provider

Project Term	
A/P	Action Plan
C/P	Counterpart
DFR	Draft Project Completion Report
FR	Project Completion Report
F/S	Feasibility Study
ICR	Inception Report
JCC	Joint Coordination Committee
JET	JICA Expert Team
M/P	Master Plan
PR	Progress Report
R/D	Record of Discussions
PDM	Project Design Matrix
PO	Plan of Operation
PP	Pilot Project
TOR	Terms of Reference

1. PROJECT OUTLINE

1.1 Background

Based on the national laws and regulations of Mozambique such as the "National Environmental Policy" (Resolution No. 5/1995) and the "Environmental Law" (Law No. 20/1997), the City Council of Maputo (CMM) has enacted the "Cleaning Ordinance of Maputo City" in 1997 (revised in 2004 and 2006). In 2007, the "Master Plan for Urban Solid Waste Management in Maputo City" (hereinafter, "M/P") was formulated with the support of the German Agency for International Cooperation (GTZ, currently GIZ), and the capacity on solid waste management (SWM), such as waste collection and transportation, and financial management was enhanced. However, mainly due to insufficient organizational and technical capacities of CMM, proper waste management could not be fully achieved.

For this reason, the Japan International Cooperation Agency (JICA) and the former Directorate of Municipal Health and Cemetery Services (DMSC), currently Directorate of Municipal Service of Environment and Waste (DSMAS) of CMM implemented the "Project for Promotion of Sustainable 3R Activities in Maputo" (hereinafter, "3R Project") for about four and a half years since March 2013. The Project contributed to the capacity development of DSMAS through a series of activities such as the preparation of revised M/P, the improvement of waste collection and transportation and financial management, and the promotion of 3R and awareness-raising activities.

Although CMM/DSMAS needs to continuously improve SWM in the city in accordance with the revised M/P, still it lacks the capacity to implement various measures planned in the revised M/P. Hence, JICA decided to implement this technical cooperation project at the request of the Government of Mozambique.

Figure 1 shows the background of this project and the relationship between the expected capacity building.

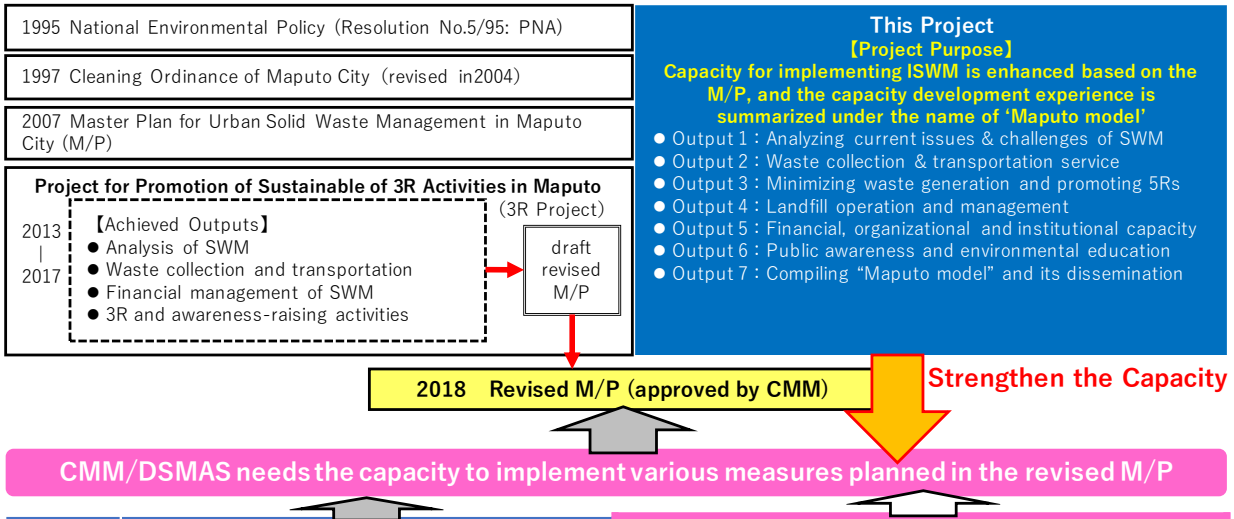
1.2 Objective

By conducting the project activities based on the record of discussions (R/D) of this technical cooperation project concluded by JICA and CMM, it aimed to realize the expected outputs and achieve the project purposes shown in Table 1.

Table 1 Summary of the Project Design Matrix

Overall Goal	Integrated solid waste management (ISWM) is established in a sustainable manner in Maputo City and the 'Maputo Model' is disseminated to other cities.
Project Purpose	The capacity for implementing ISWM is enhanced based on the SWM Master Plan (M/P) of Maputo City, and the capacity development experience is summarized under the name of the 'Maputo Model'.
Outputs	1. The capacity for analyzing current issues and challenges of SWM in Maputo City is enhanced. 2. The capacity for supervising the waste collection and transportation service is enhanced. 3. The capacity for minimizing waste generation and promoting 5Rs (Rethink, Refuse, Reduce, Reuse, Recycle) are strengthened. 4. The technical capacity for operation and management of final disposal is enhanced. 5. The financial, organizational, and institutional capacities in SWM are enhanced. 6. The capacity for raising public awareness on the environment including waste issues and environmental education at various levels is strengthened. 7. The experience of realizing ISWM in Maputo City is summarized as the 'Maputo Model' and disseminated to other cities.

Source: JICA Project Team



Output	Capacity strengthened through the 3R Project	Required capacities to implement various measures planned in the revised M/P
Output 1	Strengthen the capacity on analyzing the issues through preparing the revised M/P	Prepare the action plan and conduct monitoring of the revised M/P
Output 2	Proposing the measures to improve the waste collection service in urban area	Examine measures to improve and optimize waste collection service according to its categories
Output 3	Proposing the measures to improve 3R activities through the pilot project	Verify the feasibility of source separation Implement the measures to promote 5R activities
Output 4	(not focused in the 3R Project)	Operation and management of the new sanitary landfill
Output 5	Improving the financial management work process Proposing DMSC's restructuring plan	Promote the cost-recovery measures on SWM Formulate an organizational development plan and a human resources development plan of DSMAS Develop a plan for updating ordinances and regulations on SWM
Output 6	Establishing GECPA Developing the implementation structure of continuous public awareness-raising activities	Continue and improve public awareness-raising activities by GECPA Promote public awareness and environmental educations in various levels
Output 7	Disseminating the project outputs (through the ACCP preparatory meeting) Establishing ANGER	Compile "Maputo model" and disseminate it to the other municipalities in Mozambique

Source: JICA Project Team

Figure 1 Background of the Project and Required Capacity Development

1.3 Target Area

Maputo City and Matola City

The activities related to the landfill operation and management (Output 4) are assumed to be carried out in Mathlemele Sanitary Landfill to be constructed in Matola City.

For the activities related to the dissemination of the Maputo Model (Output 7), Matola City will be designated as a priority area for dissemination.

1.4 Duration

Planned: From 13 November 2019 to 12 November 2022 (37 months)

Actual: From 13 November 2019 to 12 October 2023 (47 months)

JICA and CMM agreed to extend the project duration for ten months based on the Minutes of the Meeting in August 2021 to address the impact of the coronavirus disease 2019 (COVID-19) pandemic.

1.5 Implementing Structure

(1) Mozambican Implementing Agency

- Counterpart (C/P) agency

  The Directorate of Municipal Service of Environment and Waste (DSMAS) of the City Council of Maputo (CMM)

- Coordination agency

  The National Directorate of Environment (DINAB) and Sustainable Development National Fund (FNDS) of the Ministry of Land and Environment (MTA), and Matola City

- Cooperating agency

  The Ministry of Education and Human Development (MINEDH) and the National Solid Waste Management Federation (ANGER)

(2) JICA Expert Team

The members of the JICA Expert Team are shown in Table 2 and the total mobilization of the experts is as follows: Field: 13.07 MM, Home: 25.83 MM in the first term and Field: 31.47 MM, Home: 14.7 3MM in the second term.

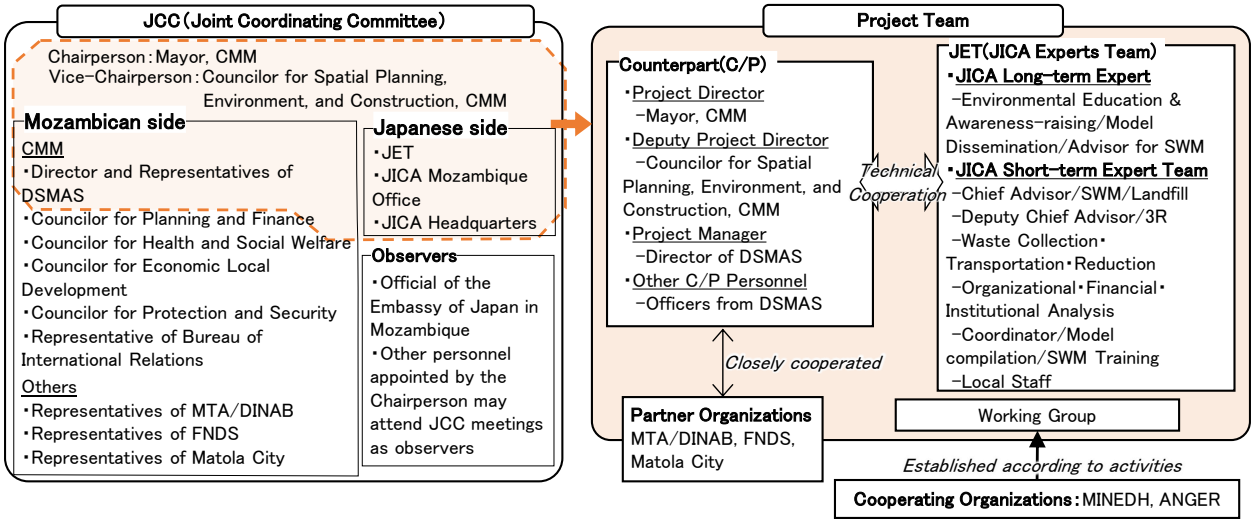
Table 2 Members of the JICA Expert Team

No.	Position	Name	Remarks
1	Chief Advisor/ Solid Waste Management/ Final Disposal	Tomoyuki Hosono	
2	Deputy Chief Advisor/ 3R Policy Promotion	Shungo Soeda	
3	Solid Waste Collection. Transportation and Reduction	Atsushi Otsuka	
4	Organizational, Financial, and Legal System Analysis	Grace Marco Neptuno	
5	Public Awareness and Environmental Education	Makiko Nakayama	From February 2022～
6	Project Coordinator /Model Compilation	Taishi Ushijima	From November 2019 to September 2022
		Sojiro Yamazaki	From October 2022～
7	Environmental Education and Awareness-raising/Model Dissemination/ Advisor for SWM	Eiko Kojima	From November 2019 to May 2022
8	Interpreter/ Technical Assistant (Output 1 and 4)	Acácio Muhosse	From November 2019 to June 2021
9	Interpreter/ Technical Assistant (Output 3)	Lúcia Fumo	From November 2019 to May 2021
10	Interpreter/ Technical Assistant (Output 1 and 4)	Silvino Sambo	From May 2021～
11	Interpreter/ Technical Assistant (Output 3)	Dionildes Mucanze	From November 2021～
12	Technical Assistant (Output 2)	Mário Fijamo	
13	Technical Assistant (Output 5)	Rogério Mole	
14	Technical Assistant (Output 6)	Stella Jamine	
15	Project Secretary	Lina Célia Daniel	
16	Interpreter	Valdimar Fonseca	From May 2023～

Source: JICA Project Team

(3) Project Implementation Structure

Figure 2 summarizes the overall implementation structure of the Project.

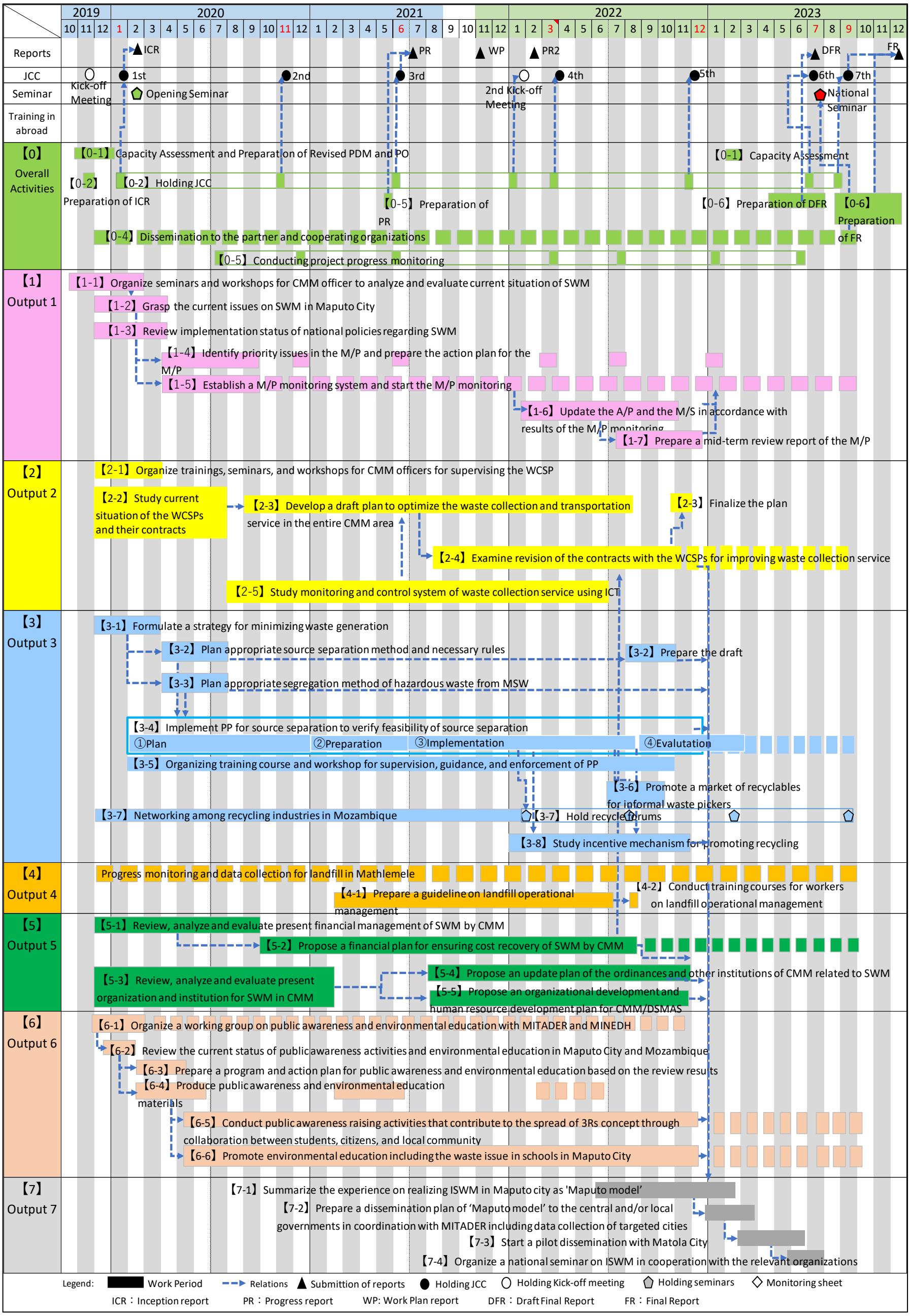


Source: JICA Project Team

Figure 2 Overall Implementation Structure of the Project

1.6 Workflow

The workflow of the Project is shown in Figure 3.



Source: JICA Project Team

Figure 3 Workflow of the Project

2. RESULTS OF THE PROJECT ACTIVITIES

2.1 Overall Activities

2.1.1 Capacity Assessment and Preparation of Revised PDM and PO (Activity [0-1])

(1) Capacity Assessment

There are two types of capacity assessment (hereinafter, "C/A"), which are individual (each counterpart (C/P)) and organizational (Directorate of Municipal Service of Environment and Waste (DSMAS)) level C/A, and institutional and social level C/A.

The individual and organizational C/A was conducted by setting questions regarding "learning about the activity", "individual's ability to implement activity", and "organizational capacity to continue activity" for every activity under each output of the Project. A C/A sheet to evaluate them on a five-point scale was also developed. Then, the C/P and the JICA Expert Team (JET) assessed the achievement of each item based on the C/A sheet, respectively. After that, the joint assessment was conducted by confirming and consulting the results of the assessment by both parties.

At the beginning of the Project, the questionnaire for C/A sheet was examined together with the C/P, and then the baseline assessment was conducted in December 2019. In May 2023, six months before the completion of the Project, the endline assessment was conducted. The result of C/A is summarized as shown in Table 3 and the capacity assessment sheets were attached in this report as Appendix 1-3.

Table 3 Result of Capacity Assessment

Output	Category	Baseline Score	Endline Score
Output 1	Individual	2.83	4.67
	Organizational	2.86	4.71
Output 2	Individual	2.78	4.44
	Organizational	1.88	4.00
Output 3	Individual	3.10	4.60
	Organizational	2.43	3.57
Output 4	Individual	2.25	3.25
	Organizational	1.50	4.00
Output 5	Individual	2.60	3.60
	Organizational	2.29	4.00
Output 6	Individual	3.00	4.60
	Organizational	2.78	4.44
Output 7	Individual	2.67	4.17
	Organizational	1.83	3.67
Overall	**Individual**	**2.75**	**4.19**
	Organizational	**2.22**	**4.06**

Source: JICA Project Team

As it can be seen in the table, the individual and organizational capacity of the C/P and DSMAS was assessed to have improved steadily through the project activities, although it was a self-assessment.

The key points for further capacity development for each Output are also identified as follows:

- Output 1: Continuation of Action Plan (A/P) and Master Plan (M/P) monitoring, and revision of M/P by DSMAS.
- Output 2: Implementation of the Waste Collection and Transportation Service Improvement Plan prepared in the Project.
- Output 3: Enforcement of the regulation on promotion of source separation and recycling, expansion of source separation practice, and continuation of recycling-related actor networking platform.
- Output 4: Improving understanding of the sanitary landfill operation and management by referring to the guidelines prepared in the Project and by practice in the Maputo Urban Transformation Project (PTUM).

- Output 5: Enforcement of the financial sustainability strategy, implementation of DSMAS organization and human resources development plan and the plan for updating the City Council of Maputo (CMM) regulations related to solid waste management (SWM), which were prepared in the Project.
- Output 6: Implementation of collaborated activities with other departments of DSMAS to tackle issues on SWM, and continuation of regular coordination meeting with partner agencies and NGOs.
- Output 7: Promote dissemination of the Maputo Model in collaboration with the Ministry of Land and Environment (MTA), National Association of Mozambican Municipalities (ANAMM), National Solid Waste Management Federation (ANGER), and Matola City.

The institutional and social C/A was conducted by assessing the achievement of the project design matrix (PDM) indicators. At first, the current institutional and social capacity was reviewed through workshops with the C/P and the relevant organizations, and the objectively verifiable indicators for each output were set by considering expected capacity development at the institutional and social levels by the project activities.

(2) PDM and PO

Based on the PDM (Ver. 0) attached in the record of discussion (R/D), the indicators and means of verification that are considered appropriate for assessing the achievements of the project activities were proposed and it was approved as PDM (Ver. 1) in the first joint coordination committee (JCC) meeting held in January 2020. The PDM was further revised by adding some activities and setting target values of the indicator, and it was approved as PDM (Ver. 2) as shown in Table 4 in the fourth JCC meeting held in June 2022.

Table 4 Indicators and Means of Verification in PDM (Ver. 2)

Output	Indicator	Means of Verification
Project Purpose	· 1) The progress rate of the SWM M/P implementation is increased from 15% at the beginning to 67% at the end. · 2) MSW collection service coverage (number of bairros where waste collection service is provided) is improved from 56 (89%) at the beginning to 58 (92%) at the end (SDG 11.6.1) · 3) Amount of collected recyclables by source separation at CMM/DSMAS and the related organizations is increased from 0 kg/month at the beginning to 100 kg/month at the end. (SDG 12.5.1) · 4) The average score of the capacity assessment at the organizational level showed an improvement from 2.2 at the beginning to 3.5 at the end. · 5) The average score of the capacity assessment at the individual level showed an improvement from 2.8 at the beginning to 4.0 at the end. · 6) The citizen's satisfaction and cooperation on SWM in Maputo City showed an improvement from 70% (satisfaction) and 82% (cooperation) at the beginning to 80% (satisfaction) and 90% (cooperation) at the end.	· 1) M/P monitoring results · 2) Project reports, DSMAS annual activity report · 3) Monitoring results of the source separation pilot project · 4) and 5) Capacity assessment sheet · 6) Social survey report
Output 1	· Action plan for the revised M/P is prepared. · Monitoring system for the revised M/P is established. · Periodical monitoring on the revised M/P is implemented. · Mid-term review report of the M/P is prepared.	· Action plan · Monitoring plan · Monitoring report · M/P mid-term review report

Output	Indicator	Means of Verification
Output 2	· The draft plan for the optimization of waste collection service is prepared. · Revision of contracts with WCSPs is proposed in line with the draft plan.	· Draft plan for optimization of waste collection service · Proposal on the revision of contracts with WCSPs
Output 3	· More than three offices of CMM and the related organizations introduced the source separation PP. · Amount of collected recyclables by source separation at DSMAS doubled (30 kg/month) from the start of the pilot project. · Draft regulation on source separation is prepared. · The recycling forum is held periodically.	· Monitoring results of the source separation pilot project · Draft regulation on source separation · Record of recycling forums
Output 4	· The Guideline on Operation and Management of Sanitary Landfill is prepared. · More than 50 staff participated in training on sanitary landfill operation and management.	· Guideline for landfill operation and management · Record of training
Output 5	· The financial plan for waste management cost recovery is proposed. · The plan for updating ordinances and regulations on SWM is proposed. · The plan for organizational and human resource development in DSMAS is proposed.	· Plan for improving waste management cost recovery · Plan for updating SWM regulations · Plan for organizational and human resource development
Output 6	· The percentage of administrative officers who understand and act on 5Rs concept and garbage disposal rules increased from 11.5% (understanding) and 50.9% (behavior) at the beginning to 70% and 80% at the end. · Awareness-raising and environmental education activities in which the Project is involved are conducted 20 times.	· Social survey · Project's report
Output 7	· "Maputo model" is compiled. · A dissemination plan of the "Maputo Model" is prepared. · A national seminar on the "Maputo Model" is held.	· Explanatory document of "Maputo Model" · Dissemination plan of "Maputo Model" · Record of national seminar

Source: JICA Project Team

Furthermore, the PDM (Ver. 3) was discussed and agreed in the sixth JCC meeting held in July 2023 to set target values of indicators for overall goals.

The PDM and PO (Versions 1 to 3) were attached in this report as Appendix 1-1.

2.1.2 Preparation of ICR and Holding JCC (Activity [0-2])

(1) Preparation of ICR

Based on the results of the capacity assessment at the initial stage of the Project as mentioned above, the inception report (ICR) was prepared and the revision on PDM and PO were proposed. The contents of the ICR were explained and discussed at the first JCC held in January 2020, and it was finalized reflecting the results of the consultation.

(2) Holding JCC Meetings

To facilitate project management and coordinate the related organizations, JCC meetings were held six times during the project period. Table 5 shows the timing and main agenda for each JCC.

Table 5 Record of JCC Meetings

Meeting	Timing	Main Agenda
Kick-off Meeting	November 2019	· Explanation of the project, confirmation of the project members · Current situation of SWM in Maputo City and Mathlemele New Landfill Project
First JCC	January 2020	· Explanation and discussion on ICR · Approval of PDM and PO (Ver.1)
Second JCC	November 2020	· Progress of activity for Output 1~7 and COVID-19 prevention measures
Third JCC	June 2021	· Explanation and discussion on PR
Fourth JCC	June 2022	· Progress of activities for Outputs 1~6 · Approval of PDM and PO (Ver.2)
Fifth JCC	December 2022	· Progress of activities for Outputs 1~6
Sixth JCC	June 2023	· Explanation and discussion on DFR and the 'Maputo Model'. · Approval of PDM and PO (Ver. 3)

Source: JICA Project Team

A kick-off meeting was held in November 2019 with the DSMAS counterparts to provide an overview of the project and the first JCC meeting was held in January 2020 to discuss the contents of ICR and the revision of PDM and PO. The revised PDM and PO were attached in the ICR.

It was difficult to hold the second JCC due to the coronavirus disease 2019 (COVID-19) pandemic; however, it was finally held in November 2020 by using the Zoom platform. The JICA experts explained the progress of activities for each output and the JCC members discussed the activity plan for 2021.

The third JCC was held in June 2021 to discuss the contents of the progress report (PR). The DSMAS counterparts explained the progress of activities for each output in the 1st half of the project period and the JCC members made comments on the achievement in the 1st half and the activity plan for the 2nd half of the project period.

The fourth JCC was held in June 2022 as DSMAS and the Project needed to restructure its operation after the accident of the former DSMAS Director and Project Manager, Mr. Domingos Paulo Chivambo on 9 February 2022. In the fourth JCC, the DSMAS counterparts explained the progress of the project activities and the revision of PDM and PO was approved.

The fifth JCC was held in December 2022 and DSMAS counterparts explained the major achievements and way forwards of the project activities. One of the highlights was the JCC members agreed on promoting the strategy on improving financial sustainability of the SWM sector proposed by the JICA Project Team.

The sixth JCC was held in July 2023 and DSMAS counterparts made presentations on the 'Maputo Model', which summarizes the lessons learned from the project activities, and the revision of PDM was approved.

The presentation materials used in the JCC meetings are attached in this report as Appendix 1-2.

(3) Regular Progress Meetings

The JICA Project Team held regular progress meetings with the project manager's initiative to share the progress of the project activities, discuss issues and countermeasures, and reflect them in the planned activities.

Through the progress meetings, the JICA Project Team exchanged views and shared information on the progress and issues of project activities as well as related DSMAS operations, and it contributed to enhance C/P's ownership for the project. It also functioned as a place to check the status of the workload caused by the project activities, set up individual meetings as necessary, and examine how to cooperate among the working groups.

A total of 50 progress meetings were held throughout the four-year project period. Although the JICA Project Team experienced difficulty in holding progress meetings due to the COVID-19 pandemic in April and May 2020, it succeeded and overcame difficulties by applying online and hybrid meeting format.

2.1.3 C/Ps' Training in Abroad (Activity [0-3])

To improve the C/Ps' capacity to implement an integrated solid waste management (ISWM), and to learn good practices in other countries that would be helpful in implementing the project activities and compiling the "Maputo Model", counterparts' trainings in Japan and Brazil were planned in the beginning of the Project. However, it was inevitable to cancel these trainings due to the COVID-19 pandemic.

On the other hand, JICA and the Ministry of Environment, Japan, have provided the online training courses on SWM to DSMAS and other Mozambican counterparts in 2020.

2.1.4 Dissemination to the Partner and Cooperating Organizations (Activity [0-4])

Dissemination of the project activities to the partner organizations (MTA and Matola City) and the cooperating organizations was actively implemented during the project operation.

The seminar on SWM in Maputo City, which included the presentation on introduction of the JICA project was held on 18 December 2019 through the CMM/DSMAS initiative. Also, Mr. Silva Magaia, the Councilor for Spatial Planning, Environment and Construction of CMM and the Project Director of this Project made a presentation of the project activities at the JICA Clean City Initiative (JCCI) International Seminar held on 2 February 2023. (Refer to Figure 4.)

SWM Seminar (December 2019)

JCCI International Seminar (February 2023)

Source: JICA Project Team

Figure 4 Project's Dissemination Activities

The Project's Brief Note (Vol. 1 to Vol. 3) were issued three times in April 2020, January 2022, and May 2023, respectively, as shown in Figure 5 and attached in this report as Appendix 1-4. They were then distributed to the cooperating organizations.

Project Brief Note (Vol. 1)

Project Brief Note (Vol. 2)

Project Brief Note (Vol. 3)

Source: JICA Project Team

Figure 5 Project Brief Note

2.1.5 Conducting Project Progress Monitoring and Preparation of PR (Activity [0-5])

(1) Project Monitoring Sheet

'Project monitoring sheets' were prepared semi-annually for the purpose of confirming and sharing the progress of the project activities and discussing issues and countermeasures.

A total of six project monitoring sheets were prepared by the JICA Project Team during the project, i.e., in July and December 2020, June 2021, June and December 2022, and July 2023.

(2) Progress Report

The progress of the project activities in the first half of the project period and the work plan in the second half were compiled as PR. The contents of the PR were explained and discussed at the third JCC meeting held in June 2021, and it was finalized reflecting the results of the consultation.

2.1.6 Preparation of DFR and FR (Activity [0-6])

The results of the project activities for about four years were summarized in the draft project completion report (DFR) and it was discussed at the sixth JCC meeting held in July 2023. After reflecting on the comments from the JCC members, the project completion report (FR) was finalized.

2.2 Activities Related to Output 1

2.2.1 Organize Seminars and Workshops for CMM Officer to Analyze and Evaluate the Current Situation of SWM (Activity [1-1])

Workshops with DSMAS were expected to be organized when JET's international experts were in Maputo. But due to COVID-19-related restrictions, JET's international experts have been forced to stay in their home countries since the middle of March 2020.

During the absence of experts, each expert of JET has organized a series of online meetings with DSMAS counterpart to analyze and evaluate the current situation of SWM.

As for the seminar, DSMAS and JET agreed to take the opportunity of "Solid Urban Waste Management and Good Environmental Practices Forum" to fulfil the objective of this activity, which aimed to analyze and evaluate the current situation of SWM.

Details of the forum are described in Table 6 and Table 7.

Table 6 Outline of Solid Urban Waste Management and Good Environmental Practices Forum

Date	Venue
18 December 2019	Centro de Conferências Joaquim Chissano
Objective	
· To disclose to the general public, private sectors, and other governmental bodies what is being done in the field of solid waste management, which includes the revision of the Master Plan and the Municipal Stance on Cleanliness and Salubrity, and JICA's previous 3R Project and the current capacity development project toward the Realization of Integrated Solid Waste Management in Great Maputo.	
Justification	
· The present activity falls within the PDM objectives (2019-2023): Strategic Objective 48: Render better services of urban sanitation and urban environmental; Strategic Objective 49: Improve urban solid management, environment and citizen's quality of life and the Corrective Activity Plan of the Municipal Council for 2019. · The activity falls within one of the main challenges in the land use planning area, environment, and urbanization of the municipal development five-year plan (004/AM/2019 of 5 March). · With the undertaking of the forum, it is expected to collect contributions about: ✓ Solutions concerning problems resulting from inappropriate management. ✓ Per-capita reduction of the negative impact over the environment in the Maputo Municipality, paying attention to aspects such as air quality, municipal waste management, among other aspects in accordance with the Sustainable Development Goals (SDG) of September 2015 that define specific goals concerning climate change and waste management. ✓ The cost sustainability of waste management, given that the average income is relatively low if compared with other African capital cities.	
Expected Outcomes	
· Wide-raging discussion about the real situation of waste management, associated problems, and most urgent needs identification; · Enhancing discussion about existing problems and possible solutions, boosting a wide participation of various actors in the society, which will lead to identification and selection of easily acceptable and functional solutions (invites to entities that part take in the solution); · Positive impact in the sensitization level for the importance of issues resolution, leading to a stronger commitment of people and entities; · Positive impact of the strategy defined through the involvement of participants in the identification of policies and solutions to adopt; and · Interaction and positive engagement in the relationship with the civil society concerning the urban solid waste management.	
Participants	
About 100 people from public funds, academic institutions, multinationals, banks, international cooperation partners such as JICA and the World Bank, service rendering enterprises, NGOs, and CMM.	

Source: JICA Project Team

Table 7 Agenda of Solid Urban Waste Management and Good Environmental Practices Forum

Agenda		
Time	Activity	Person-in-charge
8.00 – 8.20	Participant's registration	Protocol
8.20 - 8.30	Mayor arrival and agenda presentation	Teresa Chissequere Chairperson
	Intervention by Mr. Votau	José Nocols Urban Planning, Green and Environment
8.30 - 8.40	Intervention by MTA	National Directorate of Environment

Agenda		
Time	Activity	Person-in-charge
8.40 - 8.55	Intervention by the Mayor	Dr. E. Comiche Mayor
8.55 - 9.10	Presentation 1 National Strategy of Urban Solid Waste Management	Dr. João Cipriano National Directorate of Environment
9.10 - 9.25	Presentation 2 Maputo Municipality USW Management	Stella Novela DSMAS
9.25 – 9.40	Presentation 3 Hospital Waste Management	Dr. João Swalback
10.00 -10.20	Coffee Break	
10.20 -10.40	Presentation 4 The Project for Capacity Development to Realize Integrated Solid Waste Management in Great Maputo	Mr. Hosono Chief Advisor of JICA Project
10.40 - 11.00	Presentation 5 Solutions for the USW Management Technological Options	Dr. Hafido Abacassamo National Fund for Sustainable Development
11.00 - 11.20	Presentation 6 Mozambique Challenges in the Implantation of USWM Infrastructure	Carlos Serra Prof. And Environmental Activist
11.20 -12.45	Debate	José Nicols VOTAU
12.45 - 13.30	Lunch Break	
13.30 -13.45	Presentation 7 Vision and Challenges faced by ANAM in the Implantation of New Municipalities in Mozambique, concerning Urban Solid Waste Management	National Municipalities Association (ANAM)
13.45 -14.00	Presentation 8 Project of Hulene Municipal Dumpsite Safely Close Down	Sérgio Manhique DSMAS
14.00 - 14.15	Presentation 9 Environmental Educational and USW Management in Maputo	Raul Chilaule DSMAS
14.15 – 14.30	Presentation 10 Practical Experiences of Recycling, Reutilization and Recovery of the SW in Mozambique	Rui Silva Recicla Serviços Lda.
14.30 -14.45	Presentation 11 The Role and the Impact of Micro-Enterprises in USWM in Maputo	AMEPS
14.45 -15.15	Presentation 12 The Private Operators Contribution in the Effective Functioning of USWM Systems	Ecolife/Enviroserv
15.15 -16.30	Debate	Moderator Domingos Chivambo DSMAS
16.30 – 16.45	Closing Session	José Nicols VOTAU

Source: JICA Project Team

2.2.2 Grasp the Current Issues on SWM in Maputo City (Activity [1-2])

This activity was expected to be done at the occasion of the abovementioned workshops with DSMAS to clarify the gap and analyze the current issues. As mentioned, due to the travel restriction of JET and international experts to Maputo, such gap analysis was done through individual activity of each output. Therefore, the results of analysis for the current issues are reported in each section.

2.2.3 Review the Implementation Status of National Policies Regarding SWM (Activity [1-3])

In addition to the abovementioned workshops with DSMAS, consultation meetings with MTA to discuss about the implementation of national policies regarding SWM was not organized during the pandemic period of COVID-19, even though JET and DSMAS had been in communication with MTA and FNDS occasionally.

In the SWM seminar held on 18 December 2019, a representative from MTA gave a brief report on the current situation of SWM in the country with some information-related national regulations concerned.

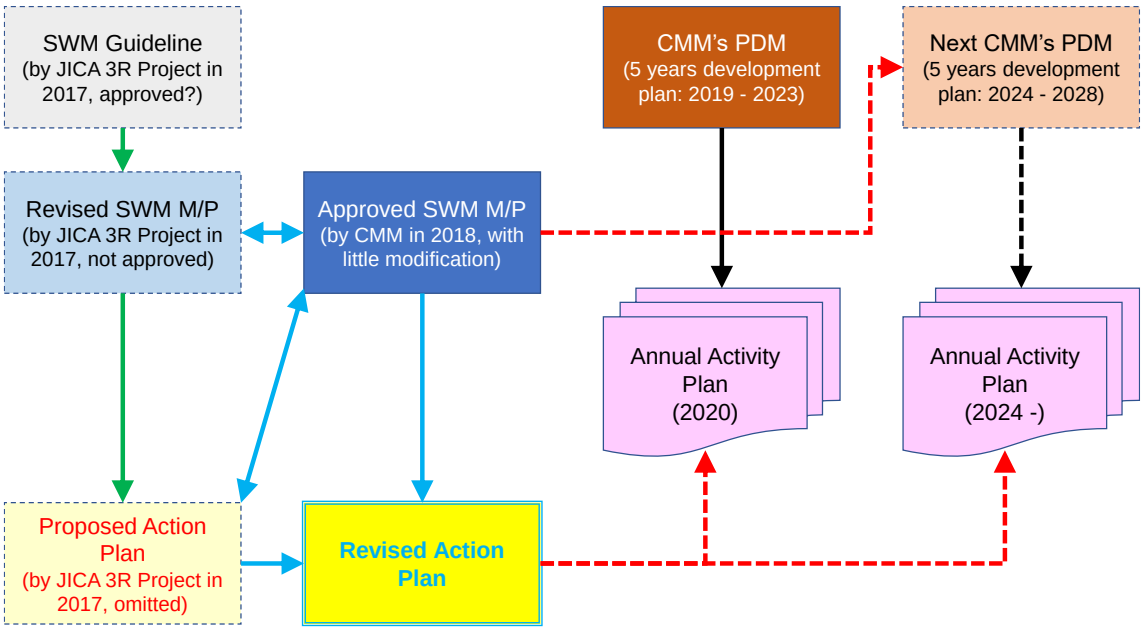
In addition, by using other occasions such as joint coordination meetings on the Maputo Model Seminar, which is conducted under Output 7 of the project, or the recycling actors meeting under Output 3, JET and DSMAS have tried obtaining the updates on the national policies. The updates on national policies regarding SWM were studied and summarized under Output 5 activity.

2.2.4 Identify Priority Issues in the M/P and Prepare the Action Plan for the M/P (Activity [1-4])

(1) Related Document

There are several documents related to this activity as shown below, which requires careful understanding of the relationship among each other to prepare the action plan. Relationship among each can be visualized as shown in Figure 6.

- **Approved M/P**: Latest Master Plan approved by CMM in 2018
- **Draft M/P**: Master Plan drafted during the previous JICA 3R Project in 2017
- **CMM's** Activity **Plan**: Annual activity plan developed by CMM which includes objectives related to the solid waste management.
- **CMM's PDM 2019-2023**: CMM's five-year development plan approved in 2019 to instruct the future development strategies and directions on overall municipal services.
- **Action Plan**: Actions to be taken for five years after the approval of the M/P. It was attached to the draft M/P but deleted in the approved M/P.



Source: JICA Project Team

Figure 6 Relationship of Revised Action Plan and Others

It is very important that the "Action Plan", which would be developed through this activity, be consistent with the contents and procedures of CMM's Annual Activity Plan that was prepared under the CMM's five-year development plan (PDM: 2019 - 2023).

The following are the preliminary observations of the CMM's PDM:

- PDM sets six pillars for governance priorities.
- Urban solid waste management is described under Pillar 5, which is "Infrastructure Development and Provision of Basic Services to Citizens".
- According to the PDM, the structure of the PDM is as follows: 1) Current Situations, 2) Main Challenges, 3) Strategic Objectives and Priority Actions, and 4) Operational Matrix. However, 4) Operational Matrix is missing in the provided PDM.
- Under each pillar, strategic objectives are proposed; These pillars and strategic objectives are followed by the structure of the Activity Plan.
- In the Activity Plan, specific objectives are set under each strategic objective. Although many of the specific objectives in the Activity Plan are also mentioned in the PDM but some are not.
- Strategic Objective 48 is the part mostly related to urban solid waste management. In this objective, the following three actions related to the final disposal of waste are proposed:
  a) Complete the Mathlemele Landfill implementation process;
  b) Stabilize and transform the Hulene trash can into a sorting and reuse station for solid waste; and
  c) Build a landfill in Katembe.
- However, specific objective related to the closure of Hulene and construction of the Mathlemele Landfill are 49.4 and 49.5, respectively, under Strategic Objective 49, and not 48 as mentioned above.

(2) Implemented Activities

Prior to the consultation meeting with DSMAS, JET had reviewed and compared the following documents to know the consistency of the contents of the approved M/P and Action Plan, then drafted the Action Plan. Through several online meetings, the validity of actions in the proposed Action Plan was discussed for its finalization.

- Respective Plan in Chapter 6 of the approved M/P.
- "Table 6.24: Implementation Schedule of the Activities" in Chapter 6 of the approved M/P.
- Action Plan, which was originally prepared during the previous JICA 3R Project.

- CMM's Activity Plan 2019 and 2020, especially related part of solid waste management, together with CMM's Five-year Development Plan (PDM: 2019 – 2023).

To know the consistency of the contents of the approved M/P and Action Plan, the respective plan in the approved M/P and activities are compared in Appendix 2-1.

During the online meeting with DSMAS, the following are clarified to understand the procedures of the annual "Activity Plan" development.

- Which department or who shall be a responsible to develop the PDM?
- Where can we find "4) Operational Matrix in the provided PDM", which is missing in the PDM provided by DSMAS?
- Next PDM shall be for 2024 - 2028, right? If so, when will CMM start to prepare for the next one?
- Considering the approval date for the current PDM, in March 2019, could we understand that the urban solid waste management master plan, which was approved in December 2018, was not fully reflected in the PDM?
- Who initiated to describe the waste management part, which might be under "Strategic Objective 48: Provide better sanitation, solid waste management and cemetery services"?
- As pointed out before, are there any reasons why specific objective related to closure of Hulene and construction of the Mathlemele Landfill are 49.4 and 49.5, respectively, under Strategic Objective 49, and not 48 as mentioned above?
- What is the procedure to prepare the Annual Activity Plan, by whom, by when?
- When will CMM and DSMAS start to prepare the Activity Plan 2021?
- Does the budget amount and budget line in the Activity Plan reflected in the CMM's annual budget plan as they are?
- Who shall be involved in the preparation of the part of urban solid waste management from DSMAS?
- Who shall be involved in the preparation of the parts of financial improvement and civic education of CMM from DSMAS?

(3) Results of Activities

The results of the comparison of related plans are summarized as shown below.

- Some of the action items proposed in the Action Plan attached in the draft M/P that was developed by the previous JICA 3R Project seem to be similar with those in the CMM's Activity Plan 2020, delaying a few years due to the delay of approval of the M/P.
- Therefore, it is significantly crucial to understand the procedures of preparation of CMM's Activity Plan, its means, how it was, and who developed the specific objectives under the CMM's Action.
- Unfortunately, the Action Plan attached in the draft M/P has been deleted from the approved M/P. However, considering that the contents of respective plans of the approved M/P are almost the same as those in the draft M/P, actions under JICA's Action Plan could be consistent with the approved M/P. Therefore, it shall be very effective for DSMAS to review and understand the Action Plan.
- In the approved M/P, a part of organizational development plan is described in Chapter 3 and another part for waste treatment and disposal plan is described in Chapter 5, while other respective plans are described in Chapter 6. These respective plans were in one chapter which is Chapter 6 in the draft M/P. As mentioned above, however, the contents of each plan of both M/Ps are almost the same.
- It is better to re-develop the waste collection and transportation plan based on the latest situations which has been changed from the time when the M/P was developed by JICA 3R Project during 2013 to 2017. This re-development could be the same with Activity 2-3 under this ISWM Project and be put into one of the actions under new Action Plan.
- A part for the final disposal, actions are also recommended to be re-developed based on the latest situations not only in Hulene and Mathlemele but also in Katembe.
- As same as above, Actions for "5R Promotion" and "Civic Education" shall be re-developed in collaboration with Activities for Output 3 under this ISWM Project.
- As for the financial management part, since there are a kind of overall inter-directorate improvement activities in the CMM's Activity Plan, Actions under the new Action Plan, which are related to urban solid waste management, shall be considered in conjunction with the CMM's related activities.

- Since CMM's Activity Plan contains the request for the budget, the new Action Plan shall be aligned with the structures of the CMM's Activity Plan so that DSMAS could easily prepare the Annual Activity Plan based on the new Action Plan.

Since it is necessary to define "Action Plan" so that both CMM and DSMAS could understand the importance of "Action Plan" to comply with the contents of the M/P, the purpose and contents of the Action Plan was discussed by DSMAS and JET, referring to the "Solid Waste Management Guideline", which was also developed as one of the outputs by the previous JICA 3R Project in 2017, which is explained as shown below.

- Together with the development of the Master Plan, CMM shall prepare the short-term action plan which instructs the detailed actions to satisfy the target and goal set in the Master Plan for the given period. Annual Action Plan can be prepared for three to five years from the approval of the Master Plan. (Section 4.2 of Volume 1 "Guideline on Preparation of the Master Plan for the Integrated Management of Municipal Waste")
- For each action, types of methodology to be used to implement the actions are also proposed as shown below.
  - Discussions
  - On-the-job Training (OJT)
  - Lecture
  - Workshop
  - Survey
  - Field visit
  - Outsourcing
- Each action also must set the goal to be achieved so that no one can lose the objective and direction of the action. The organizations that shall oversee each action are also proposed with the name of person who will take the initiative in the action.
- Responsible organizations for the activity's expenditures shall also be set so that the necessary budget can be prepared efficiently and appropriately in advance.
- Schedule of the actions shall be shown in the action plan sheet depending on the characteristic of each action with three different bars, continuous action, intermittent action, and spot action.
- Progress on the action plan shall be checked every six months to monitor the development.

As the result of these discussions through a series of online meetings, the Action Plan is developed as attached in Appendix 2-2 with the review points as shown in Table 8, which were discussed with DSMAS through the meetings.

Table 8 Major Review Points for Action Plan (A/P)

Action #	Description of Revisions
Overall	Target years for A/P is for five years from 2020 to 2024.
AP1-1	Monitoring duration for the Master Plan (M/P) is from September to November, every year.
AP1-2	Monitoring for A/P is twice a year, from April to May, and from October to November, every year. Based on the monitoring result done in April and May, the result shall be reflected in the CMM's Annual Activity Plan, which is newly added as one of the Actions.
AP1-3	Mid-term review of the M/P approved in 2018 is proposed to be done in 2021.
AP1-4	Waste quantity and quality survey is proposed to be conducted from 2021 to 2022; thus, the budget request shall be done in 2020.
AP1-5	Minor updating of the current M/P will be done in 2022
AP2-1	Actions under AP2-1 were already done, re-organizing the former DMSC to DSMAS
AP2-2	AP2-2 was changed to "Review of the new organizational structure under DSMAS", from the former one which is "Re-Organization of DAF", because the new organization structure was already set as DSMAS.
AP2-3	No major change. Preparation of annual training plan shall be done together with budget preparation period, from June to September every year, to secure the appropriate budget for the trainings.

Action #	Description of Revisions
AP2-4	This action is kept as it was for the case that the new landfill in Mathlemele will be constructed and managed by both Maputo and Matola cities.
AP3-1	New action is added, which is "(1) Implementation of time and motion study to the new landfill sites", according to the DSMAS's proposal. With the assumption that the new landfill in Mathlemele or Katembe will start its operation at the beginning of 2024, the activity schedule is adjusted. It shall be re-adjusted when the new landfill construction schedule will be fixed. Based on the current contract period for urban collection, which will terminate in February 2025, the activity schedule is adjusted.
AP3-2	Study for expansion of door-to-door collection is proposed to implement in 2020 and 2021. Tentatively, it is assumed the expansion of door-to-door will be implemented from the middle of 2023, if it will be feasible.
AP3-3	Same as AP3-1
AP3-4	Since it is not decided which new landfill, Mathlemele or Katembe, will accept the waste from Katembe, it is tentatively considered that the secondary transportation from Katembe shall be included to the existing contract for the secondary transportation from the suburban area.
AP3-5	It is described that the primary collection has already been done in three bairros in Katembe. It is tentatively proposed that two more bairros will start their primary collection from 2022, after AP3-4 (1) "Study for waste quantity to be transported from Katembe"
AP3-6	This action is remained as it was, which aims to procure the new backhoe in 2021 and the new dump truck in 2022.
AP4-1	As same as AP3-1, it is tentatively assumed that the new landfill in Mathlemele will start its operation from 2024.
AP4-2	This is newly added, which is the construction and operation of another new landfill in Katembe, which may start its operation from 2024.
AP4-3	Actions for tentative continuous operation plan of Hulene dumping site and its implementation are added. It is tentatively assumed that the Hulene dumping site will stop accepting the waste in 2024 due to the commencement of new landfill in Mathlemele or Katembe in 2024.
AP4-4	This action is also maintained as it was with timeline adjustment so that the result of AP4-4 (3) Study of Introduction of Intermediate Treatment System can be reflected to AP1-5 (2) Preparation of Updated M/P 2023.
AP5	It was changed from 3R to 5R It is proposed that DGIA or REAS shall be the responsible organization for this action.
AP5-1	Schedule for AP5-1 (1) is following the PO of JICA Project for Activity 3-6 which is "networking among recycling industries in Mozambique until 2022". Schedule for AP5-1 (3) is also following the PO of JICA Project for Activity 3-7 which is "study incentive mechanism for promoting recycling".
AP5-2	AP5-2 (1) and (2) are undergoing with the JICA Project. Recyclables recovery from public buildings and spaces, which is now under discussion, is included into this action. The result of AP5-2 (3) is expected to reflect to AP1-5 (2) Preparation of Updated M/P 2023.
AP5-3	This action is maintained but shall be implemented in case the expansion of 3R stations will be re-studied during the AP5-2 (3) and recognized to be applicable.
AP5-4	As well as AP5-3, this action is maintained but shall be implemented in case the expansion of segregated collection will be re-studied during the AP5-2 (3) and recognized to be applicable.
AP5-5	As well as AP5-3, this action is maintained but shall be implemented in case the expansion of household composting will be re-studied during the AP5-2 (3) and recognized to be applicable.
AP6	As same as AP5, it was changed from 3R to 5R It is proposed that DGIA or REAS shall be the responsible organization for this action.
AP6-1	This action shall be implemented together with JICA Project.
AP6-2	This action shall be also implemented together with JICA Project. Some campaigns related to AP6-2 (2) and (5) have been already conducted.

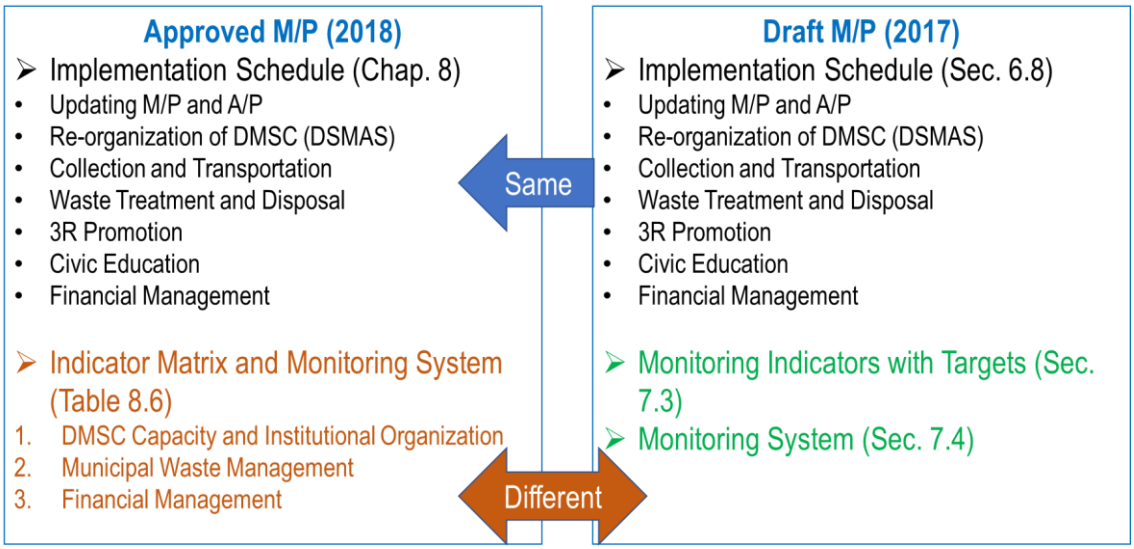
Action #	Description of Revisions
	It is tentatively proposed to start AP6-2 (3), (4) and (6) in 2022 but need to be discussed.
A7-1	This action is maintained, and rough cost estimation will be done together with other actions such as AP3-1 (2), AP3-3 (2) and AP4-1 (2). Detailed cost estimation will be done before the new landfill starts its operation.
A7-2	This action shall be implemented together with JICA Project, together with other actions such as AP3-1 (1) and (2) and AP3-3 (1) and (2)
A7-3	This action shall be implemented together with JICA Project. The result of study for changing of cleaning tax rate and its charging system shall be reflected to AP1-5 (2) Preparation of Updated M/P 2023.

Source: JICA Project Team

2.2.5 Establish the M/P Monitoring System and Start the M/P Monitoring (Activity [1-5])

(1) Activities Implemented to Establish the M/P Monitoring System

In order to establish the M/P monitoring system, "6.2 Indicator Matrix and Monitoring System 2017 – 2027" in the approved M/P and "Chapter 7" in the draft M/P prepared during the previous JICA 3R but deleted in the approved M/P were reviewed and compared, checking the consistency with the description of respective plan proposed in the approved M/P, as shown in Figure 7 and attached in Appendix 2-3.



Source: JICA Project Team

Figure 7 Comparison of Monitoring Structure of Approved M/P (2018) and Draft M/P (2017)

(2) Results of Activities

1) M/P Monitoring System Development

The results of this comparison are summarized as shown below.

- The approved M/P divided the monitoring items into three components as shown in the above Figure 5, which are "1. DMSC (DSMAS) capacity and institutional organization", "2. USWM (Urban Solid Waste Management)", and "3. Financial Management of USWM". In Component 2, which is "USWM", technical activities such as collection, transportation, recycling, and disposal are put together in one category. It seems that there are no direct links between the description at the approved M/P and the contents (results) stipulated in the table for the indicator matrix. In addition, the targets for each indicator, the frequency of monitoring, and the responsible departments are not specified.
- On the other hand, "Chapter 7" of the draft M/P, which was prepared at the previous JICA 3R Project, divided the monitoring items into six categories: 1) Re-organization of DMSC (DSMAS), 2) Collection

and transportation, 3) Treatment and disposal, 4) 3R promotion, 5) Civic education, and 6) Financial management, according to the structure of Chapter 6 of the draft M/P. In addition, each indicator has its annual target to be achieved every year.

- Some indicators set in the approved M/P and draft M/P are the same, such as "quantity of the waste, which is disposed of at the final disposal site" or "quantity of recyclables removed from the waste stream".

JET had a meeting with DSMAS about the above results of comparison, raising the question on how the monitoring system should be. It was agreed that the monitoring system shall have the specific numeral targets to be easily monitored as proposed in the draft M/P. Therefore, the monitoring system was prepared by using the "Chapter 7" of the draft M/P. On the other hand, however, DSMAS insisted that the target values should follow the values, which are described in the approved M/P, not in the draft M/P, because the approved M/P was already authorized by CMM.

Upon such discussions, the monitoring system was developed as shown in Appendix 2-4.

As understood that this M/P monitoring system has some inconsistencies between indices and numeral targets because the approved M/P was somehow finalized through patchworking of the contents from the different views. Therefore, it is very important for DSMAS to use this system first by themselves so that DSMAS can realize the points of the system to be improved.

2) Implementation of M/P Monitoring

By using the M/P monitoring system, DSMAS and JET jointly have been implementing the monitoring of the M/P with the following steps:

a) Monitoring Team Formation

DSMAS formed a special monitoring team led by the deputy director of DSAMS as shown in Table 9 to implement the monitoring of the M/P, appointing the appropriate staff from the different departments in DSMAS. In addition, other DSMAS staff were also invited as internal resources to give the related information and data to the monitoring team.

Table 9 M/P Monitoring Team

Name	Belonging Department
Meriamo Stela Novela	Deputy Director
Raúl Chilaúle	Department of Environmental Planning and Monitoring (DGIA)
Florência Francisco Martins	Department of Administration, Human Resource and Finance (DARHF)
Linda Vênia Verdiano	DARHF
Ricarda Ricardo Jemisse	Department of Urban Solid Waste Management (DGRSU)

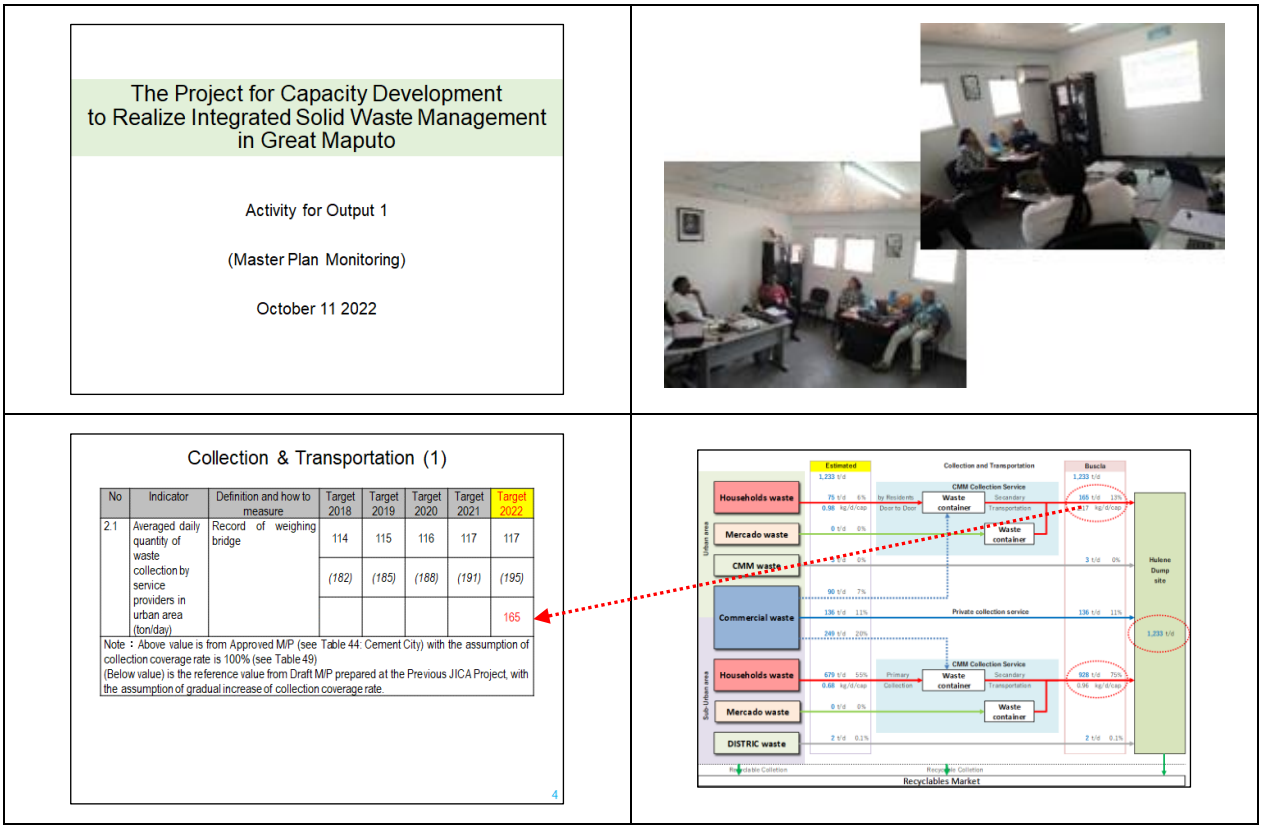
Source: JICA Project Team

b) Preparation of M/P Monitoring

After the above-mentioned monitoring team was formed, JET provided the instruction on the monitoring procedures by using the M/P monitoring system, together with the detailed explanation on the background on how the monitoring indicators and targets were set.

c) Implementation of M/P Monitoring

After the above-mentioned instruction, a series of joint monitoring meetings were organized in November 2022, to check the progress of each category under the M/P indicated with the target, as shown in Figure 8.



Source: JICA Project Team

Figure 8 Implementation of Joint M/P Monitoring

2.2.6 Update the A/P and the M/S in Accordance with the Results of the M/P Monitoring (Activity [1-6])

(1) Implemented Activities

1) Update of the A/P for its Monitoring

In order for DSMAS and JET to implement the monitoring of the A/P, monitoring format was added to the A/P Microsoft Excel sheet to check the actions one by one easily. The monitoring date and team members are to be reported in the format, together with the following monitoring items as shown in Figure 9.

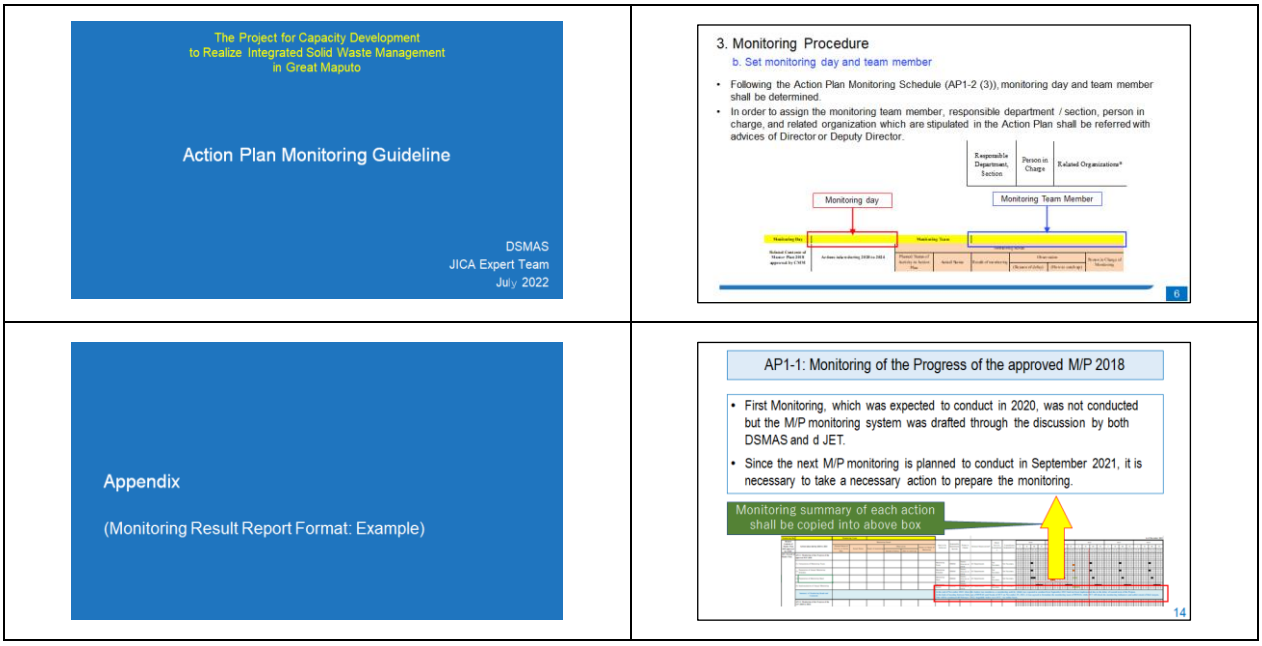
- Planned status of activity in the Action Plan
- Actual status
- Result of monitoring
- Observation (reason of delay, how to catch up)
- Person in charge of monitoring

Monitoring Result					
Planned Status of Activity in Action Plan	Actual Status	Result of monitoring	Observation		Person in Charge of Monitoring
			(Reason of delay)	(How to catch up)	

Source: JICA Project Team

Figure 9 Added Format of the A/P for Monitoring

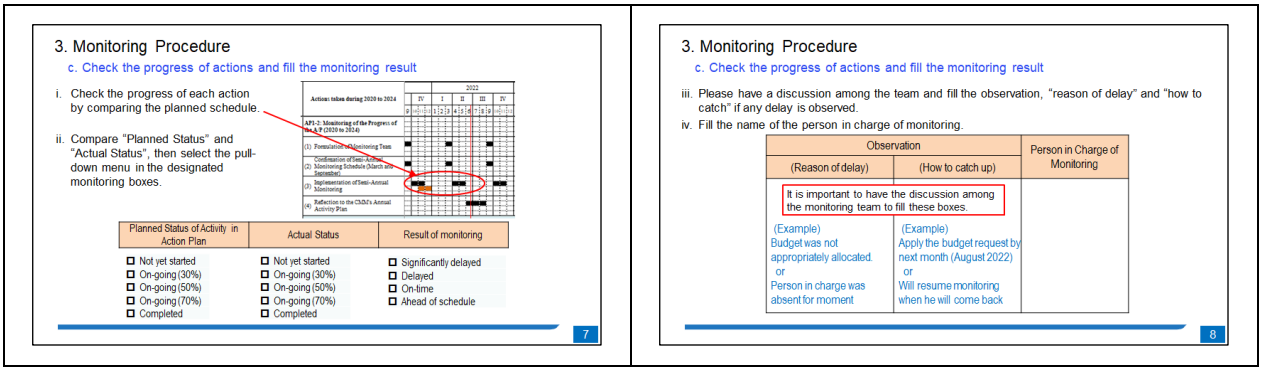
In addition, the Action Plan Monitoring Guideline was also developed so that DSMAS can monitor the A/P by itself. This guideline also includes the report format in Microsoft PowerPoint in its appendix.



Source: JICA Project Team

Figure 10 A/P Monitoring Guideline

"Planned Status of Activity in Action Plan" and "Actual Status" are monitored by reviewing the implementation schedule specified in the A/P. Then, through the discussion among the monitoring team, "Result of monitoring" is concluded as "Ahead of schedule", "On-time", "Delayed", or "Significantly delayed". In case the delay of action is observed, the monitoring team discusses the reason of delay and how to catch up such delay. The purpose of such activities is not only to identify delays, but also to identify problems and issues by DSMAS and train them to consider solutions.



Source: JICA Project Team

Figure 11 A/P Monitoring Procedures on the Status of Actions in Guideline

2) Implementation of the A/P Monitoring

The first A/P monitoring was implemented as a trial with the initiative of JET, with the director and deputy director of DSMAS to verify the monitoring system at the beginning of the 2nd term of the Project in November 2021. After several months due to travel restrictions that was caused by the spread of the Omicron variant of COVID-19, A/P monitoring had resumed starting with the formation of the monitoring team.

The following DSMAS staff are assigned as members of the A/P monitoring team as shown in Table 10.

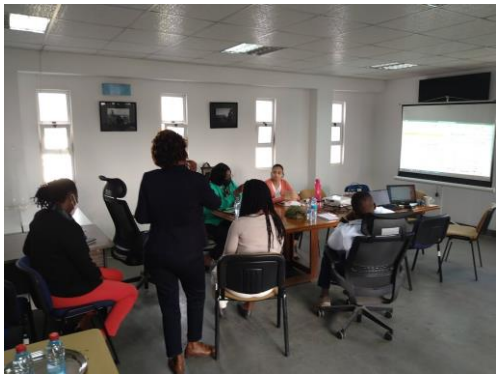
Table 10 A/P Monitoring Team

Name	Belonging Department
Meriamo Stela Novela	Deputy Director
Raúl Chilaúle	Department of Environmental Planning and Monitoring (DGIA)
Florência Francisco Martins	Department of Administration, Human Resource and Finance
Nayanka Maulide Massamby	DGIA

Source: JICA Project Team

From July to August 2022, a series of A/P monitoring meetings were organized jointly among DSMAS A/P monitoring team and JET, to review the progress of the actions category by category.

Monitoring for AP1: Overall of Master Plan and AP2: Review of Organizational Structure of DSMAS



Monitoring for AP3: Waste Collection and Transportation and AP4: Waste Treatment and Disposal

Monitoring for AP7: Financial Management

Monitoring for AP5: 5R Promotion and AP6: Civic Education

Source: JICA Project Team

Figure 12 A/P Monitoring by DSMAS Monitoring Team

3) Summarizing the Results of Monitoring

Results of monitoring on both M/P and A/P, which are described in the following section were summarized by DSMAS itself with its ownership to be presented at 5th JCC meeting held on 7 December 2022.

At this moment, there is no update made on both the A/P and M/S because the M/P, which will be the base document for these is now going to be updated.

(2) Results of Activities

1) Results of the A/P Monitoring

Firstly, the draft of the A/P monitoring was concluded and summarized by DSMAS and shared at the 41st Progress Meeting held on 13 September 2022. Then, through the supplemental discussion made among DSMAS and JET, it was finalized as shown in Table 11 for the above-mentioned JCC meeting.

Table 11 Result of A/P Monitoring (as of December 2022)

Action Plan Category		Summary of Monitoring Result
AP1. Overall of the Master Plan		
	AP1-1: Monitoring of the progress of the approved M/P 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.
	AP1-2: Monitoring of the progress of the A/P (2020 to 2024)	Due to the delay in preparing the A/P monitoring guidelines, the monitoring was also delayed. However, with JET assisting in creating the guidelines, the monitoring has been started since the beginning of August 2022 and its result is expected to be reflected in the Annual Activity Plan by the end of September 2023 by DSMAS.
	AP1-3: Implementation of the mid-term review for the approved M/P 2018	It was expected to implement the mid-term review of the M/P in 2021, but due to the CMM intention to build the landfill in Katembe instead of Mathlemele, in 2021, which would be supported by the WB, the timing of the review was changed in 2022.
	AP1-4: 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.
	AP1-5: Minor updating the approved M/P 2018 (Updated M/P 2023)	This action will be conducted together with the mid-term review of the M/P. The DSMAS Team will be responsible for conducting the mid-term review of the M/P.
	AP1-6: Amendment of Cleansing Ordinance	The consultant has started its work since mid-July and needs about six 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.
AP2. Review of Organizational Structure of DSMAS		
	AP2-1: Establishment of DSMAS	This action has already been completed.
	AP2-2: Review of the new organizational structure under DSMAS	This action has already been completed.
	AP2-3: Capacity development 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.
	AP2-4: Consideration of Inter-municipal Association for Landfill Operation	No action is implemented because it is still under discussion on which landfill will be used for the final disposal of USW (Katembe or Mathlemele). 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 this action will continue.
AP3: Waste Collection and Transportation		
	AP3-1: Consideration of increase of transportation distance to the new landfill for 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, the Output 2 Team and JET will conduct a survey using Google map or similar tools.

Action Plan Category		Summary of Monitoring Result
	AP3-2: Expansion of door-to-door urban collection	The implementation of the door-to-door collection study is planned in the annual activity plan 2022. On the other hand, the Output 2 Team and JET will verify the effectiveness of door-to-door collection, which is not highly prioritized.
	AP3-3: Consideration of increase of transportation distance to the new landfill in Mathlemele and/or Katembe for secondary collection from 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 would depend on budget programming.
	AP3-4: Waste transportation from Katembe	The management of solid urban waste in Katembe will be discussed in the studies planned by the WB for the construction of the new landfill with technical input from JET.
	AP3-5: 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.
	AP3-6: Removal of illegal dumping waste	Three trucks were procured, where two of the roll-on/roll-off type and one compactor to carry out the work of eliminating informal dumps sites and respond to emergency cases in coordination with the municipal districts.
	AP3-7: Improvement of special collection by DSMAS	A 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.
AP4: Waste Treatment and Disposal		
	AP4-1: Construction and operation of the new sanitary landfill in Mathlemele	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.
	AP4-2: Construction and operation of the new sanitary 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.
	AP4-3: Closure of Hulene dumping site	It has contracted a consulting service for the closure of the Hulene Dumpsite through PTUM in September 2022.
	AP4-4: Introduction of 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 M/P.
AP5: 5R Promotion		
	AP5-1: Upgrade 5R Policy Framework	The 5Rs forum has been organized four times so far. In parallel, intermittent, and irregular meetings were held with MTA to discuss issues related to the 5Rs policy.
	AP5-2: 5R promotion in urban area, including recyclables recovery from public buildings and spaces	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.
	AP5-3: Expansion of 5R station in suburban area (if this action can be applicable)	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.
	AP5-4: Introduction of segregated waste collection in suburban area (if this action can be applicable)	DMAS, with support from Italian Cooperation, is preparing to implement segregated collection in Chamanculo C, including community composting from the collected organic waste.
	AP5-5: Promotion of household composting (if this action can be applicable)	DMAS is planning to implement the segregated collection study in Chamanculo C, including community composting. Note that composting is

JICA Project Team

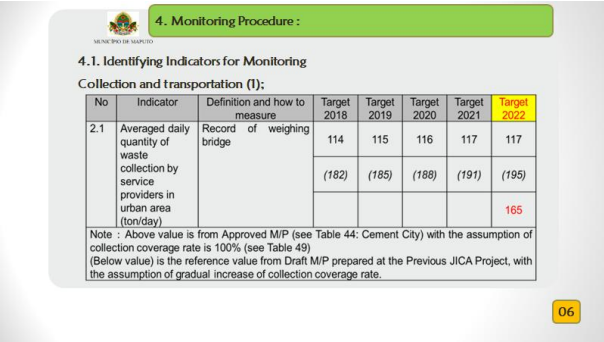
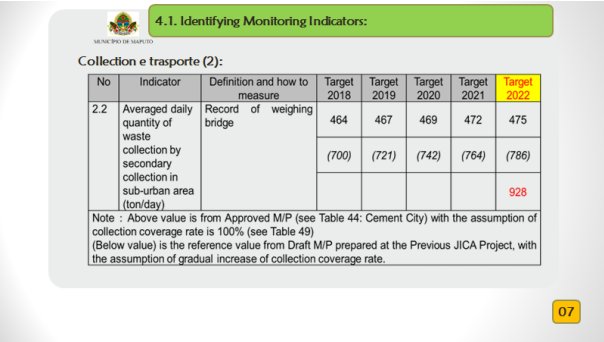
Action Plan Category		Summary of Monitoring Result
		one of the alternatives to reduce the volume of waste to be disposed in the landfill.
AP6: Civic Education		
	AP6-1: Introduction of 5R principles in teaching institutions	It has been introduced in five schools, including primary and secondary schools. 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 health protocols.
	AP6-2: Public sensitization campaigns in critical places	All actions related to public awareness campaign at critical USW generation points have been implemented in compliance with the sanitary protocol imposed by the COVID-19 situation.
AP7: Financial Management		
	AP7-1: Estimation of major expenditure for the new solid waste management system	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 Mathlemele.
	AP7-2: Improvement of the revenue mechanism	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.
	AP7-3: Study for change of cleaning tax rate and its charging 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 will now wait for an opportunity to present at the CMM session.

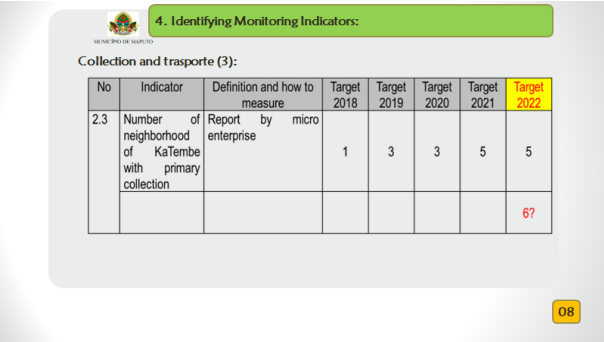
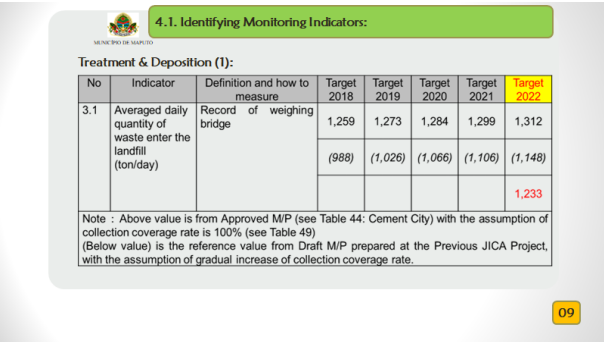
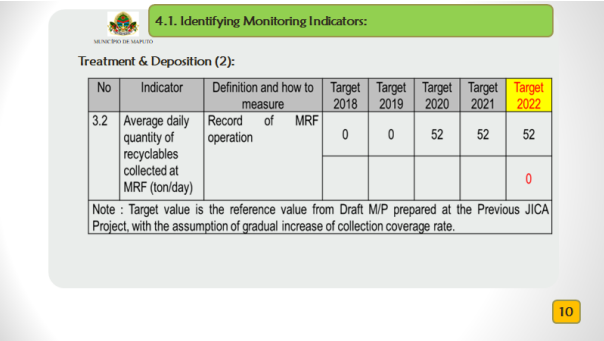
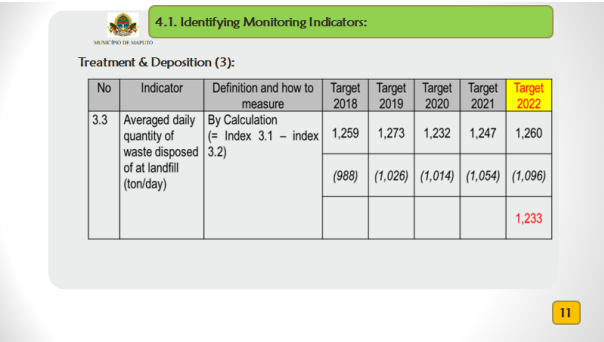
Source: JICA Project Team

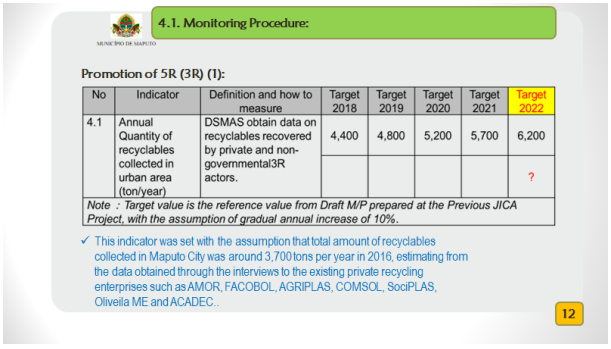
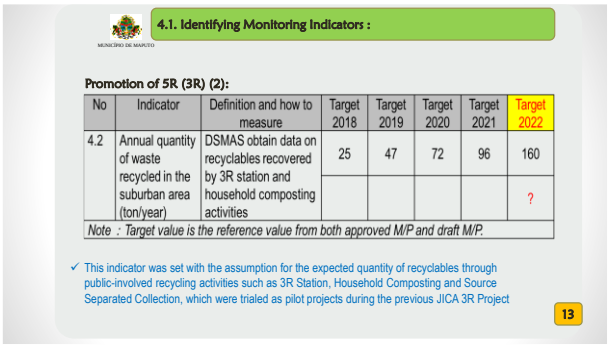
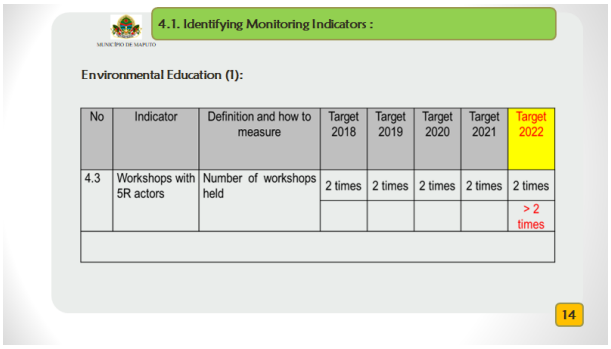
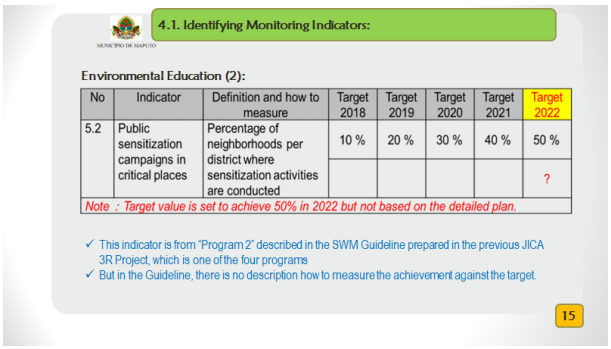
2) Results of the M/P Monitoring

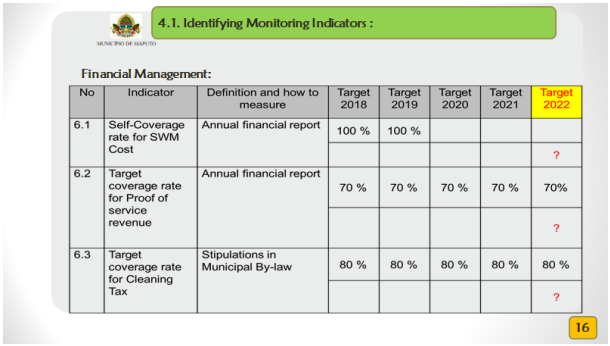
As previously mentioned, M/P monitoring was started in November 2022 and summarized by DSMAS as shown in Table 12, although some indicators are still under confirmation.

Table 12 Results of M/P Monitoring (as of December 2022)

Monitoring Result	Remarks
	From the summarized track scale data at Hulene dumping site, the average daily quantity of waste collected in the urban area was analyzed and estimated to be at 165 tons per day, which is in the middle range between the projection in the approved M/P in 2018 and draft M/P prepared at the previous JICA project.
	From the summarized track scale data at Hulene dumping site, the average daily quantity of waste collected in the suburban area was analyzed and estimated to be at 928 tons per day, which is much beyond the projected value in both the approved M/P and draft M/P.

Monitoring Result	Remarks
	According to DSMAS, there are six neighborhoods that have already started their primary collection, which is beyond the target set in the M/P monitoring system (M/S).
	From the summarized track scale data at Hulene dumping site, the average daily quantity of waste accepted at the site was analyzed and estimated to be at 1,233 tons per day, which is in the middle range between the projection in the approved M/P in 2018 and draft M/P prepared at the previous JICA project.
	There are no recyclables recovered at the MRF because the facility is not constructed yet.
	Due to the above result where no recyclables are recovered before dumping of the waste accepted at the final disposal site, same amount of waste, which is 1,233 tons per day, was disposed of at Hulene dumping site.

Monitoring Result	Remarks
	Although recycling-related actors' networking meetings are organized, there is still no numeral data on the quantity of recovered recyclables in Maputo was obtained. Data collection will be continued.
	As same as the previous indicator above, it is still no numeral data on the quantity of recovered recyclables via 3R stations or Eco-point in Maputo was obtained. Data collection will be continued. As for the household composting, it was observed no household implement this activity officially.
	With the efforts by DSMAS in cooperation with JET, workshops, which also means "recycling-related actors' networking meeting", was organized occasionally more than twice, which then satisfies the target.
	There is still a discussion on how to estimate this value on public sensitization campaigns.

Monitoring Result	Remarks
	These indicators are now under confirmation with the financial team of the Project.

No	Indicator	Definition and how to measure	Target 2018	Target 2019	Target 2020	Target 2021	Target 2022
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 Project Team

2.2.7 Prepare a Mid-term Review Report of the M/P (Activity [1-7])

(1) Implemented Activities

In the current A/P, implementation of the mid-term review of the M/P is proposed as "Action AP-3", with the following three actions:

- Preparation of Review Plan and Schedule
- Implementation of Mid-term Review
- Report of the Review Result

Since target duration of the current M/P is ten years from its approval in 2018, the mid-term review shall be implemented in the middle of its duration, meaning five years after the approval.

In addition, according to Article 8 of Regulation of Urban Solid Waste Management, which is Decree 94/2014, the validity of the urban solid waste management plan is also five years.

Considering this when DSMAS and JET discussed to develop the A/P, it was concluded to implement the mid-term review of the M/P in 2023.

1) Preparation of Review Plan and Schedule

Prior to implementing the mid-term review, a review plan was prepared to be scheduled to implement intensively in April 2023 during the time when JET expert, who oversees Output 1 activity stayed in Maputo. Upon this, the review meetings were organized once or thrice a week to discuss the contents of the M/P chapter by chapter as shown in Table 13.

Table 13 Implementation Schedule of M/P Mid-term Review

Table of Contents of M/P	Proposed Date
Overall (Table of Contents, Styles, Designs, or others)	April 11 (PM 13:00 -)
Executive Summary	July 13 (PM 13:00 -)
Chap. 1 The Master Plan	April 11 (PM 13:00 -)
Chap. 2 Basic Information of USWM	April 14 (AM 10:00 -)
Chap. 3 Current Management of USW in Maputo	April 18 (AM 10:00 -)
Chap. 4 Interventions in the Scope of the 3Rs	April 24 (PM 10:00 -)
Chap. 5 Projection of Amount of USW (2017 – 2027)	April 19 (AM 10:00 -)
Chap. 6 Planning and Monitoring	April 19 (AM 10:00 -)
Chap. 7 Civic Education and Citizens Sensitization	April 24 (PM 10:00 -)
Section 7.4 Funding for USWM	April 21 (AM 10:00 -)
Chap. 8 Implementation Schedule	May 2 (AM 9:00 -)
Chap. 9 Final Consideration	May 2 (AM 9:00 -)
Bibliography	July 13 (PM 13:00 -)

Source: JICA Project Team

The review plan includes the review points on each chapter advised by JET, as shown in Table 14.

Table 14 Review Points for M/P Mid-term Review

Table of Contents of M/P		Review Points
Overall	Table of Contents, Styles, Designs, or Others	✓ Follow the Decree 94/2014? ✓ Follow the MTA Guideline? ✓ Easy to read? ✓ Appropriate contents order and allocation? ✓ Balance of each chapter? ✓ Attractive?
Executive Summary		✓ Has it summarized the contents of the M/P? ✓ Is it easy to understand? ✓ Does it make an impact for readers to read the M/P in detail?
Chap. 1	The Master Plan	✓ Are the contents in this chapter appropriate? ✓ Are the headlines in this chapter appropriate in order? ✓ Should the legal context and framework be described in this chapter? ✓ Is the legal information the latest ones?
Chap. 2	Basic Information of USWM	✓ Is the chapter title appropriate with the contents? ✓ Are the data or information shown in tables and figures understandable and reasonable? ✓ Are the waste categories described follow Decree 94/2014 or the municipal ordinance?
Chap. 3	Current Management of USW in Maputo	✓ Is it necessary to update the information related to waste management? ✓ Situations on 3R activities and other aspects such as the civic education are not included in this chapter, separated to the next chapter. Is this appropriate? ✓ Is the tragic collapse of Hulene dumping site in 2018 and the current improvement of the site be added? ✓ Is there no informal dump in the city? ✓ Is it necessary to put some pictures which show the current situation?
Chap. 4	Interventions in the Scope of the 3Rs	✓ 3R shall be changed into 5R? If so, is it necessary to describe what 5R is? ✓ Contents of "4.5 Problem analysis and performance indicators" are understandable based on the current situations described in the previous chapter? ✓ What do you think about waste flow? ✓ Is the location of "4.5.3 Performance Indicators" appropriate in this chapter which is describing the current situation?
Chap. 5	Projection of Amount of USW (2017 – 2027)	✓ Is it necessary to recalculate the urban solid waste generation in the future? ✓ How do you think the description about landfill is written in this chapter which is describing the projection of waste amount in the future? ✓ Is the new plan for the landfill in Katembe necessary to be added?
Chap. 6	Planning and Monitoring	✓ How do you generally think about this chapter which is the most important part of the Master Plan? ✓ Do you agree on the pentagon approaches? ✓ Are the contents of this chapter enough to describe the individual plans not only on waste collection but also on other waste management aspect? ✓ Should the new waste collection and transportation plan for the case of Katembe landfill be added?
Chap. 7	Civic Education and Citizens Sensitization	✓ Do you think that the part related to the civic education in this chapter is independent from the other aspects? ✓ Are the proposed civic education activities following the actual activities implemented so far?

Table of Contents of M/P		Review Points
		✓ How do you think "7. 4 Funding for USWM" is described together with the aspect of civic education in the same chapter? ✓ Is it necessary to update the financial analysis for future investment and operation, with the expected improvement of revenues?
Chap. 8	Implementation Schedule	✓ Is the implementation schedule consistent with CMM's five-year development Plan (PDM?) ✓ Is indicator matrix for monitoring appropriate?
Chap. 9	Final Consideration	✓ How do you generally think on the description in this chapter?
Bibliography		✓ Is the list in the bibliography enough to refer to the Master Plan? ✓ Do you have all the references in the list?
Annexes		✓ Are all documents in the Annexes appropriately referred to in the Master Plan?

Source: JICA Project Team

The core member for the M/P mid-term review team of DSMAS is the same for the M/P monitoring team as shown in Table 9, and additional DSMAS, who were concerned with the contents of each chapter, were also convened for more practical discussions.

2) Implementation of Mid-term Review

A series of the mid-term review meetings were organized following the planned schedule as shown in Table 15. At the beginning of each meeting, two DSMAS staff were appointed as note-takers. The meeting memo noted by these were confirmed by the M/P review team, then utilized for the preparation of the review report.

In each meeting, since the deputy director of DSMAS, a team leader for the monitoring team, took its role as a facilitator to encourage the participants to make their comments, a variety of comments were very actively given among the participants.

Table 15 Implementation of M/P Mid-term Review

Table of Contents of M/P	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, Ferreira, Rute <JET> Soeda, Dionildes	
Chap. 2 Basic Information of USWM	April 14 (AM 10:00 -)
Participants: <DSMAS> Stela, Raul, Ricarda, Linda, Florencia, Leonardo, 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, Leonardo, Anselmo, Simao, Hortencia, Ferreira, 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 -)

Table of Contents of M/P	Meeting Date
Participants: <DSMAS> Stela, Raul, Ricarda, Linda, Anselmo, Faustino, Simao, Ferreira, Rafael <JET> Soeda, Ace, Mario, Rogerio, Silvino	
Section 7.4 Funding for USWM	April 21 (AM 10:00 -)
Participants: <DSMAS> Stela, Raul, Ricarda, Leonardo, Anselmo, Faustimo, Simao, Ferreira, 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 10:00 -)
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, Ricarda, Linda, Florencia, Nilza, Rute <JET> Soeda, Dionildes	
Executive Summary Bibliography	July 13 (PM 13:00 -)
Participants: <DSMAS> Sergio, Stela, Nilza, Raul, Ricarda, Linda, Florencia, <JET> Soeda, Dionildes, Fonseca	

Source: JICA Project Team

3) Preparation of the Review Meeting Memo

As mentioned above, two note-takers assigned at each review meeting summarized the discussion points in Portuguese after the meeting. Then, review and checking on it with other participants was addressed in several days after each meeting.

These Portuguese versions were shared with JET for translation into English.

A set of English versions was then submitted to an international expert of JET for final check to prepare the mid-term review report.

(2) Results of Activities

The results of the M/P review meeting are summarized in Table 16, and the overall findings to be reflected when the current M/P will be updated under PTUM are shown below.

- ✓ Current M/P, which was approved in 2018 by CMM, has some incomplete parts in its structure and some inconsistent description in logic. It could be assumed that this is because during the approval process of

the M/P some changes were made into the draft M/P, which was prepared by DSMAS with the technical support of JICA (Draft M/P 2017), referring to the former M/P developed in 2007 with the assistance of GTZ (M/P 2007). Changes include some partial quotation of M/P 2007 as they were, replacing applicable parts of the Draft M/P 2017.

- ✓ Considering this fact, it seems that the expert who made the revisions to the Draft M/P 2017 did not know anything about the four-year process of preparing the Draft M/P 2017, which was a joint effort between DSMAS and JET from March 2013 to April 2017. In addition, however, due to time constraints, revising works on the Draft M/P 2017 were not completed with some complicated works to combine the essential parts of both the Draft M/P 2017 and the M/P 2007. As a result, unfortunately, the current M/P had to become a very illegible plan and is not so often utilized.
- ✓ Problem is not only about incomplete contents of the current M/P but also of the irresponsible attitude of CMM who approved such M/P. It is recommended that careful technical reviews should be implemented when the current M/P will be revised by the CMM itself including DSMAS, not accepting the document developed by the third party blindly.
- ✓ During the review meetings, it was pointed out that this M/P should cover other environment aspects in addition to waste management because of the current duties of DSMAS. It should be understood, however, that such organizational duties and sectoral plan such as the waste management plan or environmental management plan have different objectives. In general, an environmental management plan of the local municipality includes briefly fundamental directions for waste management. Then, in accordance with that environmental management plan, details on waste management shall be discussed in the waste management master plan.

Table 16 Summary of Results of M/P Mid-term Review

Table of Contents of M/P		Review Result
Overall	Table of Contents, Styles, Designs, or others	✓ The table of contents should be re-organized appropriately with logical orders referring to National Decree 94/2014, which is the regulation on Urban Solid Waste Management, and existing M/P guidelines prepared by the JICA technical cooperation project in 2017 and by MTA in 2020. ✓ It should be re-organized to make it easier to read with appropriate adjustment by unifying or effectively using fonts and table / chart formats, in addition to coloring and use of photographs, etc. ✓ Title of figures and tables should be given in short phrases. ✓ Current situations should be updated as much as possible when the M/P will be revised.
Executive Summary		✓ Current executive summary is mostly copied and pasted from the former M/P 2007 with some modifications but has not correctly summarized the contents of the M/P. Therefore, it should be re-summarized. ✓ Motto or vision of the M/P should be determined through careful discussions by DSMAS and other stakeholders, not given by the third party, as well as the objective of the M/P.
Chap. 1	The Master Plan	✓ This chapter 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. Current M/P says there are three parts in the document, but was not classified into such three parts. ✓ It should be discussed where the legal context, which is currently described in Chapter 1, should be located. It is recommended to set a separate chapter for the legal context with appropriate chapter title so that the readers can easily understand where this matter is described. ✓ In the current M/P, there are some duplications in the list of objectives, which should be modified in the revised M/P.

Table of Contents of M/P		Review Result
Chap. 2	Basic Information of USWM	✓ All natural and social data such as meteorological data, population or municipal infrastructures shall be updated based on the latest open information. ✓ When describing about climatic conditions, it should mention the recent impacts due to the climate change. ✓ There are some descriptions in the boxes but not related to the text in the M/P. Therefore, these should be removed. ✓ Waste data related to both quantity and quality are rather old based on the surveys implemented in 2013 under the previous JICA technical cooperation project. It is recommended for DSMAS to implement the waste quantity and quality survey as early as possible following the Action Plan, regardless of the timing on when the M/P will be revised.
Chap. 3	Current Management of USW in Maputo	✓ As mentioned above, current situations should be updated appropriately. Then, it should be reminded to conduct SWOT analysis on the current situation, following the National Decree 94/2014. In the Draft M/P 2017, there was a result of SWOT analysis that DSMAS and JET jointly conducted but was totally removed during the approval process. ✓ Description about the organization structure should be updated according to the latest structure of CMM and DSMAS with the date of confirmation using "As of xxx", including the number of municipal employees. If the latest organization will still be under the approval process, it should be annotated. ✓ It should be discussed when the M/P will be revised and where would be the appropriate chapter for the description of the organization chart be described, if it will be in the previous chapter for basic information of urban solid waste management or in this chapter. ✓ Considering the recent circumstance by which the municipal enterprise for the waste management might be established, more detailed explanation on the municipal enterprise, its advantage and disadvantage, should be given here. ✓ 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. ✓ 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 the Japanese government. ✓ 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.
Chap. 4	Interventions in the Scope of the 3Rs	✓ 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" which means "Rethink, Refuse, Reduce, Reuse and Recycle" because this 5R concept has been already pervasive among residents through the public awareness campaigns that was conducted.

Table of Contents of M/P		Review Result
		✓ As well as other chapters, data and information in the current M/P shall be updated according to the recent situations.
Chap. 5	Projection of Amount of USW (2017 – 2027)	✓ Projection of amount of municipal waste shall be updated based on the recent data, which are actual weighbridge data recorded at the Hulene dumping site and population data. Methodology and base data for the estimation should be also clearly and logically explained in the M/P. ✓ In the current M/P, description about the final disposal site and intermediate treatment options are included in this chapter which should describe the projection of waste amount. This makes no sense to be written here, thus, should be replaced to the appropriate chapters, which is the planning part, Chapter 6 in the current M/P.
Chap. 6	Planning and Monitoring	✓ Although this chapter should be a core part of the M/P, which describes the fundamental plan on each process of waste management, rules on waste discharge, collection and transportation, recycling and other treatment, final disposal, public awareness raising, and financial management with necessary projects, the current contents are quite incomplete and inappropriate. 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 the 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.
Chap. 7	Civic Education and Citizens Sensitization	✓ As mentioned above, it should be discussed when the M/P will be updated and if these sectors, which are civic education and citizens sensitization, shall be in independent chapters or be included together with the other sectors. ✓ There was a discussion on the technical wording on these sectors, which are “civic education” or “environmental education”. Thus, careful discussion is recommended to determine this. ✓ Since, somehow, there is a different topic which is “financing for urban solid waste management” and is a part of this chapter, so re-structuring of this chapter should be discussed in the revised M/P.
Chap. 8	Implementation Schedule	✓ Most important condition for preparing the implementation schedule of the revised M/P is the construction and operation schedule of new landfills in Katembe and Mathlemele. Therefore, frequent and close communication with the PTUM team and other stakeholders such as MTA, FNDS, and Matola City is very crucial. ✓ In addition to the implementation schedule, the implementation structure with private sectors and possible establishment of municipal enterprises shall be discussed. ✓ It is recommended to separate the part of monitoring of the M/P from this chapter. ✓ Monitoring index should have numerous targets that need to be achieved by certain timing.

Table of Contents of M/P		Review Result
Chap. 9	Final Consideration	✓ There was a discussion on the title of this chapter, whether "final consideration" or "conclusion". On the other hand, since there is an executive summary, which concludes the contents of M/P, it should be also discussed if this chapter itself is necessary or not.
Bibliography		✓ Some of the 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. Therefore, it should be carefully discussed what bibliographies would be attached to the M/P.
Annexes		✓ Same as above, some of the annexes are just copied and pasted from the old M/P developed in 2007 and some of these are not updated. Therefore, it should be carefully discussed what annexes should be attached to the M/P.

Source: JICA Project Team

2.3 Activities Related to Output 2

2.3.1 Organize Training, Seminars, and Workshops for CMM Officers for Supervising the WCSP (Activity [2-1])

To understand the current situation and problems of waste collection in Maputo City, workshops and field surveys were conducted with the counterparts (C/Ps) to understand the changes in the situation after the approval of the M/P. In addition, in the Activities [2-2] to [2-5] described below, the capacity of the C/Ps in charge of supervising the WCSP was strengthened through on-the-job training (OJT). The working group of Output 2 has conducted many meetings, field visits, and surveys during the project period of which scenes are shown in Figure 13. Furthermore, the progress of the activities was shared with the director, deputy director, and relevant departments of DSMAS through regular progress meetings.

Source: JICA Project Team

Figure 13 Workshop and Field Survey for Output 2 Activities

2.3.2 Study the Current Situation of the WCSPs and their Contracts (Activity [2-2])

(1) Initially Identified Issues

Interviews were conducted with relevant DSMAS departments and major WCSPs in each collection service category to understand the status of waste collection services and analyze issues. The results of current situation of waste collection and transportation service are summarized in the draft plan for improvement of waste collection and transportation service in Maputo City, attached in this report as Appendix 3-1.

Based on the results of the above-mentioned understanding of the current situation, the issues of DSMAS on waste collection and transportation services are summarized as shown in Table 17.

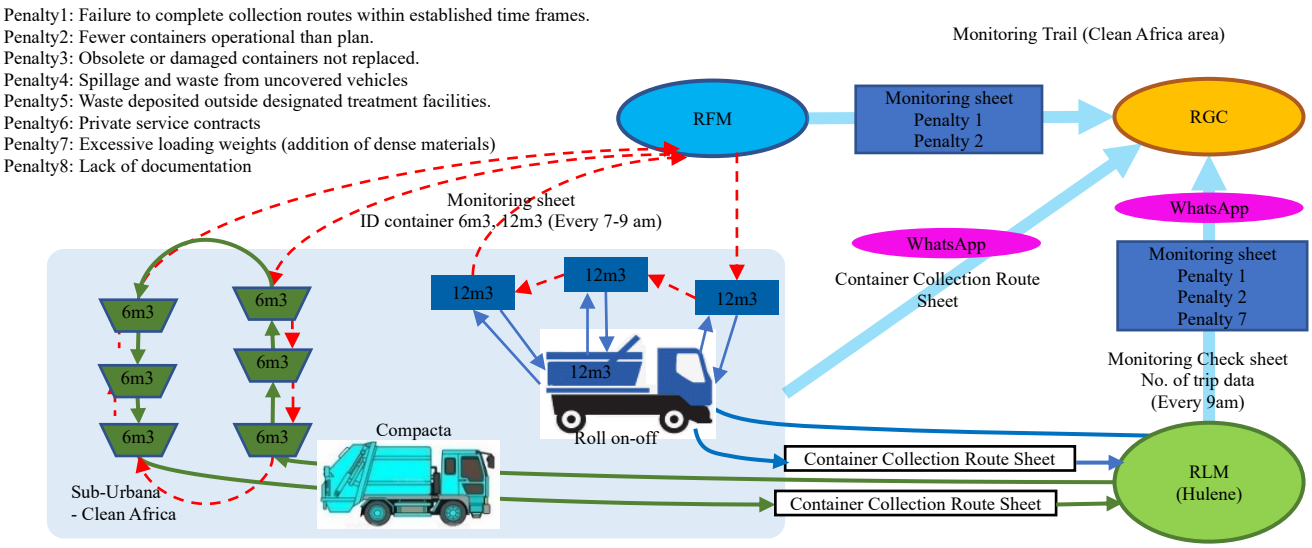
Table 17 Summary of Issues on Waste Collection and Transportation Service

Item	Content
1. Container Management	· The location and number of waste containers are 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 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 section/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

(2) Monitoring Trial

In the current WCSP contract, which was started in 2020, articles on penalty were set and daily monitoring by DSMAS was required. However, since the monitoring method has not been established within DSMAS, a monitoring trial for WCSP's collection and transportation was conducted in Nlhamanculu 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 14.



Source: JICA Project Team

Figure 14 Image of Monitoring Trial Activity

In the trial activities, for 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 the Contract Management Section (RGC), the Municipal Dumping Site Section (RLM), and the Supervision Section (RFM) of the DSMAS in order to identify daily check results, problem trends, and problem-prone areas in collection and transportation services and take effective measures.

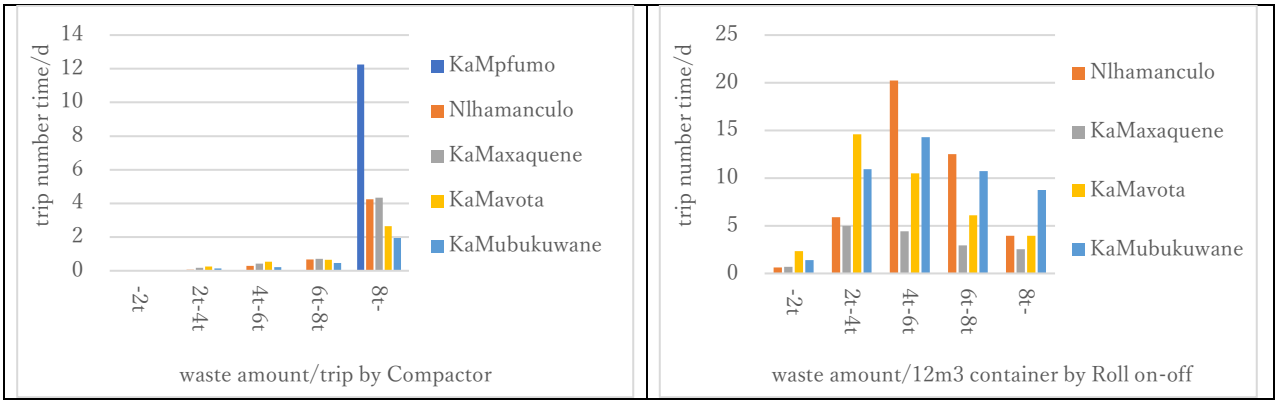
During the trial, due to many incomplete daily reports by RLM, the information was limited to weight bridge data, daily reports from WCSP (container collection route sheet) and daily reports from RFM. As for the result of the monitoring trial activity, information management by the RGC was found to be effective to a certain extent, and issues were identified as shown in Table 18.

Table 18 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 on 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 two times a week, and some containers are not being used on certain days of the week. It seems that WCSPs collect containers that are not being 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/roll-off vehicles because the collection equipment is often fully loaded with waste (See Figure 15).
More than two-time collections per day for each container	· This is especially true in Nlhamanculu District, where each container tends to be collected twice a day. Estimates based on population and waste generation rate showed 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. Thus, it is recommended that container points should be added to the weighbridge data input field. · Some of the 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 (See Figure 16).

Item	Content
Insufficient internal information sharing and inadequate work procedures	· It was found that RFM changed the 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 for around two months without collecting 12 m^3 containers. Both two roll-on/roll-off vehicles had a break down and at the same time stayed around for two months in South Africa for maintenance. During that period 7 of the 12 m^3 containers were collected by DSMAS and the remaining 19 containers, until the time of preparation of this report, was under responsibility of Ecolife.
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 15 Comparison of Waste Amount per Trip for Roll-on/Roll-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 16 Comparison of the Trip Number Basing on Weighbridge Data, Paper Data from RLM, and Monthly Reports Collected from WCSPs

(3) ME Survey

To avoid empty container collection and to ensure effective and efficient collection, it was necessary to know micro-enterprises (MEs) route and to establish secondary container 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, ME survey was conducted, which had been suspended due to the COVID-19 pandemic in 2020, in the Nlhamanculu District starting from June 2022, followed by other districts in August and September 2022. Based on the survey, the following problems are identified as shown in Table 19.

Table 19 Problems Identified from the ME Survey

Problem	Content
The use of the same container by multiple MEs	· At the same day, some containers are being used by two or three MEs. Consequently, it is possible to see overflow of waste in the containers and unsanitary conditions. · Furthermore, on the contrary, there are containers not used by ME.
Possibility of collecting empty containers	· Some containers are being used by MEs only twice a week. This means that on other days of the week, the container has very low amount of waste. This also 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. In this case, MEs discharge to containers in other neighborhoods.
Mixing of business waste, etc.	· There are containers that are heavily contaminated with business waste and these containers are recognized by MEs. · In some areas, there are informal activities such as street vendors, and the waste from these informal activities is being discharged into containers in an unmanaged manner (especially around of market).
Possible inaccuracy of container collection route sheet information	· Some markets are sharing the same containers with MEs. · Some container points are removed and that place becomes an illegal dumping.

Problem	Content
Others	· WCSPs have changed container locations, reduced containers, and changed them from 12 m^3 to 6 m^3 without sharing this information with DSMAS. · There were points where containers were not located during container maintenance by WCSPs.

Source: JICA Project Team

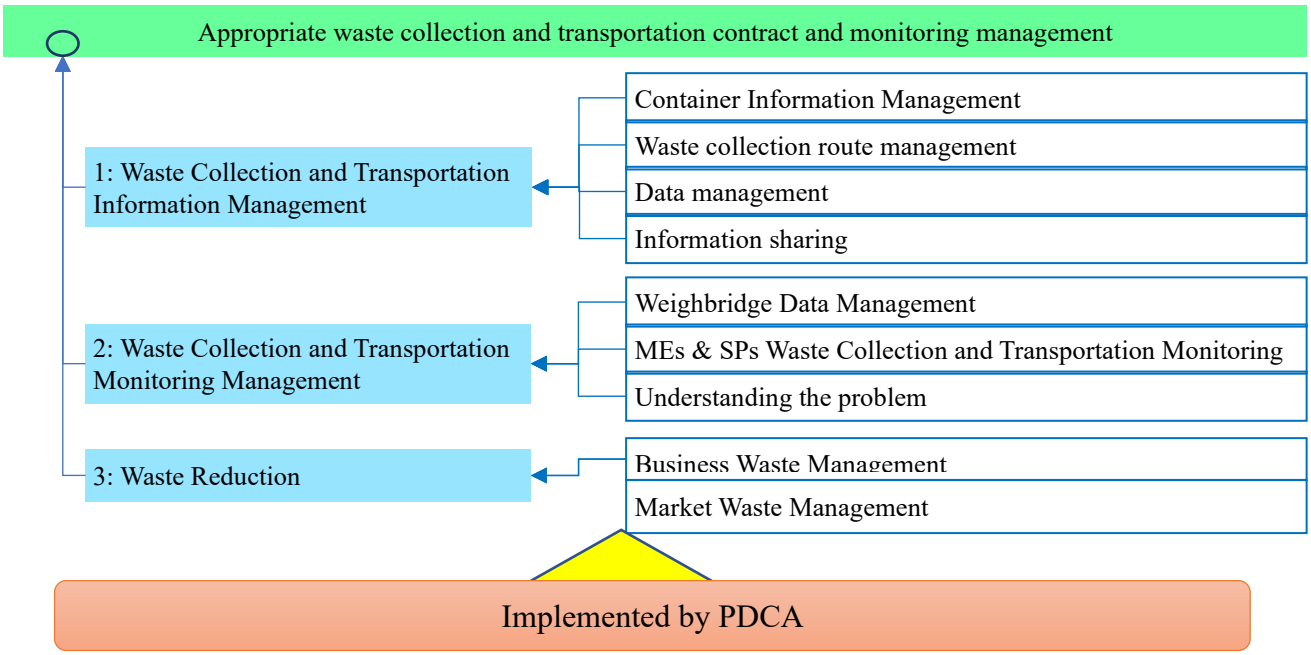
2.3.3 Develop a Draft Plan to Optimize the Waste Collection and Transportation Service in the Entire CMM Area (Activity [2-3])

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 private service providers (PSPs). However, DSMAS itself is not fully capable of identifying problems and does not know how the collection service is being conducted.

It was appropriate to develop this plan based on the issues for improvement of collection services identified in Activity [2-2], the results of the study on the improvement of the WCSP contract management work to be conducted in [Activity 2-4], and the study on supervision and monitoring system of waste collection and transportation service to be conducted in [Activity 2-5]. The draft plan for improvement of waste collection and transportation service in Maputo City is compiled as the overall outcome of Output 2 activities of this project and attached in this report as Appendix 3-1.

(1) Collection Management Improvement Plan

Based on the problems identified from the above-mentioned activities, future waste collection was discussed together with the 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 Plan-Do-Check-Action (PDCA) cycle is important for the implementation of these strategies.



Source: JICA Project Team

Figure 17 Proper Waste Collection and Transportation Contract and Monitoring Management

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 act 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.

a) Container Information Management

Information management such as container lists including information on container's 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 and 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. 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.

b) Waste Collection Route Management

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

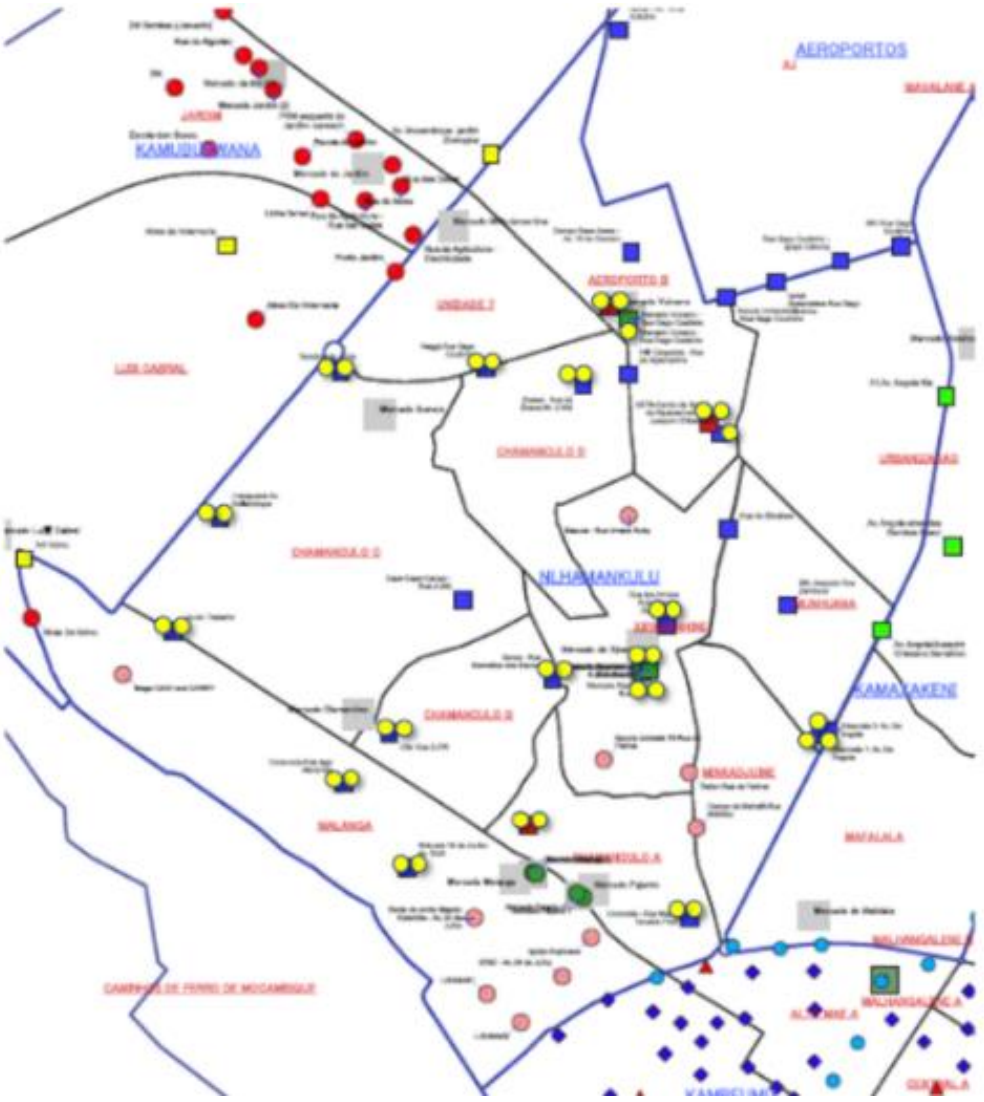
DSMAS does not fully understand which MEs are using which containers or what collection routes are being used for secondary collection. Therefore, monitoring was not conducted effectively. In considering effective and efficient collection avoiding the collection of empty containers, etc., an understanding 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 20 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 the discussion and the MEs survey as shown in Figure 18. 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.

Table 20 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 6 m^3 container	· Monitoring trials have shown that 6 m^3 containers are efficiently collected with a high waste loading rate because they are collected by compactor truck. Therefore, some 12 m^3 containers will be replaced by 6 m^3 containers (for compactor truck collection). · Instead of replacing all 12 m^3 containers with 6 m^3 containers, the 12 m^3 containers that can be replaced will be converted to 6 m^3 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 by only a few days of the week). · The change to 6 m^3 containers with compactor truck collection will be implemented in the Nlhamanculu and KaMaxaquene districts, which are more urbanized and less susceptible to sand.
Secondary collection and	· Waste collection hours for secondary collection shall be within 7:00 p.m.to 7:00 a.m. · 6 m^3 containers shall be collected at least once a day for hygiene purposes.

Item	Content
transportation method	· 12 m^3 containers are not collected on some days of the week when they are not being 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 markets 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 and this will be applied only for organized market.
Future considerations	· Waste collection by compactor trucks should also be promoted to introduce payment on a waste ton basis in areas where urbanization is progressing, such as Nlhamanculu 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 per-ton basis is efficient, it would be effective to extend the per-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 particular day of the week, and this should be the goal in the future. · Regarding the collection of market waste, it will be included in the household waste collection route. However, if the WB 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 it is not mixed with household waste.

Source: JICA Project Team



	now	new	DIS	CONT NAME (12m3)	Mercado	Problem	Business	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	12m3	12m3	Nlhamankulo	CETA 1-Centro de Saude de Xipamanine - Av. Joaquim Chissano		V(overload)		1	1	0	1	1	0	1	1	0	1	1	0	A	B		A	B		AEROPORTO A								
2	12m3	12m3	Nlhamankulo	Campo Base Aerea - Av. 19 de Outubro				1	1	0	1	1	0	1	1	0	1	1	0	A	B		A	B											
3	-	12m3	Nlhamankulo	**CETA 2-Centro de Saude de Xipamanine - Av. Joaquim Chissano (New)**				1	1	1	0	1	1	0	1	1	0	1	1			C		B	C											
4	12m3	12m3	Nlhamankulo	10– Esquadra - Rua de Xipamanine				1	0	1	0	0	1	0	0	1	0	0	1			C			C											
5	12m3	12m3	Nlhamankulo	Rua dos Irmaos Ruby/Parque Xipamanine	V(informal)		V	1	0	1	1	0	1	1	0	1	1	0	1	A			A			XIPAMANINE			C			C	MINKADJUINE	Add collection for informal
6	12m3	12m3	Nlhamankulo	Rua do Zimabwe				1	1	0	1	1	0	1	1	0	1	1	0	A			A					B			B	MUNHUANA	
7	12m3	12m3	Nlhamankulo	S㺠Joaquim Rua Zambeze				1	0	1	1	0	1	1	0	1	1	0	1	A		C	A		C										
8	12m3	12m3	Nlhamankulo	Colombia - Rua Major Teixeira Pinto				1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C										
9	-	12m3	Nlhamankulo	**CHAMANCULO A (NEW)**				2	1	1	2	1	1	2	1	1	2	1	1	A	B	C	A	B	C	CHAMANCULO A	A			A			MALANGA	
10	12m3	12m3	Nlhamankulo	Ufa- Rua 2.276				1	1	1	0	1	1	0	1	1	0	1	1		B	C		B	C										
11	12m3	12m3	Nlhamankulo	Cape-Cape-Campo - Rua 2.282		V(overload)		1	0	1	1	0	1	1	0	1	1	0	1	A			A			CHAMANCULO C			C			C	CHAMANCULO B	
12	12m3	12m3	Nlhamankulo	Zixaxa - 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								
13	12m3	12m3	Nlhamankulo	Mercado Xipamanine - Rua Zixaxa 1	V			1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	MERCADO								every day collection
14	12m3	12m3	Nlhamankulo	Mercado Xipamanine - Rua Zixaxa 2	V			1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	MERCADO								every day collection
Sum	144m3	168m3						**15**	**10**	**11**	**12**	**10**	**11**	**12**	**10**	**11**	**12**	**10**	**11**															
1	12m3	6m3	Nlhamankulo	Entrada da Base Aerea - Av. 19 de Outubro				1	1	1	1	1	1	1	0	0	1	0	0	A			A			AEROPORTO A								
2	12m3	6m3	Nlhamankulo	007-Rua Gago Coutinho				1	1	1	1	1	1	0	0	1	0	0	1			C			C	AEROPORTO A								
3	12m3	6m3	Nlhamankulo	Rua Gago Coutinho - Igreja Catolica			V(small)	1	1	1	1	1	1	0	0	1	0	0	1			C			C	AEROPORTO A								
4	12m3	6m3	Nlhamankulo	Igreja Assembleia-Rua Gago Coutinho				1	1	1	1	1	1	0	1	0	0	1	0		B				B	AEROPORTO A								
5	12m3	6m3	Nlhamankulo	Escola Unidade 18 -Rua Gago Coutinho				1	1	1	1	1	1	0	1	1	0	1	1			C			C	AEROPORTO A		B			B		AEROPORTO B	
6	12m3	6m3	Nlhamankulo	Mercado Vulcano- Rua Gago Coutinho 1	V			1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	MERCADO								every day collection
7	-	6m3	Nlhamankulo	**Mercado Vulcano- Rua Gago Coutinho 2 (New)**				1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	AEROPORTO B								
8	-	6m3	Nlhamankulo	**Mercado Vulcano- Rua Gago Coutinho 3 (New)**				1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	UNIDADE 7								
9	12m3	6m3	Nlhamankulo	Naggi-Rua Gago Coutinho 1		V(overload)	V(carpintalia)	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		UNIDADE 7								
10	-	6m3	Nlhamankulo	**Naggi -Rua Gago Coutinho 2**		V(overload)	V(carpintalia)	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		UNIDADE 7								
11	12m3	6m3	Nlhamankulo	Terminal da Junta		V(overload)	V(big)	1	1	1	1	1	1	0	1	0	0	1	0		B				B	CHAMANCULO C								
12	-	6m3	Nlhamankulo	**Terminal da Junta 2**		V(overload)	V(big)	1	1	1	1	1	1	0	1	0	0	1	0		B				B	CHAMANCULO C								
13	12m3	6m3	Nlhamankulo	Lhanguene-Av. Moçambique 1			V	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	CHAMANCULO C								
14	-	6m3	Nlhamankulo	**Lhanguene -Av. Moçambique 2**			V	1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	CHAMANCULO C								
15	6m3	6m3	Nlhamankulo	Mega CASH and CARRY				1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA								
16	12m3	6m3	Nlhamankulo	Up-Av. Trabalho 1			V	1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA								
17	-	6m3	Nlhamankulo	**Up-Av. Trabalho 2**			V	1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA								
18	12m3	6m3	Nlhamankulo	Coca-cola-Rua lago Maramba 1			V	1	1	1	1	1	1	0	1	0	0	1	0		B				B	MALANGA								
19	-	6m3	Nlhamankulo	**Coca-cola-Rua lago Maramba 2**			V	1	1	1	1	1	1	0	1	0	0	1	0		B				B	MALANGA								
20	12m3	6m3	Nlhamankulo	Rotunda 16 de Junho- Av. OUA 1			V	1	1	1	1	1	1	0	1	0	0	1	0		B				B	MALANGA								
21		6m3	Nlhamankulo	**Rotunda 16 de Junho- Av. OUA 2**			V	1	1	1	1	1	1	0	1	0	0	1	0		B				B	MALANGA								
22	6m3	6m3	Nlhamankulo	Saida da ponte Maputo Katembe - Av. 24 de Julho	V(informal)	V(overload)		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	
23	6m3	6m3	Nlhamankulo	LOUMAR1				1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA								
24	6m3	6m3	Nlhamankulo	LOUMAR2				1	1	1	1	1	1	0	0	1	0	0	1			C			C	MALANGA								
25	6m3	6m3	Nlhamankulo	STAE - Av. 24 de Julho				1	1	1	1	1	1	1	0	0	1	0	0	A			A			MALANGA								
26	6m3	6m3	Nlhamankulo	Igreja Anglicana		V(scater)		1	1	1	1	1	1	1	0	0	1	0	0	A			A			MALANGA								
27	12m3	6m3	Nlhamankulo	Xibamate- Av. De Angola 1				1	1	1	1	1	1	1	0	0	1	0	0	A			A			MUNHUANA								
28	12m3	6m3	Nlhamankulo	Xibamate- Av. De Angola 2				1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	MINKADJUINE								
29	-	6m3	Nlhamankulo	**Xibamate- Av. De Angola 3 (New)**				1	1	1	1	1	1	0	1	1	0	1	1		B	C		B	C	MAFALALA								
30	6m3	6m3	Nlhamankulo	Campo de Mahafil-Rua Mateteu				1	1	1	1	1	1	1	0	0	1	0	0	A			A			MINKADJUINE								
31	6m3	6m3	Nlhamankulo	Retiro-Rua da Fatima				1	1	1	1	1	1	0	1	0	0	1	0		B				B	XIPAMANINE								
32	6m3	6m3	Nlhamankulo	Escola Unidade 16-Rua da Fatima				1	1	1	1	1	1	0	1	0	0	1	0		B				B	XIPAMANINE								
33	12m3	6m3	Nlhamankulo	Zanza - Rua Marcelino dos Santos 1			V	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		CHAMANCULO B								
34	-	6m3	Nlhamankulo	**Zanza - Rua Marcelino dos Santos 2**			V	1	1	1	1	1	1	1	1	0	1	1	0	A	B		A	B		CHAMANCULO B								
35	6m3	6m3	Nlhamankulo	Bazuca - Rua Irmaos Ruby	V(informal)	V(overload)		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	
36	6m3	6m3	Nlhamankulo	Mercado Malanga 1	V			1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	MERCADO								every day collection
37	6m3	6m3	Nlhamankulo	Mercado Malanga 2	V			1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	MERCADO								every day collection
38	6m3	6m3	Nlhamankulo	Mercado Fajardo 1	V		V(Baraca)	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	MERCADO								every day collection
39	6m3	6m3	Nlhamankulo	Mercado Fajardo 2	V		V(Baraca)	1	1	1	1	1	1	1	1	1	1	1	1	A	B	C	A	B	C	MERCADO								every day collection
Sum	264m3	234m3						**39**	**39**	**39**	**39**	**39**	**39**	**18**	**27**	**22**	**18**	**27**	**22**															
1	6m3	6m3	Katembe	Chibantchane				1	1	0	1	1	0	1	1	0	1	1	0	A	B		A	B											
2	6m3	6m3	Katembe	Firmino				1	1	0	1	1	0	1	1	0	1	1	0	A	B		A	B		CHALI								
3	6m3	6m3	Katembe	Espiga D'ouro				0	0	1	0	0	1	0	0	1	0	0	1			C			C										
4	6m3	6m3	Katembe	Mercado Chali				0	0	1	0	0	1	0	0	1	0	0	1			C			C										
5	6m3	6m3	Katembe	EPC				1	0	0	1	0	0	1	0	0	1	0	0	A			A			GUACHENI								
6	6m3	6m3	Katembe	Complexo Guimaraes				1	0	0	1	0	0	1	0	0	1	0	0	A			A											
7	6m3	6m3	Katembe	Raul				0	1	1	0	1	1	0	1	1	0	1	1		B	C		B	C										
8	6m3	6m3	Katembe	Ponto-Final (perto do Quartel)				1	0	0	1	0	0	1	0	0	1	0	0	A			A			INCASSANE								
9	6m3	6m3	Katembe	Assucena				0	1	0	0	1	0	0	1	0	0	1	0		B				B										
10	6m3	6m3	Katembe	Cemiterio-Incassane				1	0	1	1	0	1	1	0	1	1	0	1	A		C	A		C										
Sum	60m3	60m3						**6**	**4**	**4**	**6**	**4**	**4**	**6**	**4**	**4**	**6**	**4**	**4**															
Total	468m3	462m3						**45**	**43**	**43**	**45**	**43**	**43**																					

Source: JICA Project Team

Figure 18 Map and List of Containers (After Modification), Case of Nlhamanculu

c) Data Management

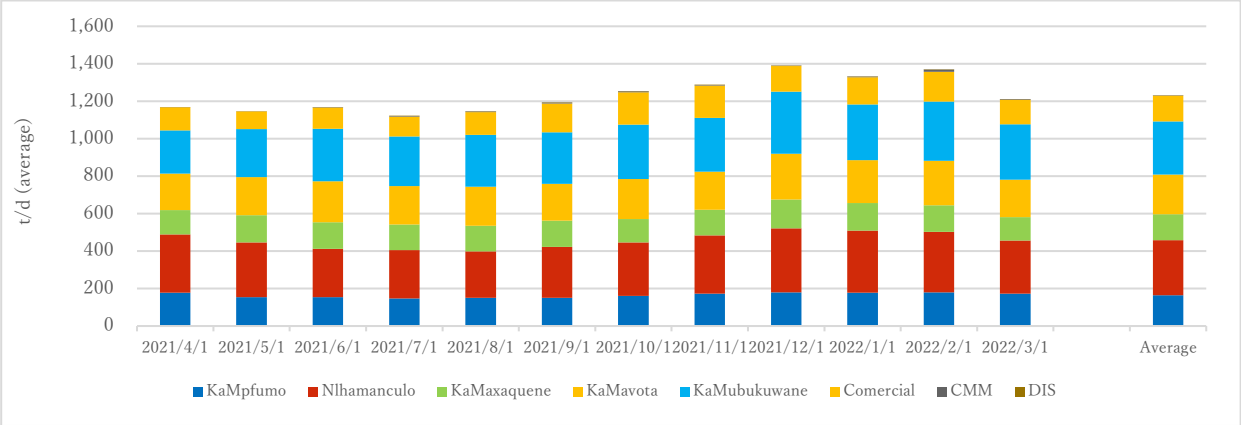
Based on the waste collection and transportation information management described above and the waste collection and transportation monitoring management to be described later, it is necessary to manage various types of data. Table 21 shows a list of possible data. All data will also need to be updated 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 oversee data management. However, in the future, a data management department, which manages various data inputs and outputs including updating of data, will be required for DSMAS.

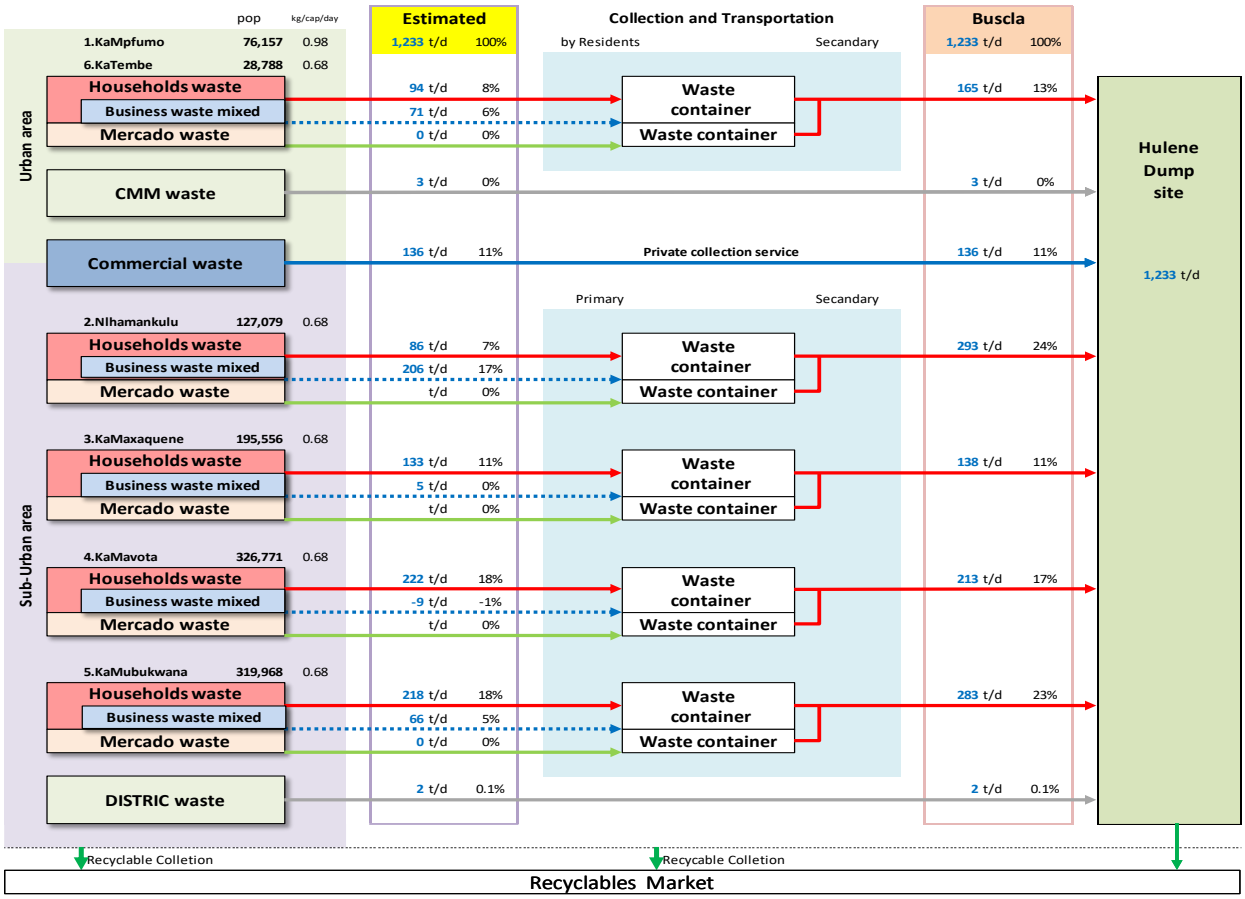
Table 21 Type of Required Data for Management

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 and countermeasure	· Waste volume data (by waste type, by district, day, month, year) · Waste collection and transport implementation information by MEs and WCSPs · List of problematic containers

Source: JICA Project Team

As an example, Figure 19 shows an output image of waste flow and waste volume trends, which is expected to be generated from the data management.





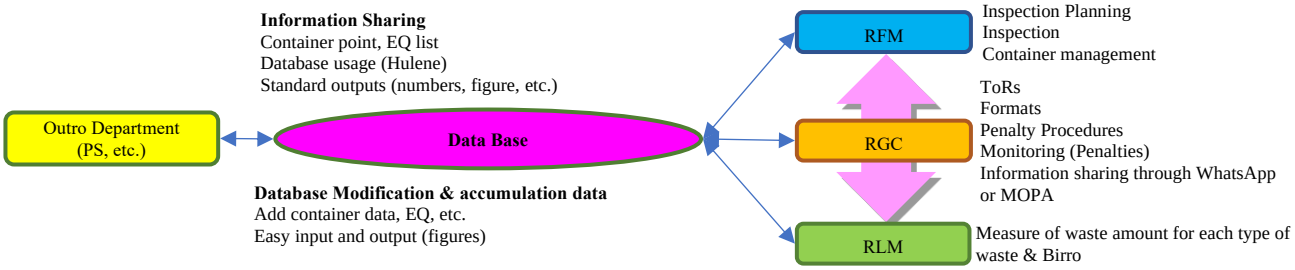
Source: JICA Project Team

Figure 19 Output Image of Waste Flow and Waste Volume Trends

d) Information Sharing

RGC, RFM, and RLM of the DSMAS will hold weekly meetings to share information on waste collection service monitoring and identified issues and countermeasures as shown in Figure 20. 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 20 Information Sharing among the Relevant Sections of DSMAS

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 as summarized in Table 22. This also includes a monitoring system using ICT.

Table 22 Content of Waste Collection and Transportation Monitoring Management

Items	Content	
Weighbridge data management	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 12 m^3 containers is easy because the waste collection and transportation is independent for each container point, while data input for 6 m^3 containers requires ingenuity because the waste from multiple containers is collected and transported by one compactor truck.
	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, the weight of collection vehicles not loaded with waste should be measured and registered at the weighbridge.
	Support for truck scale 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. [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.
Waste collection and transportation monitoring for MEs and WCSPs	It is not efficient for DSMAS to monitor all waste collection services 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 operation. The information exchange will be monitored through the WhatsApp group created by DSMAS or ICT system.	

Items	Content
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.

Source: JICA Project Team

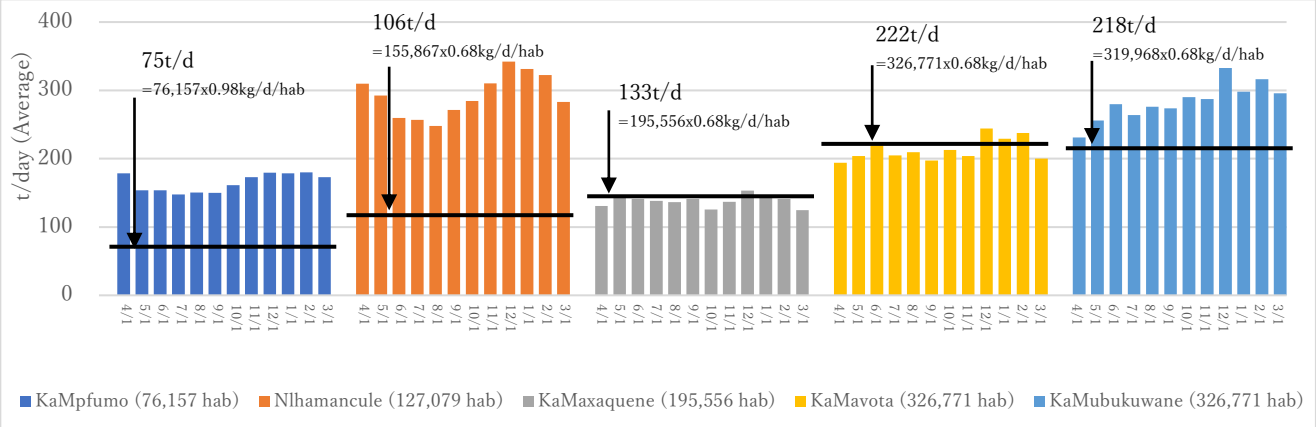
3) Waste Reduction

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.

a) Business Waste Management

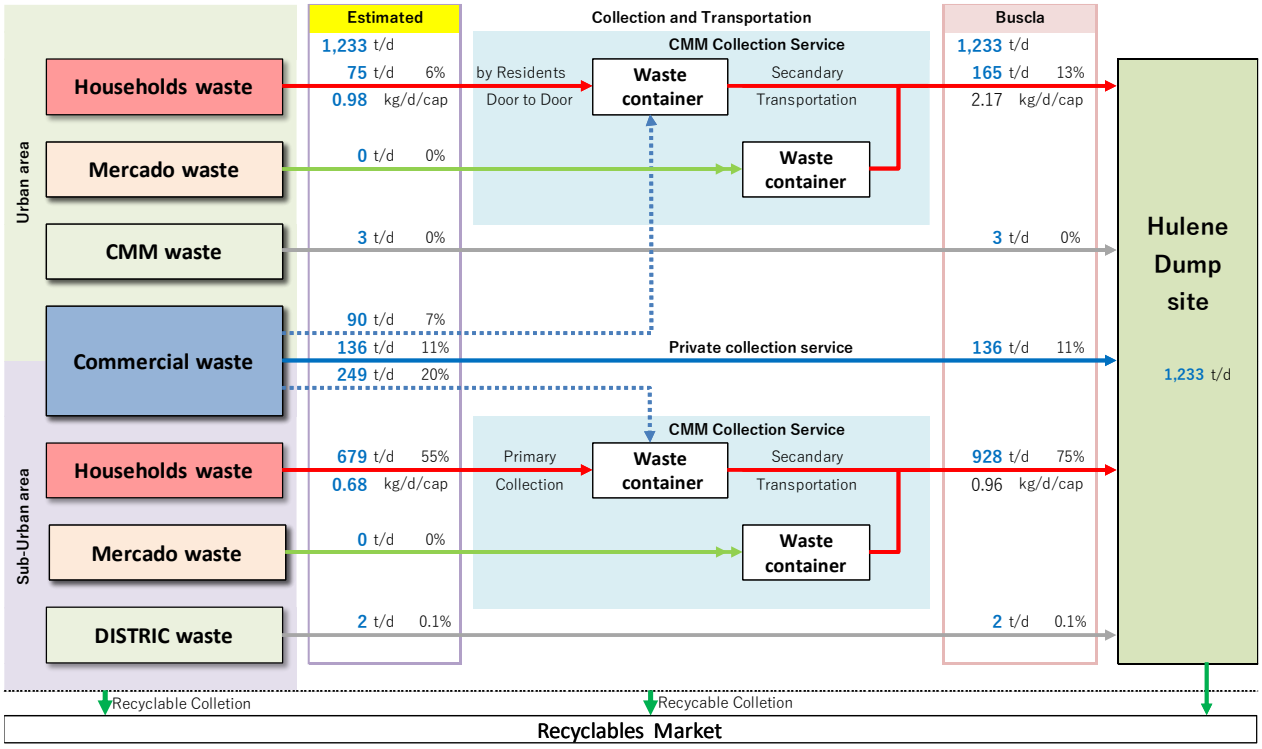
In case the business waste is mixed in with the household waste and is collected by the WCSPs entrusted by CMM, CMM will need to pay the cost of collecting the business waste, which should be paid by the business waste generators in the regulation. Considering CMM's expenditures for waste collection, 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.

The waste amount above the black line in Figure 21 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. 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 22.



Source: JICA Project Team

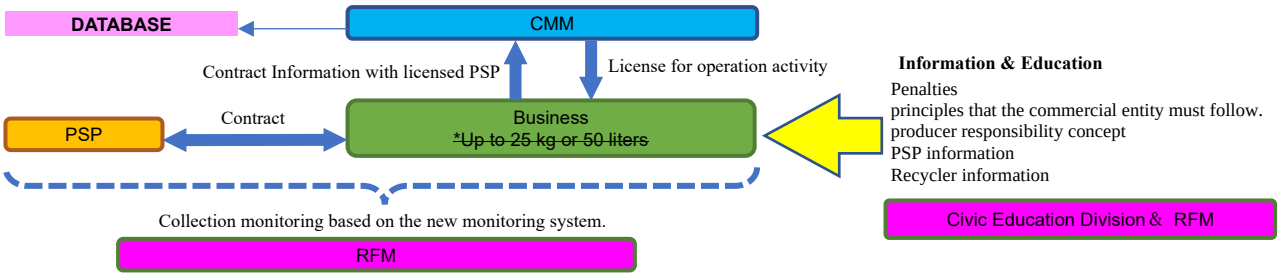
Figure 21 Possibility of Business Waste Contamination in Municipal Waste by District



Source: JICA Project Team

Figure 22 Municipal Solid Waste Management Flow in Maputo City

Based on the above, regarding the future management of business waste, it was agreed with DSMAS to eliminate 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 and to require all businesses to have contract with licensed PSPs as the condition of obtaining or renewing business operation licenses as shown in Figure 23. Furthermore, it was discussed with the C/Ps that information, education, and communication activities should be provided by REA and RFM when business licenses are issued or renewed, and that RFM's inspection in the field should be strengthened based on these conditions.



Source: JICA Project Team

Figure 23 Proposed Business Waste Management in the Future

In addition, the measures for business waste management are proposed as shown in Table 23.

Table 23 Measures for Business Waste Management

Area	Content
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 behind the problems and implement countermeasures.

Area	Content
	· If the cause of the problem is identified as business waste, RFM and REA will educate the business waste generators about their responsibilities and encourage them to have contracts with licensed PSPs for business waste collection.
Urban area	· In the urban area, the door-to-door collection will be proposed in the future. The implementation of door-to-door collection will help to avoid business waste discharged into containers as well as to identify the business which discharge waste to the door-to-door collection service. · When businesses that have discharged to the door-to-door collection service are identified, RFM and REA will educate them about their responsibilities and encourage them to have contract with licensed PSPs for business waste collection.

Source: JICA Project Team

b) 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.

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 modify the monitoring activities in the PDCA cycle.

(2) Collection Improvement Plans by Area

1) Suburban Area

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 data output and accumulation of information. Therefore, it is strongly recommended to introduce an ICT system such as MOPA, which has a database function for input and output data, and mapping functions.

2) Urban Area

Currently, waste collection and transportation in urban areas are being carried out during the night and are 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 if there are containers available for disposing waste 24 hours a day. The following three measures indicated in Table 24 are proposed to tackle these problems in urban areas.

Table 24 Measures to Improve Waste Collection in Urban Areas

Item	Content
Business waste contamination	· The 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.
Door-to-door collection	· From a cost aspect, it is considered necessary to change from the current daily collection to thrice 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 explanation and promote cooperation among residents. · As planned in the Action Plan of the Waste Management Master Plan, it is recommended that the door-to-door collection be implemented as a pilot project.

Item	Content
	· 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 increase collection cost, it is recommended to consider ways to reduce collection costs by collaborating with recycling companies, etc.
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" · 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 same as business waste measures.

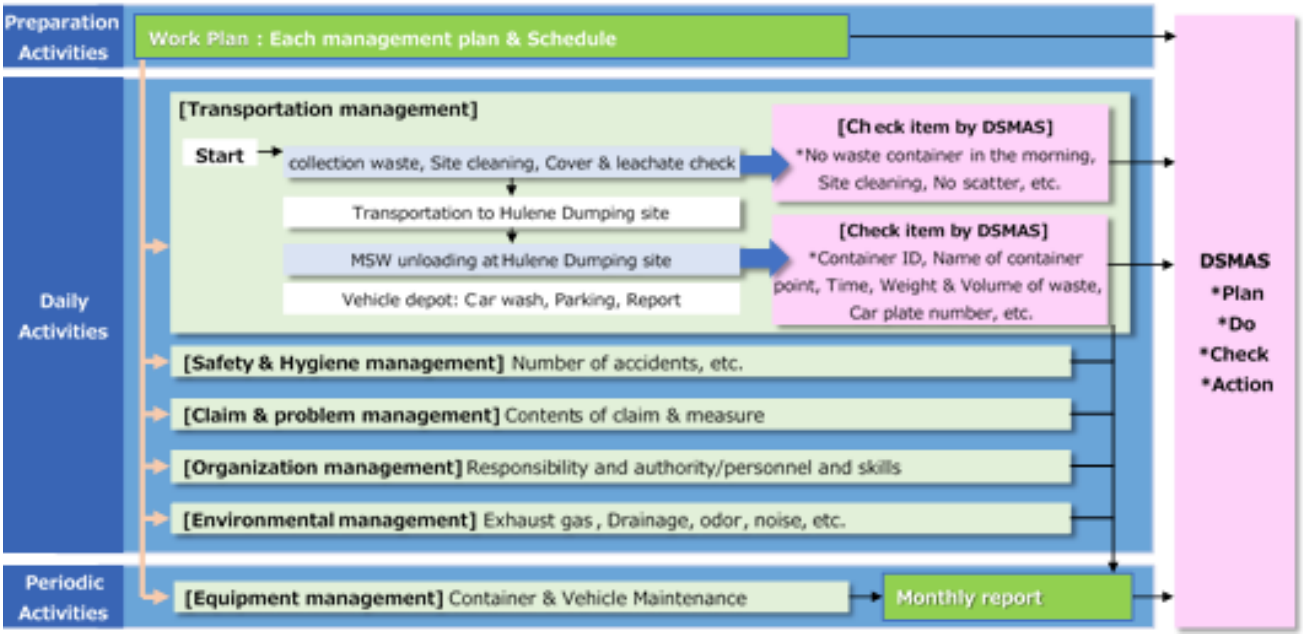
Source: JICA Project Team

2.3.4 Examine Revision of the Contracts with the WCSPs for Improving Waste Collection Service (Activity 2-4))

(1) Study of WCSP Contract Management Procedures

In the initial plan, a draft improvement plan for waste collection and transportation services was to be developed based on the results of the current situation and challenges analysis, and based on this plan, a review of the management of the collection service contract with WCSP was to be considered.

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 JICA 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 were incorporated into the proposed improvement plan for waste collection and transportation services. The JICA Project Team reviewed the basic procedures for managing WCSP contracts and organized them as shown in Figure 24.



Source: JICA Project Team

Figure 24 DSMAS Procedures for Management of Collection Service Contracts

Based on the analysis of waste collection service contract technical specifications and the review of the WCSP contract management operational procedures, the new collection contract specifications are analyzed and organized as shown in Table 25. As described in the analysis of the 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.

Table 25 Analysis on the TOR for Waste Collection and Transportation Service Contract Specifications

Specification Items and Condition	Work Plan	Pre-service Confirmation	3.4 Monitoring		Contract Management		3.5 Inspection	3.7 Penalty
			Collection Site	FDS	3.4.2 Monthly 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

(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 the COVID-19 pandemic, waste collection services by the awarded large-scale WCSPs have already been implemented without following the above procedures.

Therefore, the JICA Project Team provided necessary support and guidance to DSMAS to ensure that the contract management operations of the large-scale WCSPs will be carried out in accordance with the contracts. The activities related to contract management work with large-scale WCSPs as shown in Table 26.

Table 26 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

Items for Contract Management	Tasks for Contract Management
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) 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 as shown in Table 27.

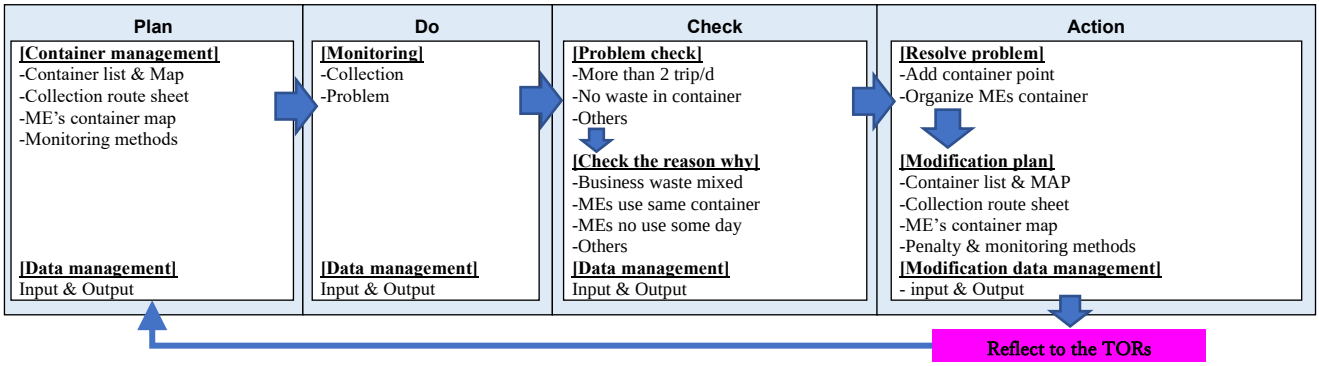
Table 27 Recommended Contents to be Added in TOR for Next WCSP Contract

Item	Recommended Contents to be Added in TOR	
Container collection plan	· Container list and map · Container collection plan WCSPs will collect pre-designated containers once a day on each day of the week between 7:00 p.m. and 7:00 a.m. If the WCSP fails to collect designated containers, DSMAS will collect a fine from the WCSPs. In addition, 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.	
Information sharing (monitoring procedures)	· WCSPs send collection completion report through MOPA when it has collected containers. · WCSPs conduct additional collection based on requests from MEs and markets through MOPA, and transmit collection completion report through MOPA. 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.	
Work plan modification	Request WCSPs to follow the workplan modification procedures in the following three cases: · When WCSPs request to add or change the location or type of container or container collection route. · When WCSPs request to add or changes collection equipment/vehicle. · When WCSPs request to make other changes to the work plan.	
Document submission form	Workplan format	Container collection plan, container collection route sheet, collection equipment sheet/supervisor's equipment sheet, organizational chart sheet, personnel list sheet, collection equipment maintenance schedule sheet, container maintenance schedule sheet, safety management schedule sheet
	Monthly report format	Monthly report format
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 to facilitate the contract price negotiation.	
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.	
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 12 m^3 container is set at 3 tons. · 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.	
Others	In urbanized areas such as Nlhamanculu 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	

Item	Recommended Contents to be Added in TOR
	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.

Source: JICA Project Team

In addition, it is important to implement PDCA-conscious operations in the management of the next collection service contract. Procedure of PDCA activities in WCSP management operations in suburban districts is shown in Figure 25.



Source: JICA Project Team

Figure 25 PDCA Activities in WCSPs Management in Suburban Districts

2.3.5 Study on Monitoring and Control System of Waste Collection Service Using ICT (Activity [2-5])

(1) 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 WB assisted the DSMAS in introducing it during 2015-2016, was studied 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. However, since the principal source of information comes from the residents, the bairro offices, the district offices, and so on, the MOPA system was not used as a monitoring tool for contract management of waste collection and transportation service by DSMAS.

At present, the MOPA system is not operational because CMM does not pay to the service providers. DSMAS could not possibly able to restart the MOPA system soon due to budget limitations.

(2) Potential for ICT-based Monitoring and Management Systems

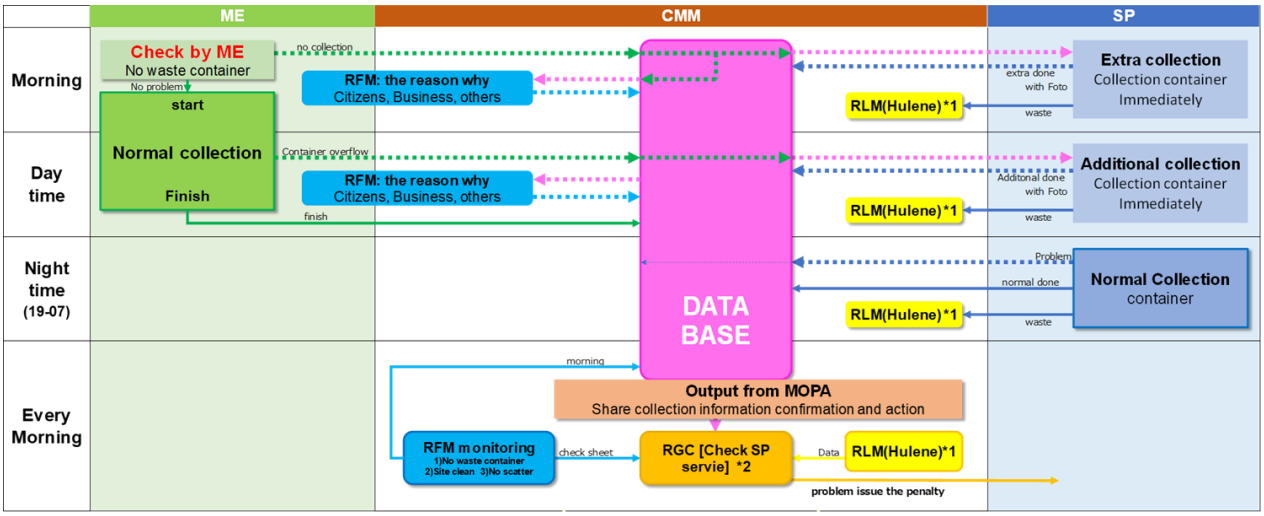
As mentioned in the previous sections, it is inefficient and difficult for DSMAS to monitor all the waste collection and transportation services in the field by themselves. It will be more efficient if MEs and WCSPs will send daily waste collection and transportation performance information to DSMAS, and DSMAS will compare and analyze that information so that each actor can monitor and check each other's service operation. Therefore, the use of ICT system such as MOPA in the contract management of primary and secondary collection services 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 desirable to develop some kind of information platform for data accumulation and analysis. For this reason, the JICA Project Team discussed the future collection service monitoring and management method using the MOPA system (or an information platform utilizing ICT with similar functions), and organized the monitoring and management methods and the output image of the daily reports as shown in Figure 26 and Table 28.

After discussing the above proposed system specifications with UX, the MOPA operational service provider, the proposed system was found to be feasible. It is desirable to use the ICT system as a monitoring system for 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.



Source: JICA Project Team

Figure 26 Workflow of Monitoring and Management of Waste Collection Services Using ICT System

Table 28 Image of Daily Report to be Output from the ICT System

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

			Extra (7-8)			additional(8-19)			Normal(19-7)		Extra & Add			Normal diffrence	Normal 2nd collection plan						
			ME	SP	Fiscal	ME	SP	Fisical	SP	SP	ME	SP	diffrence		sum	*1					
		CONT NAME	trip	trip	why	trip	trip	why	trip	foto&why					week	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総 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凯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									

Source: JICA Project Team

2.3.6 Consideration of Waste Transportation Methods to the New Final Disposal Sites

The commencement of services 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.

(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.

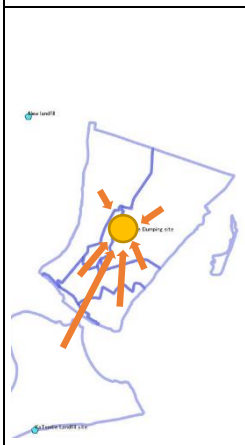
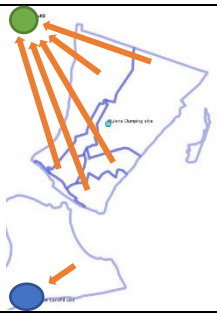
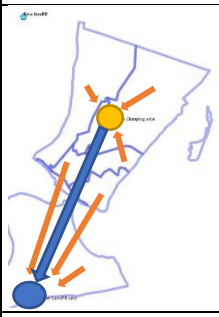
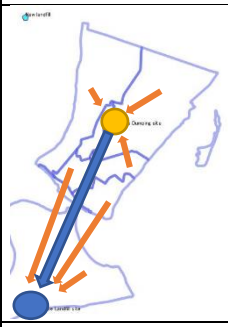
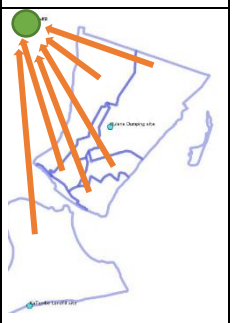
The three cases considered are as follows. Besides, the analysis was conducted by considering with and without paying the toll fee being charged at the Katembe Bridge.

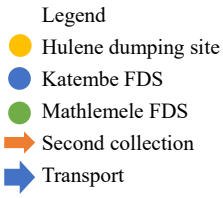
- Case 1: Both Mathlemele Landfill and Katembe Landfill in operation
- Case 2: Only Katembe Landfill in operation
- Case 3: Only Mathlemele Landfill in operation.

(2) Results of Examination

The results of the estimation for each case are shown in Figure 27, and the summary of the results is as follows:

- Compared with 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 a toll is imposed.
- In the case where the Katembe Bridge toll is paid, the least expensive case is to deliver all waste directly to Mathlemele Landfill.
- If the Katembe Bridge toll is not paid, the least expensive case is that the waste from Kampfumu and Nlhamanculu 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		Case 1	Case 2	Case 3
	With Toll Fee			—
	Cost	186%	202%	
	Without Toll Fee			
Cost 100%	Cost	174%	171%	186%



Source: JICA Project Team

Figure 27 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:

- On 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 should discuss this matter with the National Road Administration (ANE), which is responsible for the management of the Katembe Bridge, and 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 WB-supported project (PTUM), will greatly contribute to reducing waste transportation cost.
- In this estimation, the transfer station facility is 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 truck scale 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.)

2.4 Activities Related to Output 3

2.4.1 Formulate a Strategy for Minimizing Waste Generation (Activity [3-1])

The M/P sets the four basic approaches to promote 5R activities to reduce the amount of disposed waste which are the following:

1. Establishing an institutional framework to promote 5R activities;
2. Promoting awareness-raising activity on 5R for all waste generators;
3. Promoting 5R activities in the urban area, in collaboration with recycling-related actors; and
4. Promoting 5R activities in the suburban area, by DSMAS's initiative.

It was agreed by the discussions among the JICA Project Team that these approaches are still valid considering the current situation of MSWM in Maputo City, and they can be regarded as strategies for minimizing waste generation.

2.4.2 Plan Appropriate Source Separation Method and Necessary Rules (Activity [3-2])

(1) Understanding of the Recycling Situation in Maputo City

In Maputo City, collective waste segregation and collection system have not yet been introduced in both urban and suburban areas, and there is still little understanding of the necessity and method of waste segregation among the waste generators. Also, given DSMAS's current financial capacity, it is difficult to adopt a segregated collection system that entails a significant increase in waste collection costs. On the other hand, although some recycling non-governmental organizations (NGOs) are engaged in collection of recyclable waste mainly in the urban areas, recognition of citizens is still low and existing recycling routes are not fully utilized.

Therefore, the M/P adopts the policy to increase the amount of recycling and reducing the amount of disposed waste by putting recyclable waste on the existing recycling route in cooperation with the recycling-related actors.

(2) Target Items Subject to Source Separation

Considering the above-mentioned circumstance on recycling activity in Maputo City and based on the experiences in the JICA 3R Project, the JICA Project Team adopted the five target items for source separation as shown below.

1. Paper (white paper, newspaper, cardboard, etc.)
2. Plastic (PET bottle, HDPE, PP, etc.)
3. Metal (aluminum, steel, etc.)
4. Glass (not broken glass bottle)
5. Hazardous waste (used cell battery, fluorescent lamps)

'Paper', 'plastic', and 'metal' are selected as the target items because there exists a recycling market for these items and many recycling-related actors deal with them. Hence, it will be possible to increase the amount of recycling and reducing the amount of disposed waste if these items will be appropriately segregated and delivered to recyclers.

The situation with 'glass' is a bit different. Currently, only a small amount of domestically produced and not broken glass bottles (typically, domestic beer bottles such as 2M) can be traded in the recycling market in and around Maputo City, and those recovered bottles are cleaned and reused as beverage bottles again. On the other hand, there is no value for broken glass bottles and imported glass bottles in the recycling market as there is no glass recycling factory in and around Maputo City. Consequently, plenty of broken glass bottle is currently disposed at Hulene dumping site. With this understanding, the JICA Project Team adopted the 'not broken glass bottle' as the target items for source separation.

The JICA Project Team will also aim to adopt household hazardous waste, which are cell battery and fluorescent lamp, as the target item for source separation as it is considered to cause health and environmental problems if those hazardous waste will be disposed at Hulene dumping site or scattered on the streets.

(3) Arrangement of Recyclables Recovery

Although it is desirable to adopt collective waste segregation and collection system in the entire city to promote recycling, it is still difficult to adopt it considering DSMAS's current financial capacity. Therefore, it was originally planned to ask households to bring their source separated recyclables and take them to the recycling stations operated by recycling NGOs. However, it was observed in the field surveys conducted in 2020 by the JICA Project Team that recycling station activities by NGOs are currently shrinking due to decline in the recyclables market price.

Considering this circumstance, it was agreed by the discussions among the JICA Project Team that CMM/DSMAS introduces source separation and recycling initiative from CMM offices and aims to expand the activity to business offices and households in the future. It is intended that recyclables to be segregated at the target CMM offices be collected and transported to the existing recycling facilities.

(4) Formulation of Draft Resolution on Promotion of Source Separation and Recycling

The feasibility of the above source separation method was verified in the pilot project (PP) implemented in Activity [3-4] and based on the results of the PP, CMM resolution that stipulates obligation and responsibility of waste generators to cooperate on source separation was drafted. The drafted Resolution on Promotion of Source Separation and Recycling was attached in this report as Appendix 4-1.

2.4.3 Plan Appropriate Segregation Method of Hazardous Waste from MSW (Activity [3-3])

DSMAS does not have a collection system for hazardous municipal wastes such as used cell batteries and fluorescent lamps discharged from homes and offices, nor does it have a facility to dispose of these hazardous wastes properly. Therefore, no measures have been taken for the treatment of hazardous municipal wastes in Maputo City so far.

As a result of the survey conducted by the JICA Project Team in 2020, a landfill was identified in Maputo Province that can accept some types of hazardous waste. The outline and overview of the hazardous waste landfill are shown in Table 29 and Figure 28, respectively.

Table 29 Outline of Mavoco Hazardous Waste Landfill

Name of Facility	Mavoco Hazardous Waste Landfill
Location	Beleluane, Boane, Maputo Province
Operator	Enviroserv
Operation Period	Started from 2005 to present
Capacity	20 ha or 78,000 m^3 (It is necessary to expand in near future)
Acceptable Hazardous Waste	・ Mainly, waste acid from industrial sector (such as aluminum factory) ・ Small amount of fluorescent tubes and other hazardous waste

Source: JICA Project Team

Source: Enviroserv

Figure 28 Overview of Mavoco Hazardous Waste Landfill

In this activity, a system for the separation and collection of hazardous municipal waste was examined. Specifically, it was aimed to include hazardous municipal waste (cell batteries and fluorescent lamps) in the target items subject to source separation, and DSMAS collected them. Hazardous municipal waste recovered by DSMAS was temporary stored at the DSMAS facility and it will be transported and disposed of at Mavoco Hazardous Waste Landfill.

2.4.4 Implement PP for Source Separation to Verify Feasibility of Source Separation (Activity [3-4])

(1) Design of the PP

Based on the basic approaches for promoting recycling as described in the revised M/P and the strategy for reducing waste generation that is reviewed in Activity [3-1], the JICA Project Team implemented a PP to verify feasibility of the source separation methods developed in Activity [3-2] and [3-3].

As described in Activity [3-2], the JICA Project Team implemented the source separation pilot project at DSMAS Office, Maputo City Hall, and Matola City Office and aimed to recover the segregated recyclables by delivering them to the recycling facilities in collaboration with the existing recycling-related actors.

The outline of the source separation PP is summarized as shown in Table 30.

Table 30 Outline of Source Separation PP

Item	Description
Objective	· To verify feasibility of source separation at CMM offices aiming at expanding to other offices and households in Maputo City in the future
Target Area/Location	· DSMAS Office · Maputo City Hall (CMM head office) · Matola City Office · District offices of Kampfumu
Target Waste Generator	· Officers working at the target offices
Target Recyclable Waste	· Valuable recyclables (paper, plastic, metal, glass) · Hazardous waste (cell battery, fluorescent lamps)
Methodology	· The JICA Project Team explains the PP to staff in the target offices and asks their cooperation and instructs them on how to segregate waste. · The JICA Project Team provides waste segregation bins/buckets to the target offices. · The staff in the target offices segregates the target recyclable waste and discharges it in the segregation bins/buckets.

Item	Description
	· The target offices arrange a truck to collect and transport the segregated recyclable waste and deliver to the existing recycling facilities. · The JICA Project Team in cooperation with the target offices monitors the amount of recyclable waste collected. · The JICA Project Team evaluates performance of the PP based on the monitoring results.

Source: JICA Project Team

(2) Implementation of the PP

It was originally planned to start the source separation PP in 2020, however, it had to be postponed due to the COVID-19 pandemic, as it was difficult to coordinate with the CMM offices and recycling-related actors under the pandemic situation.

After the COVID-19 pandemic situation became under control, the source separation PP in DSMAS Office was launched in June 2021. The recyclable waste bins and baskets were designed and procured by the JICA Project Team as shown in Figure 29, and the signboards for each type of recyclables are designed and prepared as shown in Figure 30.

The educational trainings on source separation for the DSMAS staff were provided for several times in collaboration with the Output 6 team to enhance participation and cooperation of the DSMAS staff. The monitoring on the number of recovered recyclables was continuously conducted to assess the performance of the PP. The recyclables recovered in DSMAS Office were delivered to the existing recycling company (Sombra Matsinhe, Lda.). The scenery of source separation PP implementation is shown in Figure 31.

Source: JICA Project Team

Figure 29 Source Separation Waste Bins and Baskets Installed in DSMAS

Plastic	Paper
	
Metal	Glass
	
Hazardous	Others

Source: JICA Project Team

Figure 30 Color-Coded Signboards for Source Separation Pilot Project

	
Instruction and Training for DSMAS Staff	Measurement of Recovered Recyclables

Delivery of Recovered Recyclable to the Recycling Company

Source: JICA Project Team

Figure 31 Scenery of Source Separation Pilot Project in DSMAS

The DSMAS counterparts enhanced their capacity on operation and management of source separation PP through their practice at DSMAS Office, and the source separation PP was disseminated in Matola City Office in July 2022 and in Maputo City Hall in November 2022, respectively, by utilizing the experience and lesson learned at DSMAS Office as shown in Figure 32.

Launching Ceremony of Source Separation PP in Maputo City Hall

Installation of Source Separation Waste Bins in Matola City Office

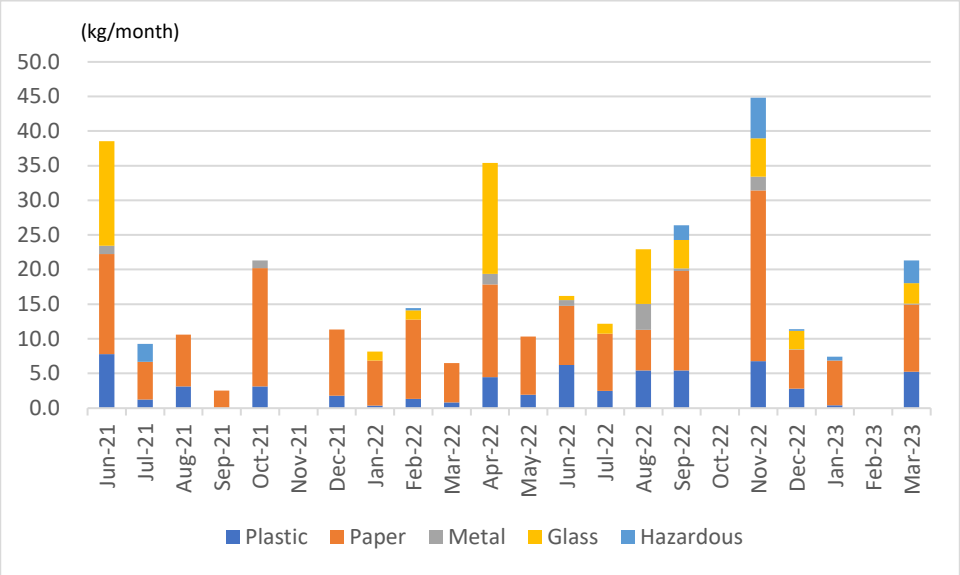
Source: JICA Project Team

Figure 32 Dissemination of Source Separation PP in Maputo City Hall and Matola City Office

(3) Performance of the PP

The results of monitoring on the number of recovered recyclables in DSMAS Office are summarized in Figure 33. The monthly average amount of recovered recyclable was 14.4 kg/month (Plastic: 2.8 kg/month; Paper: 8.4 kg/month, Metal: 0.5 kg/month, Glass: 2.7 kg/month), and that of hazardous waste was 0.7

kg/month. In total, DSMAS succeeded to recover 331 kg of recyclable and hazardous waste from June 2021 to March 2023.



Source: JICA Project Team

Figure 33 Number of Recyclables Recovered in Source Separation PP in DSMAS Office

2.4.5 Organizing Training Course and Workshop for Supervision, Guidance, and Enforcement of PP (Activity [3-5])

At each stage of planning, preparation, implementation, and evaluation of the PP in Activity [3-4], training and workshops for the C/Ps were conducted as shown in Table 31 to enhance C/Ps' initiative and strengthen the capacity to promote recycling activities.

Table 31 Capacity Development of C/Ps through the PP

Stage	Measures for Capacity Development
Planning and Preparation	· Identifying existing recycling-related actors and understanding their activities · DSMAS workshop on PP planning · Preparatory meetings with partner recycling-related actors · Workshop on PP to request cooperation for waste generators (CMM staff)
Implementation	· Awareness-raising workshops for waste generators · Training and guidance on segregated waste discharge for waste generators · Coordination with partner recycling-related actors
Evaluation	· DSMAS workshop on analysis and evaluation of PP monitoring data · DSMAS workshop on verification of the feasibility of source separation

Source: JICA Project Team

The capacity development of the C/Ps in planning of the PP was conducted through interviews with the recycling-related actors and discussion meetings among the JICA Project Team as shown in Figure 34. The information necessary to understand the recycling-related actors' activities and to identify potential partners for the source separation PP was examined and compiled as the interview sheet, and planning procedures of the source separation PP was explained and practiced with the C/Ps. The capacity development in preparation, implementation, and evaluation of the PP was conducted through the practice of Activity [3-4].

	
Discussion on PP Planning	Interview with the Recycling NGO (AMOR)
	
Visit to Recycling Facility (Valor Plastico)	Interview with the Recycling Company (Reciclagem)

Source: JICA Project Team

Figure 34 Capacity Development of C/P in Planning of the PP

2.4.6 Promote a Market of Recyclables for Informal Waste Pickers (Activity [3-6])

In Maputo City, there are informal waste pickers who are engaged in valuable recyclables collection in the city. Besides, it is estimated that more than 1,500 waste pickers are engaged in valuable recyclables collection at Hulene dumping site. CMM/DSMAS has a fundamental policy to engage these informal waste pickers in formal activities.

To understand the activities and livelihood of the waste pickers, the 3rd recycling-related actors networking meeting was held in May 2022, by inviting the leaders of waste pickers at Hulene dumping site as guest speakers. As a result of the discussion among the recycling-related actors, it was concluded that an association of waste pickers will be necessary to formalize the activities of waste pickers as well as to provide access to education, social welfare supports, etc.

Currently, the World Bank project (PTUM) is supporting CMM/DSMAS for the construction of Katembe Landfill and the closure of Hulene dumping site. During the project implementation, it will be necessary to reallocate the waste pickers who are engaged in Hulene dumping site and provide alternative means of livelihood. Hence, the JICA Project Team supported DSMAS to facilitate with the leaders of waste pickers to create an association of waste picker workers as a preparatory work for future closure of Huene dumping site.

Besides, in the source separation PP carried out in Activity [3-4], the recyclable waste recovery activity was promoted in cooperation with the recycling-related actors with an intention to promote the recycling market

in Maputo City. Measures to increase the possibility that informal waste pickers will engage in formal recycling activities in the future were also discussed with recycling-related actors.

In addition, a possibility of employing waste pickers as workers at the material recovery facility to be installed next to the Mathlemele New Sanitary Landfill will be discussed with the relevant organizations.

2.4.7 Networking Among Recycling Industries in Mozambique (Activity [3-7])

(1) Identification of Recycling-related Actors

It was observed that the current situation of recycling activity and their actors in Maputo City has largely changed after the JICA 3R Project mainly due to the stagnation of the recycling market and the COVID-19 pandemic. Therefore, the JICA Project Team tried to identify recycling-related actors (recycling companies and NGOs) to deepen the understanding of the current situation of recycling activity as well as to identify partners that can receive recyclables segregated by the PP at the CMM offices.

For this purpose, a series of interview surveys to the existing recycling-related actors were conducted, although the survey took longer than expected due to the difficulties caused by the COVID-19 pandemic. Table 32 shows the identified recycling-related actors and their handling recyclable items. As the result of the interview survey, a total of 38 recycling actors were identified in Maputo Region and it was estimated that 8,270 t/year (22.7t/day) of recyclable waste was recovered in average.

Table 32 Identified Recycling-related Actors and their Handling Items

No.	Recycling Actor	Location	Handling Item			
			Plastic	Paper	Metal	Glass
1	TOPACK Moçambique	Maputo	X			
2	Okta Metal				X	
3	Sucata Munguambe				X	
4	Cooperativa COMSOL		X	X	X	
5	Recicla		X	X		
6	LIMETAL-VULCANO				X	
7	Facobol - Fabrica Continental de Boracha, S.A					
8	Recsol		X	X		
9	LIDÍA MADUSSE RESÍDUOS, EI		X		X	
10	ARTELINDA UCHOUANE, EI		X	X	X	
11	CONSTANCIA EUGENIO RESÍDUOS, EI		X			
12	NÉRIA RUPIA RESÍDUOS, EI		X			
13	Sombra Matsinhe		X	X	X	X
14	Cooperativa de Educação Ambiental Repensar		X		X	X
15	Recic Moz Lda		X	X	X	
16	Aqua Pet Reciclagem	Matola	X			
17	METAL POCESSING SOLUTION, LDA				X	
18	Gravita Mozambique LDA					
19	Africa Scrap E.I.					
20	Recoleta MM		X			
21	Replac		X			
22	Shenxian Plastic Recycling		X			
23	3R-Reduzir, Reusar e Reciclar Limitada		X	X	X	
24	HOMBE SCRAP METAL, LDA				X	
25	SÓ RESÍDUOS					X
26	EMILIA CUMBANE RESÍDUOS. EI					X
27	ADELAIDE MACHAGUANE RESÍDUOS. EI		X			
28	Centro Ecológico de Reciclagem (EcoNsila)					X
29	Matola Start Recicla					
30	HIGHLIGHTER, LDA		X	X		
31	United Distillers, LDA					X

JICA Project Team

No.	Recycling Actor	Location	Handling Item			
			Plastic	Paper	Metal	Glass
32	Recycling For Future		X	X		
33	MOZ Cleaning Logistics and Trading		X			
34	Moçambique Recicla		X	X	X	
35	Ecocentro da Macaneta	Maracuene	X		X	X
36	Facilita Gestão e Serviços, EI		X	X	X	X
37	Minete Limpezas e Serviços		X			
38	Associação Chonga Marracuene		X			X

Source: JICA Project Team

(2) Recycling-related Actors Networking Meeting

The JICA Project Team supported DSMAS to hold the recycling actors networking meetings periodically with the identified recycling-related participants with an intention to serve as a platform for reporting on the activities of each actor and discussing recycling promotion measures in cooperation with the DSMAS. It was also encouraged that DSMAS takes the initiative and organizes a permanent conference body with the recycling-related participants to continuously hold the recycling forum after the project.

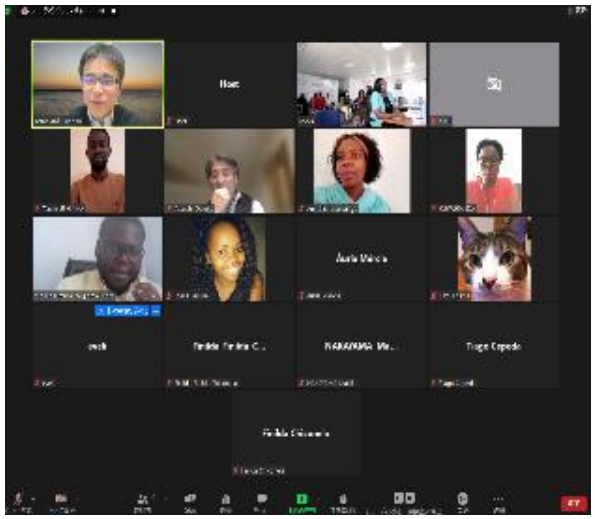
During the project period, the recycling actors networking meetings were held seven times and their outline is summarized in Table 33, and the scenery of the meetings is presented in Figure 35.

Table 33 Record of Recycling Actors Networking Meeting

No.	Date	Main Agenda	Major Discussion
1st	2 February 2022	· Introduction of the JICA project · Discussion on measures to promote recycling in Maputo	· It was agreed to continue holding the meeting and exchange information, experiences each other.
2nd	28 March 2022	· Recycling activity promotion by AMOR. · Proposal on applying a digital platform (KOLEKT) for promotion of recycling.	· It was discussed that informal transaction of recyclables is an obstacle to promote recycling and it is necessary to formalize the recycling business and activity. · KOLEKT will be a useful tool to formalize and promote the recycling activity.
3rd	24 May 2022	· Recycling activity of waste pickers at Hulene dumping site.	· It was discussed that an association of waste pickers will be necessary to manage and support waste picker's activity and livelihood.
4th	22 July 2022	· Introduction of environmental education and awareness raising activity of DSMAS	· It was agreed that recycling-related actors will cooperate and collaborate in awareness raising activity.
5th	2 November 2022	· Introduction of environmental education and awareness raising activity of MTA	· It was agreed that information sharing should be continued to avoid each actor will implement similar environmental awareness raising activity separately.
6th	15 March 2023	· Composting activity by Zero Waste Moz.	· It was discussed that DSMAS in collaboration with the recycling actors should disseminate and promote home and community composting as it will significantly contribute to waste reduction.

No.	Date	Main Agenda	Major Discussion
7th	May 2023	· Results of recycling situation survey in Maputo City.	· It was agreed among the participants that DSMAS in collaboration with recycling-related actors should continue the recycling situation survey annually and establish a platform to promote networking of recycling-related actors.

Source: JICA Project Team



First Meeting Introduction of JICA Project

Second Meeting: Presentation by AMOR

Third Meeting: Presentation by Waste Picker Leaders

Fourth Meeting: Presentation by DSMAS

Sixth Meeting: Presentation by Zero Waste Moz.

Seventh Meeting: Presentation by AMOR

Source: JICA Project Team

Figure 35 Scenery of Recycling Actors Networking Meeting

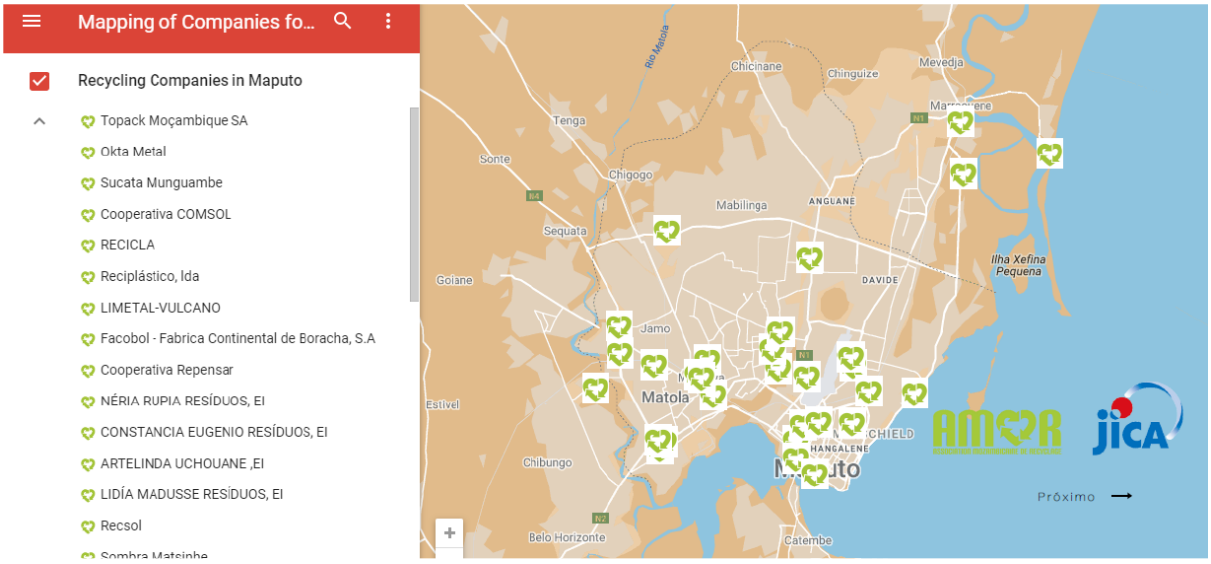
2.4.8 Study Incentive Mechanism for Promoting Recycling (Activity [3-8])

Based on the results of the Output 3 activities, the JICA Project Team examined an incentive mechanism to further promote recycling activities in Maputo City. Based on the basic approach presented in the revised M/P, the three policy measures, which are 2) regulatory measure, 2) incentive measure, and 3) information sharing measure, were identified to be essential to further promote recycling activity in Maputo City.

As for the regulatory measure, the regulations concerning source separation was drafted in Activity [3-2] and it is expected to be enacted and the cleaning ordinance of Maputo City will be revised accordingly.

As for the incentive measure, provision of incentives such as reduction, exemption, and subsidy of cleaning tax for recycling-related actors shall be examined during the revision of the cleaning ordinance of Maputo City.

As for the information sharing measure, it is important to develop an information platform to link and connect each recycling-related actor. The JICA Project Team has developed a map, which provides information on locations, contacts, handling recyclable items, etc., of the existing recyclers based on the survey conducted in Activity [3-7] as shown in Figure 36. It is expected that DSMAS, in collaboration with the recycling-related actors, will continuously update the information and utilize it as an information platform for promotion of recycling in Maputo Region.



Source: JICA Project Team

Figure 36 Recycling Actor Information Platform

2.5 Activities Related to Output 4

2.5.1 Prepare a Guideline on Landfill Operational Management including SOP that can be Utilized in the New Sanitary Landfill in Mathlemele (Activity [4-1])

(1) Understanding the status of landfill development in Maputo City

1) Mathlemele New Sanitary Landfill

Mathlemele Sanitary Landfill was expected to be put into service in 2021. However, significant delays in the project schedule were observed. As of June 2023, FNDS and Matola City is still in the process of resettlement for dozens of families living inside the site boundary and only the perimeter wall was built at the site boundary. The JICA Project Team held coordination meetings with FNDS and Matola City to grasp the status and construction schedule of Mathlemele Landfill Project. However, service commencement date of the landfill is still unclear. Figure 37 shows some photos of the Mathlemele Landfill construction site in November 2019.

Perimeter Wall at Site Boundary

Settlements inside the Project Area

Source: JICA Project Team

Figure 37 Scenery of Mathlemele Landfill Construction Site (November 2019)

2) Katembe New Sanitary Landfill

Considering the delay in construction of Mathlemele Landfill and the urgent needs for safe closure of Hulene dumping site, CMM promoted Katembe Landfill development from May 2020 with the support from the WB by PTUM. CMM intends to utilize its public land area in Katembe District to construct a sanitary landfill, and the feasibility study started from 2023 by the WB's consultants. The PTUM project aims to start operation of Katembe New Sanitary Landfill in 2026. Figure 38 shows some photos of Katembe Landfill site in June 2020.

	
Signboard indicating the Municipality's Reserved Area	Candidate Site Area

Source: JICA Project Team

Figure 38 Scenery of Katembe Landfill Candidate Site (June 2020)

3) Hulene Dumping Site

At Hulene dumping site, the heavy rains on 19 February 2018 caused a collapse of the waste pile inside the dumping site, resulting in extensive damage. In response, the Ministry of Environment of Japan supported safety improvement of Hulene dumping site since 2019. The safety improvement measures were applied at a part of the dumping site and its civil work was completed in October 2020. Figure 39 shows some photos of Hulene dumping site in December 2019.

Currently, CMM/DSMAS intends to expand the application of safety improvement measures in the whole dumping site by utilizing the knowledge and experience obtained from the project with the Ministry of Environment of Japan. Besides, it will be necessary to keep Hulene dumping site in service for the next few years considering the delay in construction of Mathlemele and Katembe landfills.

	
Waste Unloading Area	Improvement of Access Road

	
Recyclable Collection Activity by Waste Pickers	Truck Scale

Source: JICA Project Team

Figure 39 Scenery of Hulene Dumping Site (December 2019)

(2) Preparation of Guideline on Operation and Management of Sanitary Landfill

The Guideline on Operation and Management of Sanitary Landfill that can be used as reference material for the concerned agencies of Mozambique was prepared by the JICA Project Team, and attached in this report as Appendix 5-1.

The components of the guideline are shown in Table 34. The guideline includes illustrations such as flowcharts showing the flow of landfill management work and examples of forms such as data management sheets, and check sheets, so that it will be easy to understand and practical for landfill workers. Besides, the guideline was prepared by referring to the "Technical Guidelines for the Implementation of Sanitary Landfill in Mozambique" developed by MTA in 2010.

Table 34 Components of the Guideline on Operation and Management of Sanitary Landfill

Component		Contents
1. Management of landfill for municipal solid waste		The purpose of the guideline and its coverage
2. Functions and facilities of landfills		Outline of each facility of landfill and their functions
3. Management of landfills	Transportation control management	Tasks on waste reception management, waste receiving standards, acceptance inspection items, management methods.
	Landfilling operation management	Management items and methods related to landfill plan, control, and landfill operation.
	Facility management	Management items and methods related to maintenance of landfill facilities.
	Environmental management	Management items and methods related to environmental monitoring at the landfill and surrounding area.
	Safety management	Management items and methods related to traffic safety, landfilling operation safety, health care, accident response.
4. Site management after completion of landfilling		Post landfilling management methods related to leachate, landfill gas, land subsidence, groundwater, temperature, etc.
5. Maintenance practice		Examples of forms such as data management sheets and check sheets

Source: JICA Project Team

2.5.2 Conduct Training Courses for Workers on Landfill Operational Management (Activity [4-2])

JET provided training on landfill operation and management for the counterparts of DSMAS, MTA, and Matola City to enhance their understanding of operation and management of sanitary landfills by utilizing

the developed guideline in Activity 4-1. The record of training is shown in Table 35. A total of 56 staff from DSMAS, MTA, and Matola City participated in the training. Although it was originally planned to conduct on-site training in Mathlemele Landfill, it was impossible to conduct it at the site due to the delay in construction work of the landfill. The training material (presentation) used in the training is attached in this report as Appendix 5-2.

Table 35 Record of Training on Landfill Operation and Management

Date	Trainee	Participants
22 November 2022	DSMAS	25 staff
30 November 2022	Matola City	21 staff
2 December 2022	MTA	10 staff

Source: JICA Project Team

2.6 Activities Related to Output 5

2.6.1 Review, Analyze, and Evaluate Present Financial Management of SWM by CMM (Activity [5-1])

The current financial management system of SWM of Maputo City is primarily the responsibility of the Administration and Finance Section (RAF) under the Administration, Human Resources, and Finance Department (DARHF) of the DSMAS. In this section, the organizational structure, as well as its key players, will be presented as part of the assessment of the current financial management. This is because the financial operation of an organization is largely influenced by the framework under which it operates. The JICA 3R Project, or Phase 1 of the Project, proposed a restructuring of the RAF for a more functional and transparent operations and a brief discussion whether the recommendation was acted upon or not will be made here.

Moreover, the JICA 3R Project introduced several other innovations in the financial management system which resulted to clear impacts on processes and, eventually, on the internally generated revenue especially those under the responsibility of the Proof of Service (PdS). Some of the changes were: the use of templates to simplify recording, reporting and analysis, holistic or participatory approach to budgeting that are based on realistic targets, budget performance management by income and expenditure monitoring, proper cleaning in tax collection through a reliable database that provides correct and updated information, and better information-sharing from the Electricidade de Mozambique (EDM), the country's public electricity enterprise, which also collects and remits to the sector the cleaning fee from households and enterprises through the monthly electricity bill. This section reports whether the changes introduced were sustained.

As a caveat, since the first two years of the project were affected by the pandemic, the online off-site work proved to be especially challenging for the Finance Team of JET in obtaining timely data and records from the counterparts. However, toward the middle of 2022, the situation in Maputo has returned to almost in the pre-pandemic situation and on-site work had been more viable.

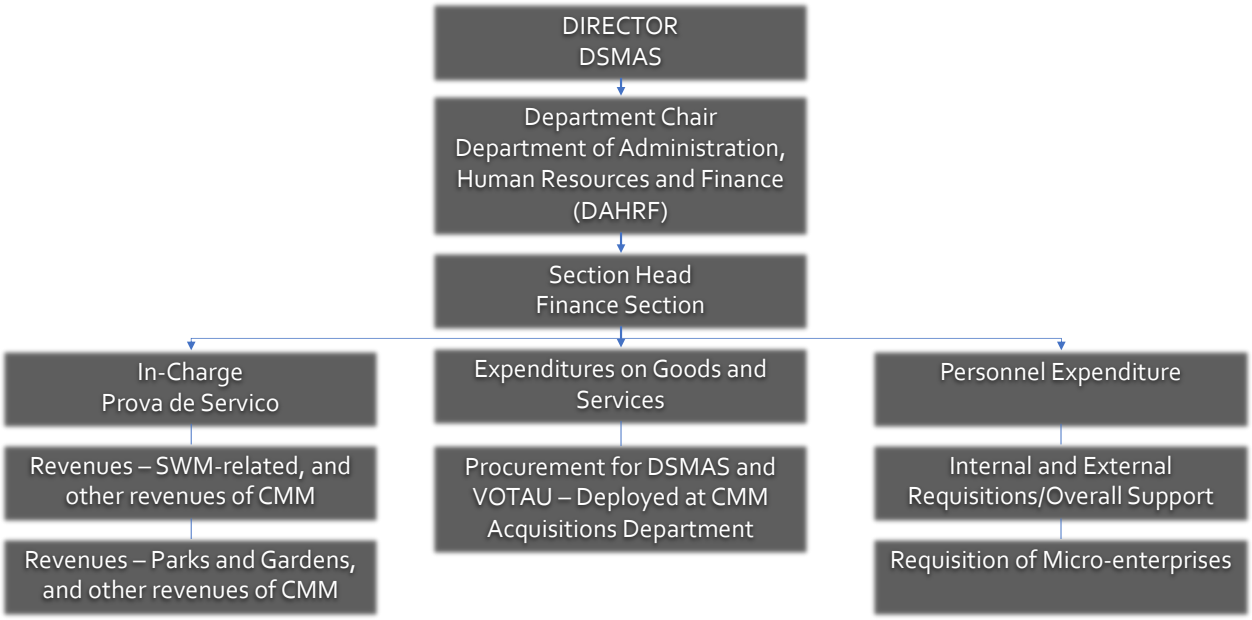
(1) Administration and Finance Section (RAF)

Figure 40 provides the internal organizational structure under which the financial management of the SWM operates. Financial operations are under the DARHF whose chief directly reports to the director. One of the very first activities of the JET Finance Team during the deployment in January 2020 was meeting the key people in-charge of finance in DSMAS. For the duration of the Project, working closely with DARHF, particularly the Finance Section and PdS, was done. Benefiting from the good relations created in Phase 1, meetings, data sharing and discussions with the counterparts had been less challenging during this Project.

The entire directorate experienced a restructuring in 2019, or before the beginning of the Project. With the restructuring, the RAF likewise experienced major changes, starting with the replacement of the Chief of DARHF, who had been in the position for six years. The new chief used to be with the now-defunct Department of Planning and Monitoring (DPM), and was working on contracts monitoring. And while experience on financial management had been limited, the new chief of the department showed keen interest

and commitment in understanding the financial operations of the sector and in working closely with the RAF, as well as the JET.

From Phase 1, there were worth-noting changes in the organizational structure under which the financial operations are conducted. One of these was the removal of the PdS as a distinct unit which was previously under the DPM but strongly linked with RAF. It was reduced to a specific task under a technician or staff when the DSMAS was restructured. Another change that happened was the deployment of DSMAS procurement officers to CMM that reported directly to the Acquisitions Department.



Source: JICA Project Team

Figure 40 DSMAS Finance Section (RAF)

In the 3R Project, it was recommended that the RAF should create subsections to organize and simplify its operations. The subsections recommended were: (1) Budget, (2) Revenue or Treasury, and (3) Accounting --- all three with distinct but clear and interdependent functions. However, this recommendation has not been acted upon. Looking at Figure 40, the RAF remained to be a section that contains staff with individual tasks and almost disconnected responsibilities. Management level meetings at the DSMAS continued to be undertaken but no departmental meetings in DARHF are done regularly. Section meetings are likewise only called very infrequently, resulting to communication gaps. Problems resulting from a lack of proper communication in an organization can range from the simplest to the most severe.

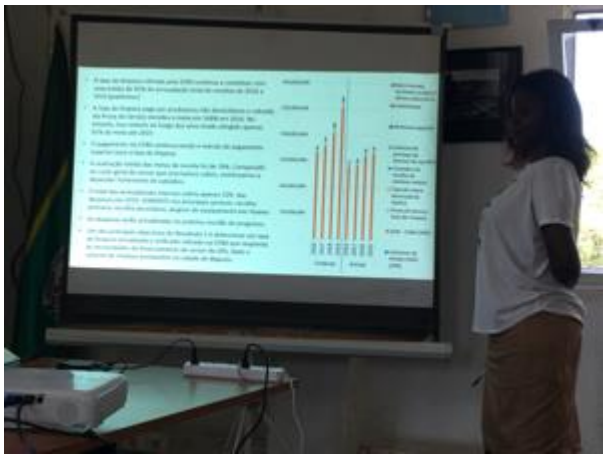
One example that DSMAS can learn from with regard to open communications in the workplace was the situation that happened in the PdS. In early 2022, with the joint work conducted by JET and the counterparts, it was found out that the invoicing system at the PdS for Hulene dumpsite tipping fee continued to charge the old fee of MT 75 per ton, instead of MT 97.5 which was enforced in July 2015. Because of this error, the sector lost an estimated MT 3.9 million in revenues, annually. Apparently, this was already known by the IT technician earlier on and attempted to correct it. However, because the invoicing system can only be rectified by a service provider, which did not have a work contract with DSMAS, the problem was not resolved. Moreover, while the technician informed his immediate supervisor, the issue was not communicated to the management, and was therefore not elevated as a serious matter that needs to be corrected immediately. With the insistence of JET, the matter was given attention in the second and third quarters of FY 2022. The PdS in-charge, as well as the technician, were required to give clarification to the management through a report. The correction was finally made in June 2022, or seven years after the invoicing system was installed, and a possible total loss in revenue amounting to MT 27.3 million. It was

observed that RAF sections perform tasks almost as if work in finance is isolated, instead of working interpedently. People tend to keep to themselves work-related concerns instead of discussing them in the open.

As a first step towards resolving the issue on communications, JET introduced Monday morning meetings in the RAF. This was a good starting point in easing the communication lines among staff and supervisors. These Monday morning meetings are a replicate of the JET meetings done at the beginning of each day to talk about various matters like tasks for the day and whether assistance from colleagues is needed. The Monday meetings in RAF only expected a sharing four things, at the minimum: (1) how their weekend was, (2) how they are feeling today, (3) what are the work to be done by them for the week, and if necessary, (4) what help would they need from their colleague/s to undertake their tasks. When RAF began holding these weekly activity, behavioral changes were observed such as having more confidence of the section head in calling a meeting to order, a more relaxed relationship among the staff, and quicker resolutions of small work-related concerns.

(2) Use of Templates to Simplify Recording, Reporting, and Analysis

During the 3R Project, basic financial data collection was very challenging as reports and records were not uniform, and some were not recorded in an appropriate spreadsheet program. At the time, there were delays for JET to organize the financial data, on top of the time it took for the RAF to collect and provide these data. Thus, templates were devised to simplify the recording, reporting, and the analysis of data. The templates devised were the (1) Revenue Updater, the (2) Budget and Expense Tracker, and the (3) Activity and Budget Planning Model. (Figure 41)



Ms. Rosa presenting an Analysis of Revenues during the Fourth Progress Meeting

CONSELHO MUNICIPAL DE MAPUTO
DIRECCAO MUNICIPAL DE AMBIENTE E SALUBRIDADE
REPARTIÇÃO DE ADMINISTRAÇÃO E FINANÇAS

BALANCETE DE RECEITA DE JUNHO DE 2020

		DOTACAO (MT)	TOTAL DE RECEITAS (MT)	%	SALDO MT
	Receitas				
	Receitas nao Fiscais				
	Coimas e Multas	641,921.00	120,387.99	19%	521,535.01
	Cobranca de Multas DMSC (30%)	641,921.00	120,387.99	19%	521,535.01
	Tarifa e taxas pela prestação de serviços	318,525,143.00	71,754,974.82	23%	246,770,168.18
	A Recolha, depósito e Tratamento de Lixo	318,525,143.00	71,754,974.82	23%	246,770,168.18
	EDM - Cliffal (95%)	294,117,647.00	64,843,969.80	22%	229,273,677.20
	Prova de Servico, Taxa de Limpeza	14,695,446.00	5,146,358.78	35%	9,549,087.22
	Taxa de Usetra Municipal de Hulene	2,998,306.00	527,439.74	18%	2,470,866.26
	Contratos de recolha de residuos solidos	5,280,997.00	777,308.50	15%	4,503,688.50
	Licencas de provisao de servicos de recolha	1,032,747.00	407,900.00	39%	624,847.00
	Remocao especial	200,000.00	51,998.00	26%	148,002.00
	Incineracao	200,000.00	-	0%	200,000.00
	Patrimoniais	1,560,000.00	165,000.00	11%	1,395,000.00
	Bens imoveis, incluindo rendas e aforos sobre terra	1,560,000.00	165,000.00	11%	1,395,000.00
	DIAGRU	1,560,000.00	165,000.00	11%	1,395,000.00
	TOTAL DE RECEITAS	320,727,064.00	72,040,362.81	22%	248,686,701.19

Revenue Updater Model Still Currently Utilized in Checking SWM Incomes

Source: JICA Project Team

Figure 41 Use of Templates to Simplify Reports and Analysis

Among the three templates, the Revenue Updater was consistently utilized by a project counterpart and in-charge of revenues in RAF. The counterpart in charge would fill the template monthly, as introduced in the 3R Project. Because of this, JET was able to promptly obtain all monthly revenue data from 2016-2019, and in the ensuing months of 2020. The counterparts continued the practice of this learning from the 3R Project --- as well as the observed improvement in confidence when presenting to an audience, as compared with the meekness that was observed during the previous project --- is highly commendable.

The Budget and Expense Tracker, as well as the Activity and Budget Planning Model was not used as regularly as they hoped after the conclusion of the 3R Project, or from 2016-2019. The CMM has developed a similar template on checking expenses with respect to the budget, which is mandatorily filled by the RAF. Nonetheless, JET and the counterparts continued to use the Budget Tracker Model to facilitate the presentation and analysis of the expense data monthly, with the JET local staff recording data as soon as

they are made available by the counterparts. The Budget Tracker Model continues to be a very useful template in putting together the monthly details and visually seeing the periodic performance of the budget in terms of expenditure versus the approved.

In the preparation of the 2021 and 2022 budgets, JET intended to observe the use of the Activity and Budget Planning template during the budget seasons. However, this did not become possible with the restrictions brought by the COVID-19 pandemic.

(3) Holistic or Participatory Approach to Budgeting that are Based on Realistic Targets

In relation to number (2), the 2021 budget preparation of the DSMAS, that was to be led by the RAF, was truly anticipated by JET, from the onset of the Project. But observing the process, it did not become workable. In the M/P, the budget planning procedure was recommended to be in two phases, i.e.: Phase 1 to commence earlier than the release of CMM's budget call to ensure that a participative approach to activity and budget planning is conducted, and Phase 2, which was to be compliant to CMM's methodology for the Development of Activity Plans and Budget Proposals, and will follow the schedule set for all organic units or departments in the CMM. The Activity and Budget Planning template was intended to be used intensively in Phase 1, while Phase 2 was supposed to commence with the budget call. However, with the rearrangements in work schedules and the seemingly crammed working time due to the COVID-19 pandemic, this became unviable.

Nonetheless, as soon as JET was informed of the commencement of the budget season in late August, support was promptly provided and the counterpart in charge began doing the rounds in consulting with department chiefs to ensure that the budget proposal being drafted considered all necessary activities to be undertaken in 2021. The CMM's communication on the budget preparation process came in a short notice, and the timeline to prepare (about eight working days) was limiting, to say the least. Moreover, the Action Plan, which is one of the major concerns of the Output 1 activity, was discussed in detail with the counterparts to know whether activities could be funded given the budget caps set by the CMM for the sector.

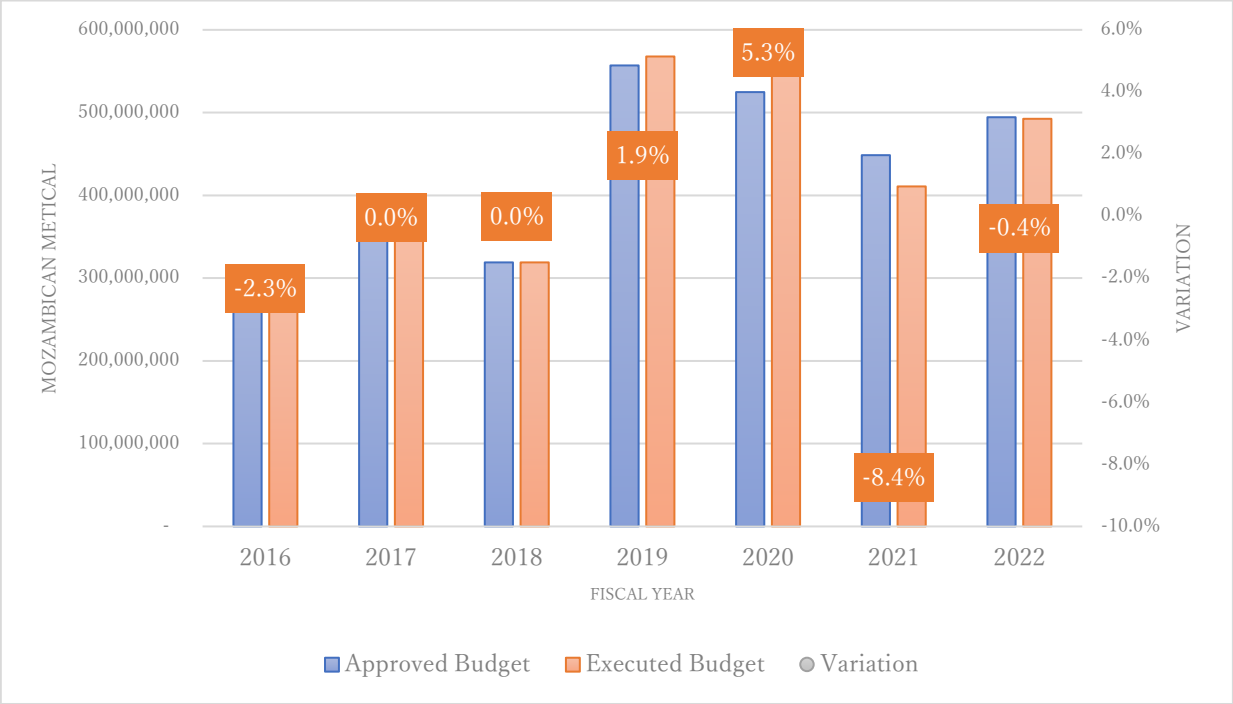
The year 2020 had been a year of lessons and the learnings will be used for a more strategic approach to 2021. Lesser travel restrictions in 2021 made it possible to observe budget planning sessions in 2021. JET had the opportunity to sit during the DSMAS budget and activity planning for the next fiscal year. Once again, only a few days had been allotted from the budget call to the deadline for the first consolidated budget and activity plan. DSMAS devoted three full days on May 19 to 21 to comply with the CMM deadline. Budget caps were clearly identified in the budget call, such as limitations for Personnel, and Goods and Services. Budget cap for Capital Investment, which is handled directly by the CMM, was set at MZN 544.5 million for 2020, which was divided among three Directorates, including DSMAS, of which 45%, or MZN 246 million, was allocated to waste management sector.

Critical during this period was looking at the proposed Hulene operations funding that will expand safe-landfill operation and management to the entire dumpsite for implementation in 2022. The proposal amounted to MZN 205 million, which will be funded under Capital Investments. The bids for this activity had been launched without proper information within the DSMAS, as well as with the Procurement Section lodged at the CMM. Several meetings were initiated by JET for clarifications on the TOR and the Bill of Quantities (BOQ) with the presence of DARHF (RAF), Procurement, and the DSMAS directors. In the succeeding follow-ups on the evaluation of the bids, the RAF simply mentioned that they will leave the finalization of the budget sources, implementation, and who will be the responsible entity to the CMM. After all, they have little knowledge/or not directly involved in the processes regarding the matter. It has been consistent, as observed by JET, that in the process of developing and evaluating major contracts, only a handful personnel are involved, and those with technical and financial expertise in the sector are left wondering.

(4) Budget Performance Management by Income and Expenditure Monitoring

The Budget Tracker template was a tool developed to monitor whether the financial resources are sufficient to cover the expenses, or if the expenses are already going beyond the budget. The 2016 to 2022 expense

data for Personnel, and Goods and Services accounts, that are under the DSMAS management, are summarized in Figure 42, which were easily organized using the template.



Source: JICA Project Team

Figure 42 DSMAS Approved and Executed Operating Budgets, 2016-2022

A massive jump in budget and expenses was likewise observed from 2018 to 2019. This was influenced by two major factors: (1) the 2018 incident at Hulene dumping site, which prompted the CMM to intensify the contractor's work as well as other related activities, and (2) as the containers filled quickly, the DSMAS saw it fit to make transport and collection of wastes in the urban and suburban areas a 24-hour activity, and not just during nighttime. These changes doubled the efforts of the two major services of the sector, which also caused a doubling of funding requirements in 2019 and was carried over to 2020.

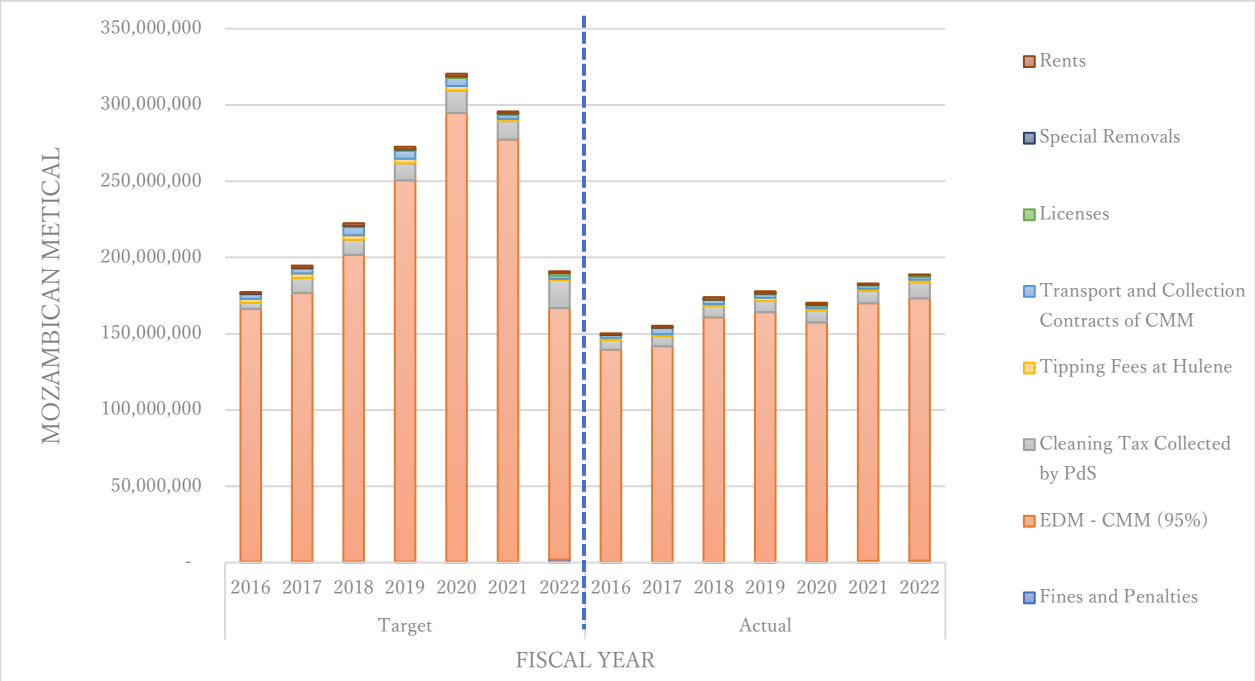
It is also worth noting that variations between approved and executed budgets were modest, or less than the absolute value ± 10%, compared with the variations in Phase 1, which would exceed ±30%. This signifies more prudent budget planning that is based on realistic goals. The biggest variance was in 2021, with actual spending, which is lesser by -8.4% than what had been planned due to lower revenue collections from the previous year that had been heavily impacted by the pandemic. A drop from the increasing spending trend was also seen this year resulting in the overall economic constrictions. Appendix 6-1 provides the annual summary of operating expense accounts from 2016 to 2022.

(5) Proper Cleaning Tax Collection

Figure 43 shows the targets and achievements of the sector with respect to internally generated revenues. The quick collection of revenue data is made possible by the consistent use of the template developed in Phase 1 by the counterpart in-charge of revenues. Revenue targets are shown on the left-side panel, while actual collections are on the right side. It may be seen that actual collections have fallen short of targets. This shortfall averages at 29% over the seven-year period, or a collection performance of 71%. The revenue targets, especially on SWM fee collection that have been previously set by the DSMAS, had always been unreasonably high and with unclear basis. JET proposed for a more realistic target-setting based on data and previous performances as well as any policy change that would impact on the revenue collection. This was started in 2022, which then showed a more favorable revenue collection vis-à-vis realistic target. Revenue

and cost targets, as emphasized by the Project, must always be based on current policies, reliable data, and assessment of actual past performance.

It should also be noted that, consistently, EDM-collected cleaning tax has contributed 92% of the total revenues of the sector from 2016 to 2022. This fee collection system, through the electricity bill, has proven to be the most efficient.



Source: JICA Project Team

Figure 43 Revenue Trends: Targets and Actual Achievements in 2016-2022

While acknowledging the efficiency of the cleaning fee collection via the electricity company, time and again, JET and RAF have pushed for more data-sharing from the EDM instead of just mere reporting of the amounts that have been remitted. It should be noted that the EDM is under a service contract with the CMM, wherein 5% of the total collections are retained by the company as a service fee. Information such as number of connections per consumer type, number of new connections per consumer type, payments collected per consumer type, among others, can help RAF in its assessment and forecast of revenues as well as in policy-changes to recommend. This effort in pushing for more transparent reporting from EDM as a service provider has been elevated to the City Council on 6 December 2022. Appendix 6-2 provides the annual summary of operating revenue accounts from 2016 to 2022.

(6) A reliable Database that Provides Correct and Updated Information

The PdS plays an important role in the sector in a way that it is the gatekeeper of various information that are key to the financial management of SWM. In October 2020, the PdS has begun to be the "collector" of proofs of payments for all CMM services, and not just pertaining to SWM.

However, the database system in the PdS has been facing a lot of failures that has marred the integrity of data and reports generated by it. This includes slowness in response time, making it difficult to hasten processes when servicing the districts. Companies that request the cancellation of activities and termination of services are inactivated in the system, but when generating invoices, these are again included. The system also does not issue invoices for some avenues such as Av. 24 de July and 25 de September. The system continues to duplicate registrations, thus, as of August 2020, the registry of companies reached over 9,000 but, in fact, the number could be less considering the duplications, which results to printing of more invoices

than necessary. This adds to both time and cost. The reports are also not organized according to the categories of companies and type of fees paid.

The DSMAS has been pushing for a system repair and maintenance contract, but this has been unheeded. On 10 August 2020, the director once again submitted a letter to the CMM, with reference to the IT system developer, Intellica. In its formal communication, the issues were enumerated as well as the proposed improvements.

In February 2020, JET explored the generated reports of the PdS in detail. It was found that there also appeared to have been a massive misclassification of companies again, when it comes to waste amount generation and the corresponding fee to pay. For example, using the limited information provided by the PdS, it was seen that about 20% of the registered companies again reported zero-kilogram waste generation.

The situation was almost similar to what was already rectified in the 3R Project. Because of this, an emergency meeting was called for on 17 February 2020 as shown in Figure 44. While it cannot be concluded that the misclassifications were again deliberate or not, the RAF and the PdS staff decided that it was only appropriate to correct the massive errors. The strategy proposed was that the supervisors (fiscais) will verify the information of the companies by visiting them, but this time, to ensure that no errors will be made, a technician will accompany each supervisor.

Emergency Meeting at PdS (17 February 2020)

Meeting with RAF and PdS (21 February 2020)

Source: JICA Project Team

Figure 44 Meetings on PdS Concerns

Several internal deliberations within DSMAS were conducted to finalize the strategy. This activity was met with opposition from the supervisors because of the complexity of the work involved. To date, this rectification of information did not progress, with the COVID-19 pandemic as the primarily cited reason.

JET continued to work with the PdS, RAF, and other relevant personnel in looking into the processed raw data (as of May 26, 2021) from the database system. The system continued to have issues that were already relayed to management in 2020. For this year, the company which installed it, Intellica, has a service contract with DSMAS to resolve the issues. Three rounds of meetings on PdS were conducted to ensure that:

- The DSMAS will be able to clearly identify to Intellica which of the aspects in the database, including the reports that the system creates, have issues that need to be resolved;
- Clarify the confusions in the categories of PSPs, non-domestic large waste generators, etc.;
- To discuss issues on the CMM-contracted collection and transport services; and
- Identify any other issues, and discuss workable solutions.

An in-depth look into the PdS database resulted to the following findings in 2021.

Table 36 Findings from the PdS Database

PdS Dataset	Specific Concerns/Findings
Registry of Non-domestic Waste Generators	· Out of 10,000 entities, 272 or 3% has inactive status but continued to be invoiced (paper printing, etc.) · Private service providers or PSPs, numbering to 425, were allotted a unique category *Provedores*, separate from categories A to E, which are the legislated categorization of non-domestic waste generators; of this, 14 were inactive. Except for the cleaning that is collected automatically by EDM, the PSPs appear to be exempted from the cleaning fee, as they are not classified according to waster generation and corresponding waste fee that is imposed on non-domestic waste generators, which is according to law. · Removing all inactive entities from the database, 87% are categorized under E, or the lowest category of producers with estimated waste generation of 25 kg/day. · Errors were found in categorizing companies according to economic activity. · Of numerous international non-government agencies, diplomatic offices and similar institutions, only 12 are in the registry.
CMM Contracts on Transport and Collection	· Of 52 CMM contracts in the registry, only 36% or 70% are active. · Among those with active status, six have already expired in 2020, while 14 were to end in 2021. This means only 16 contracts for 2022 were anticipated. · While JET finance team did not focus on CMM-contracted services for transport and collection of waste, it has been discussed with the counterparts that this is more a cost center to the sector instead of a revenue-generating endeavor with an average contribution to revenues of only about 1% annually, but takes a significant amount of the budget in terms of fuel and acquisition of goods such as containers. A proper cost-benefit analysis of this activity must be undertaken.
Licensed Private Service Providers, and their reported Clienteles	· The PSPs registered (425) in the database, only 40 reported a list of clienteles. · The total clienteles from those that reported was less than 2,000, or barely 1/5 of the total registered non-domestic waste generators in the city
Companies Licensed to Manage Own Waste	· Of the 653 cases in the registry, 160 were found to be mere duplicated entries. · Errors in reporting waste volume capacities of companies which ranged from 0 ton to 1 million tons. · No conclusion as to how to categorize recycling companies --- are these PSPs which should provide a list of clienteles and be licensed as such? or non-domestic waste generators and must be classified from to A-E or based on waste generation?

Source: JICA Project Team

Although there are so many issues related to weak monitoring of PSPs, human errors in data input, confusions within the PdS as to classifying entities, and non-diligence in recording, the technical part which pertained to the operations of the system itself was elevated to CMM finally in April 2022 with the insistence of JET. Those that were present were the Directorate of Municipal Services of Communication and Information (DSMCI), which also invited Intellica, the service provider for the database system, and of course the directors and technicians of DSMAS.

In CMM, all IT-related concerns, including service contracts are managed by DSMCI for about two years now, employs Intellica as the service provider. Apparently, the DSMCI has not been aware of DSMAS' formal letter to CMM in August 2020 about the issues on the database system, and even with the fact that

the PdS technician has, for several occasions, verbally relayed the issues to DSMCI. Moreover, it appeared that the DSMCI was not also fully aware of the conditions of its contracts with Intellica, as far as DSMAS PdS is concerned. No monitoring of the IT service contract of Intellica was done on the last two years which brings the question "*how did the firm, Intellica, continue to get paid*"? DSMAS also had no opportunity to provide neither assessment nor opinion on the service contract and approval of invoices on work done, as the beneficiary of the contract because they were unaware of it. During the meeting, DSMAS had to ask for a copy of the service contract as the DSMCI officials (director himself) appeared surprised that the contract had not been provided to DSMAS

Moving forward, among the various agreements made during the first meeting were the creation of a Task Force by Intellica that would work at DSMAS to resolve the issues with the in-house technician.

2.6.2 Propose a Financial Plan for Ensuring Cost Recovery of SWM by CMM (Activity [5-2])

(1) Review of M/P Recommendations: Revising the Cleaning Fee Structure

One of the initial activities of the JET was to review the recommendations set out in the M/P particularly in the cost-recovery for the sector. The M/P review with the finance counterparts as shown in Figure 45 made them re-appreciate the work done in the past and be on equal footing with JET as to the methodologies, strategies, and recommendations for the financial operation of the sector.

Collection of the cleaning fees from domestic waste generator, or households, is made easy through automatic inclusion in the electricity bill by the electricity company, Electricidade de Mocambique (EDM), whether the domestic consumer has a postpaid or prepaid account. The current fees are based on consumption levels low, medium, and high and an analysis conducted in the 3R Project showed that the current fee structure unfairly burdens the poorer households more than the wealthier households. The same situation was seen on large waste generators with varying levels of activity. Hence, a more equitable or fair unit pricing was determined by first finding the relationship between waste generation and electricity consumption, and then the city's cost of SWM. The simplicity and forthrightness of the proposed methodology was appreciated by the DARHF and agreed on its effectivity to potentially achieve cost-recovery for the sector.

Source: JICA Project Team

Figure 45 Meetings on Review of M/P Recommendations

Although the proposed methodology was already approved in the M/P, it was important to revive the enthusiastic discussions on cost-recovery using the more equitable and effective cleaning fee rate during the 3R Project. The interest and support of the DSMAS was important as it will champion the strategy and present to the decision-makers at CMM. To prepare the RAF, reliable SWM cost information as well as database from PdS and the EDM was important to update calculations for the cleaning fee unit rate. It was likewise critical to touch base with CMM Finance on this aspect.

(2) Payment of Cleaning Fee by Large Waste Generators

Businesses that generate a large amount of waste as a by-product of their business activities are subject to cleaning tax based on the estimated amount of waste generation in addition to the cleaning tax based on electricity consumption. With the technical support in the 3R Project, registration and billing work for business waste generators, and calculation of the amount of cleaning tax according to the type and the scale of business were supported and strengthened, and it has improved the business waste cleaning tax revenue by 2.3 times. However, DSMAS is still unable to collect proper cleaning tax from many business waste generators. For this reason, the revised M/P proposes to introduce the business waste cleaning tax collection (billing and payment) system through WCSP. However, this activity further explored in collaboration with the Activity [2-5] under Output 2 of the Project.

(3) Developing the Financial Sustainability Strategy

One of the key results of the Project was the Financial Sustainability Strategy for the sector, which basically is the culmination of all the works and efforts put forth by JET and the counterparts with regard to financial operations and management.

To make the strategy contextual in Maputo City, a survey on over 400 non-domestic waste generators were conducted in collaboration with supervisors (*fiscais*) of DSMAS. This activity was undertaken to obtain essential data from the private sector as well as perceptions on the city's solid waste management. The factors in calculating the appropriate unit pricing for SWM with respect to waste generation and energy consumption were likewise updated. Because of the preparations, which included numerous discussions with the DSMAS staff and analyses and survey on businesses, the strategy developed is based on the principle of equitability, in which attaining sound financial operations is not about raising fees, but in:

- Correcting current systems;
- Providing mechanisms that would ensure transparency in transactions; and, most importantly,
- Ensuring fairness in the distribution of costs of solid waste management.

	
Internal Discussions with DSMAS Directors	Survey on the Business Sector in Collaboration with the Fiscais

Source: JICA Project Team

Figure 46 Some Preparations Done in Developing the Financial Sustainability Strategy

On the revenue side, the important aspects in financial management that were looked into in developing the financial sustainability strategy were:

- The taxa de limpeza collected by the EDM from both domestic and non-domestic energy consumers in the city;
- The monthly fixed fee collected from the non-domestic waste generators; and

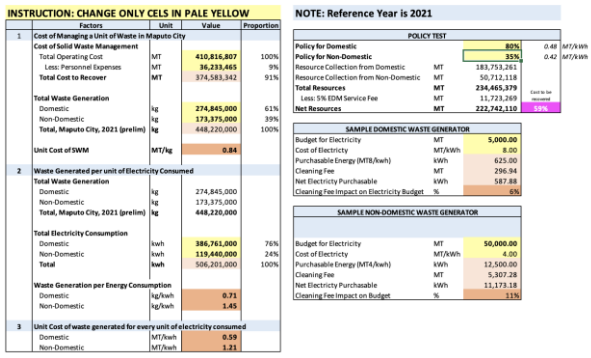
- The prevailing tipping fee and the way it is collected.

Without a doubt, it is equally essential in enhancing the revenue is to optimize the operating cost of the sector. The Finance Team had been consistently presenting to DSMAS that the sector spends 90% of its budget on major contracts. This means that among anything, the DSMAS must focus on contracts management and ensuring that the return to investment is satisfactory. For cost optimization to be possible, the following are recommended:

- A restructuring of the DSMAS that would put emphasis on contracts management as a key department;
- Participation of SWM technical and financial experts in the drafting of the TORs when contracting service, which should include key performance indicators, among others, that set conditions for incentives or disincentives;
- Development of reliable cost benchmarks regarding which proposals may be assessed or compared;
- A transparent bids evaluation that involves financial evaluation of proposals; and
- A systematic monitoring of performance against commitments or targets within defined timeframes.

The financial sustainability strategy has been presented in various discussions with stakeholders and decision makers, including the city mayor himself. In principle, the strategy, which would create significant reduction in subsidy to the sector from medium to long term, had been accepted and welcomed by the city. But the need to institutionalize it through legislation must be put forth.

Dashboard of Results from Different Policy Mixes



Tab on Possible Policy Mix in Setting the SWM Fee for Domestic and Non-domestic Consumers of EDM

Source: JICA Project Team

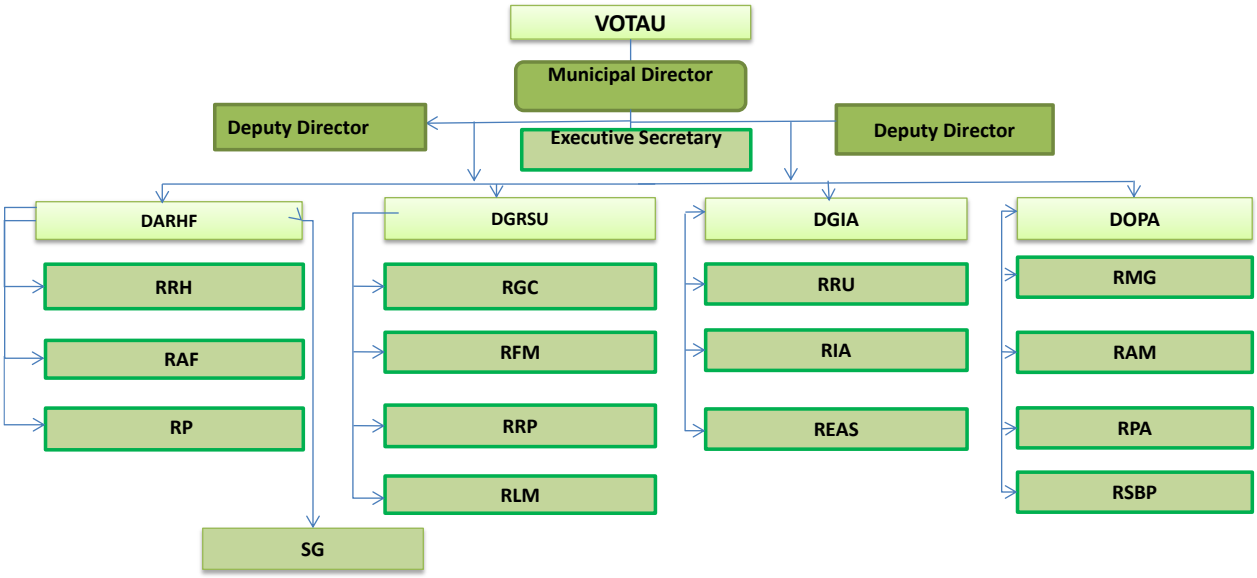
Figure 47 Images from the Quick Scenario Calculations Worksheets

The Project prepared a spreadsheet tool on MS Excel that may be used by DSMAS and CMM in its future discussions on financial sustainability for the sector. Some of the tabs are presented in the illustration above. Moreover, Appendix 6-3 presents the strategy in a Quick Read format, which was likewise prepared by the Project for an easier understanding of the strategy, including the preparations and analyses done to arrive at it.

2.6.3 Review, Analyze, and Evaluate Present Organization and Institution for SWM in CMM (Activity [5-3])

(1) Analysis of Organizational Structure of DSMAS

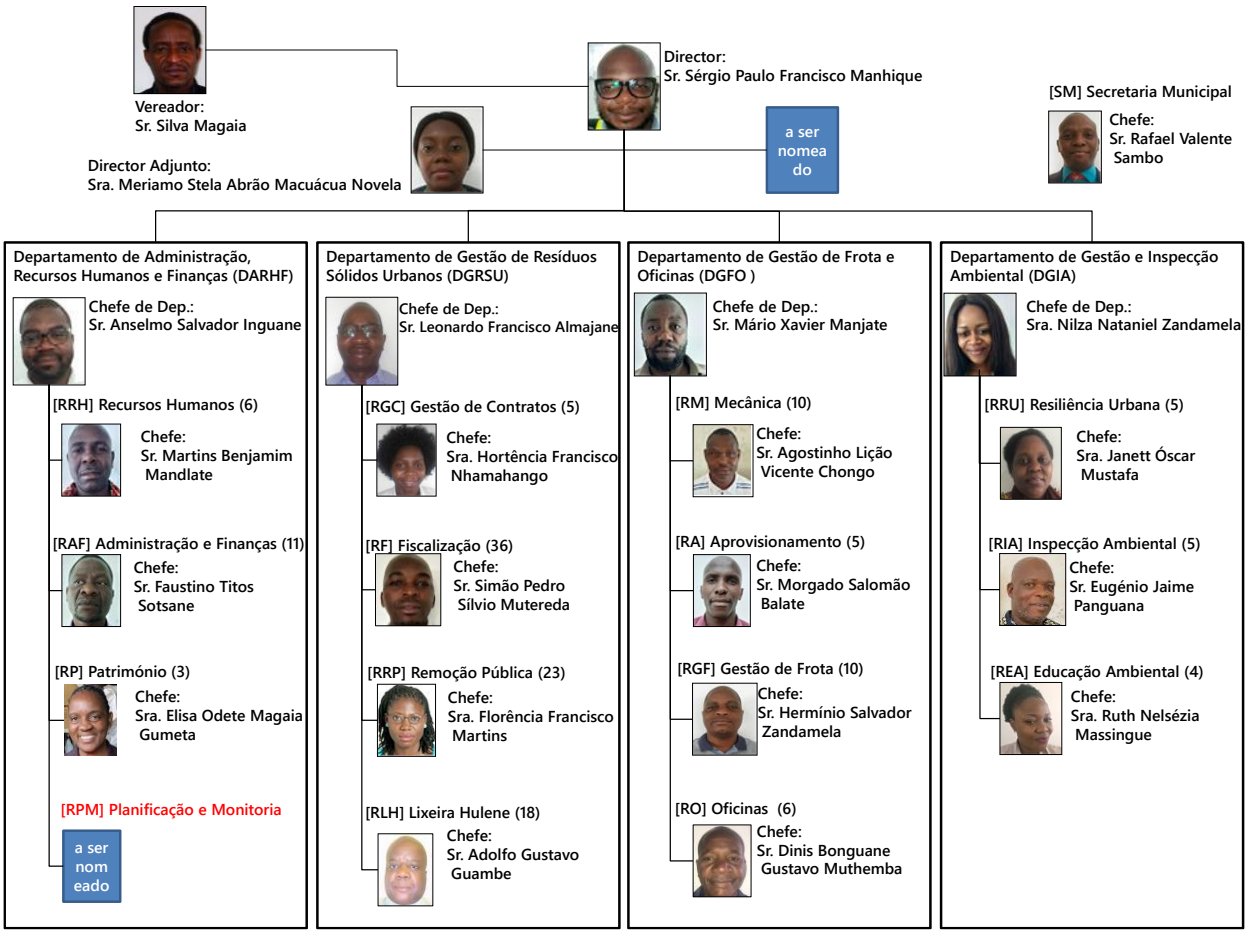
DSMAS consists of the departments responsible for SWM under the former DMSC and the department responsible for environmental management under the former Directorate for Urban Planning. The organizational reform of CMM was approved in February 2019 and DSMAS started its operation from August 2019. It is regarded that CMM partially realized the proposed measure on organizational improvement set out in the approved M/P. The current organizational structure of DSMAS is shown in Figure 48.



Source: DSMAS

Figure 48 Organizational Structure of DSMAS

In the beginning of the Project, the main counterparts of DSMAS such as the department heads and the section chiefs were confirmed, and the organizational chart was prepared. The chart was utilized to identify appropriate counterparts to oversee specific project activities considering the job description of each department and section and to form task teams for each activity. The JICA Project Team continuously updated the chart as necessary if there were reorganizations and personnel changes of DSMAS, and the latest organizational chart as of June 2023 is shown in Figure 49.



Source: JICA Project Team

Figure 49 Organizational Chart of DSMAS Main Counterparts

The JICA Project Team further analyzed and assessed the organizational structure and the job descriptions of each department and section of DSMAS from the viewpoint of whether it is consistent with the direction of the organizational development plan set out in the M/P, and findings and recommendations were reflected in an organizational development plan formulated in Activity [5-5].

(2) Analysis of Legislation on SWM

In the beginning of the Project, Chapter 2 of the M/P (Legislation on MSWM) was reviewed, and the status of enactment and revision of CMM regulations related to SWM to date was studied. As a result, the JICA Project Team has identified the national laws and regulation on SWM as well as CMM ordinances and resolutions related to SWM as listed in Table 37 and Table 38.

Table 37 List of National Laws and Regulations Related to SWM

No.	Title	Ref. No.	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 Subject to Local Autarchies	7	1997
4	Legal Framework for the Finances and Assets of Local Authorities	11	1997
5	National Environmental Policy	5	1995
6	Environmental Law	20	1997
7	Regulation on Biomedical Waste Management	8	2003
8	Regulation on Environmental Inspection	11	2006
9	Regulation on Waste Management	13	2006

No.	Title	Ref. No.	Year
10	Regulation on Hazardous Waste Management	83	2014
11	Regulation on Urban Solid Waste Management	94	2014
12	Directive on Construction, Operation and Closure of Controlled Landfills	18	2014
13	Regulation on Management and Control of Plastic Bag	16	2015
14	Regulation on Extended Responsibility of Producers and Importers of Packaging	79	2017
15	Regulation on Environmental Quality Standards and Effluent Emission	67	2019
16	Regulation on Process of Environmental Impact Assessment	54	2015
17	Regulation on Prevention of Pollution and Protection of Marine and Coastal Environment	45	2006

Source: JICA Project Team

Table 38 List of CMM Regulations Related to SWM

No.	Title	Ref. No.	Year
1	Municipal Cleaning Ordinance	15	2004
2	Urban Solid Waste Cleaning Ordinance in Maputo Municipality	86	2008
3	Regulation on the Supervision of Cleaning Activities in Maputo City	87	2008
4	Regulation on the Private Sector Participation in the Cleaning of Maputo Municipality	88	2008
5	Regulation on the Cleaning Components of Maputo City	89	2008

Source: JICA Project Team

The JICA Project Team further analyzed and assessed the legal system on SWM necessary for implementing the various measures indicated in the M/P, and findings and recommendations were reflected in the plan for updating CMM regulations related to SWM formulated in Activity [5-4].

2.6.4 Propose a Plan Updating the Ordinances and Other Resolution of CMM Related to SWM (Activity [5-4])

Based on the results of the review, analysis, and evaluation of the current legal framework on SWM in Activity [5-3], an institutional framework necessary to realize incentive granting measures for the promotion of recycling considered in the Activity [3-8], and the cost recovery measures such as the revision of cleaning tax considered in the Activity [5-2] was examined, and the JICA Project Team sorted out the policy gap with the current ordinances and regulations of CMM. Based on this, a Plan for Updating Regulations Related to SWM in Maputo City was prepared and attached in this report as Appendix 6-4.

As for waste collection and transportation, it was proposed to clarify the classification of waste producers (domestic and non-domestic) in Resolution 86/AM/2008, and for non-domestic waste producers, independently of the quantities or volumes of waste they generate, they shall not discharge their waste in the CMM waste containers but shall engage in waste collection service contracted with licensed WCSPs.

As for the financial aspect, the municipal cleaning fee set in Resolution 86/AM/2008 shall be revised in accordance with the financial sustainability strategy proposed in Activity 5-2. Also, the business waste cleaning tax set in Resolution 86/AM/2008 shall be replaced with 50% reduction in accordance with the financial sustainability strategy. Moreover, the tipping fee at Hulene dumping site stipulated in Resolution 89/AM/2008 shall be revised in accordance with the financial sustainability strategy.

As for promotion of recycling, the draft resolution on the promotion of source separation and recycling, which includes provisions on recyclable waste items, color-coding, container, obligations and responsibilities of waste generators and recycling-related actors, composting and recycling platform and association, etc., should be enacted.

2.6.5 Propose an Organizational and Human Resource Development Plan for CMM/DSMAS (Activity [5-5])

Based on the results of the analysis and evaluation of the organizational structure and the job descriptions of DSMAS in Activity [5-3], the DSMAS Organizational and Human Resources Development Plan was prepared and attached in this report as Appendix 6-5.

The concept of organizational development is to strengthen contract management, financial management, and planning and monitoring functions in DSMAS, and the following nine measures are recommended.

1. Enhancing RGC (Contract Management Section),
2. Re-creation of Proof of Service (PdS) Section,
3. Enhancing REA (Environmental Education Section),
4. Realizing DPM (Planning and Monitoring Department),
5. Create a Management Information System (MIS),
6. Create the Public Information Office (PIO),
7. Optimizing DGFO (Department of Fleet Management and Workshops),
8. Optimizing RRP (Public Removal Section), and
9. Creation of Katembe Landfill Management Section.

Besides, the DSMAS staff database that can be utilized for DSMAS's human resources management and development was created. The information and data included in the staff database are: name, gender, age, date of birth, academic background, field of study, year of service, scheduled retirement year, assigned section, position, rank, record of training.

The following four measures for human resources development are recommended by utilizing the developed database.

1. Balanced staff allocation in each department/section;
2. Personnel transfer based on the expertise and background of each staff;
3. Recruitment of mew staff according to needs; and
4. Selection of suitable trainees for various training programs.

2.7 Activities Related to Output 6

2.7.1 Organize a Working Group on Public Awareness and Environmental Education with MTA and MINEDH (Activity [6-1])

A core working group on public awareness and environmental education was organized within DSMAS. Meetings with MTA and MINEDH were held and commitments of cooperation for future activities have been confirmed. MTA and MINEDH officers were invited to the fourth and fifth Recycling-related Actors Networking Meetings, in cooperation with Output 3, and discussed relevant issues with DSMAS. So far, the main challenges on public awareness and environmental education in Maputo are resistance to the citizens' behavior change, lack of coordination among the organization working on environmental education at schools and including environmental components in the pedagogical curriculum of primary education. Networking with MTA and MINEDH has become the first step to resolve these issues.

2.7.2 Review the Current Status of Public Awareness Activities and Environmental Education in Maputo City and Mozambique (Activity [6-2])

In Maputo City and Mozambique, various entities such as the national government, local governments, NGOs, private companies, etc., are engaged in public awareness-raising and environmental education, and some of them have been collaborating with DSMAS, but many of their activities have not been fully understood. Since the start of the Project, information has been gathered and organized on the activities, organizational structure, budget and financial resources, strengths, challenges, etc., of each entity, through interviews and site visits. Although the activities had to be suspended due to the COVID-19 pandemic, the local staff continued to gather information by phone, online meetings, and the internet. The targets for interview proposed in the inception report are listed in Table 39.

Table 39 Targets for Interview Related to Public Awareness and Environmental Education

Category	Targets
Other department in CMM	Education Department
Central government	MTA, MINEDH
Municipal districts	KaMubukwana and KaMaxakeni

Category	Targets
NGOs	AMOR, REPENSAR, Engenharia Sem Fronteiras, Associação para o Desenvolvimento, ProjA, Construindo uma Geração C-Consciente, Justiça ambiental, kuyuka, LVIA, Livaningo, Centro terra viva.
Private companies	Reciclagem & Serviços, Lda., Reconaice, Muthualo, jovens idealistas

Source: JICA Project Team

The following are summaries of the activities of each target by category.

(1) Civic Education Office, DSMAS

In the 2020 activity plan of the Civic Education Office (prepared in April 2020), the following activities were planned: (1) campaign to stop garbage on the street, (2) environmental clubs at elementary schools, (3) implementation of exhibitions, (4) environmental awareness and beach cleanup campaign, (5) cleanest district contest, and (6) activities to combat COVID-19. Although some activities of the environmental clubs and exhibitions could not be held due to the COVID-19 pandemic, activities that were possible even under the pandemic situation were sought and implemented, such as the cleanest district contest and events held in conjunction with environment-related anniversaries such as Biodiversity Day (22 May). Figure 50 shows photos of activities conducted by the Civic Education Office.

It was unfortunate that Japanese experts could not actually see these activities during their absence due to the COVID-19 pandemic, but information had been gathered as far as possible through C/Ps and local staff. Since the Civic Education Office had a limited number of staff and has already been carrying out a variety of activities, it has been considered improving and expanding its activities while respecting the existing ones.

Guidance and Awareness for Retailers on the Coast (26 December 2019)

Event on Biodiversity Day (22 May 2020)

Source: JICA Project Team

Figure 50 Activities by the Civic Education Office

(2) Central Government

The National Directorate of Environment (DINAB) of the MTA is engaged in environmental education and public awareness related to brown and green issues. In early 2020, several meetings were held between DINAB's environmental education staff and staff of the Civic Education Office to discuss a joint activity plan. The draft joint activity plan includes (1) Realize a meeting with potential partners in environmental education area, (2) Promote environmental education in schools, neighborhoods and markets, (3) Realize campaigns in vulnerable locals, urban solid waste management and disclosure of legal instruments, (4) Celebrate environmental dates, (5) Create a page in social media, (6) Establish partnership with the media, (7) Realize a national seminar on environmental education, as well as (8) JICA's pilot projects on source separation and awareness raising. It was agreed to strengthen the cooperation between DSMAS and DINAB in the field of environmental education during the project implementation.

As for MINEDH, collaboration was achieved mainly through "Project for Expansion of New Curriculum in Mozambique." Since they formulated science textbook for the fourth grade with description of waste issue, MINEDH and DSMAS exchanged ideas about its contents. MINEDH officers were invited to the fifth Recycling-related Actors' Meeting, where environmental education was discussed, various environmental education activities in Maputo were introduced, and advice about educational activities was shared.

As described in Subsection 2.7.1, the project has tried to involve the two ministries in the discussion for the preparation of the action plan and collaborate with them.

(3) NGOs

Although it is necessary to continue the interview survey on NGOs, major NGOs have already been interviewed. The activities of the major NGOs are shown in Table 40, and the photos of interviews and site visits are shown in Figure 51.

Environmental education in elementary schools and awareness-raising activities and campaigns on waste issues were conducted by several NGOs, which are similar to the activities of the DSMAS Civic Education Office, but collaboration and information sharing are not necessarily sufficient. Hence, regular seminars to share information with these NGOs were held during the project implementation.

Table 40 Major NGO's Activities related to Environmental Education and Awareness-raising Activities on Waste Issues

NGO	Activities
REPENSAR	(1) Ecological School Program-Seeds for the Future (2) Cleaning Campaign in line with World Clean-up Day (3) Zero Waste on the Beach Program (4) Impact Survey of Plastic Waste in Coastal Areas
AMOR	(1) Infrastructure: Eco-point Network (2) Awareness: Environmental Education in Schools (3) Valorization: Plan to Develop a Smartphone Application
Engenharia sem Fronteiras	(1) Neighborhood Campaigns, Awareness Marathons and Solid Waste Collection (2) Campaigns at Schools (3) Awareness March "Trash on the floor is not a solution" (4) Recreational and Environmental Saturdays (5) Cleaning Actions Developed by the Maxaquene Development Platform (6) Maxaquene Radio
Livaningo	(1) Creation of Environmental Clubs at Schools: (2) Activities in the Neigbhorhoods
KUWUKA JDA	(1) Lectures on Urban Solid Waste Management at Schools (2) Creation of Environmental Clubs at Schools (3) Training of Young Activists in the Communities on the Production of Articles from Recycled mMterial for Children

Source: JICA Project Team

REPEMSAR (17 December 2019)

Eco-point Operated on the Beach by REPEMSAR (18 February 2020)

Engenharia sem Fronteiras (18 Feburary 2020)

Livaningo (2 March 2020)

Source: JICA Project Team

Figure 51 NGO Interviews and Site Visits

(4) Private Companies

Reciclagem & Serviços, Lda is engaged in consulting and recycling of waste plastic into tiles as its core business, while conducting environmental awareness activities such as installing monuments of various animals in the city to raise awareness of biodiversity and setting up Christmas trees made of waste plastic bottles (Figure 52). The company has been cooperating with Maputo City by co-organizing the Christmas tree lighting ceremony and the Biodiversity Day event mentioned earlier in (1), and is also good at public relations using mass media.

Christmas Tree Lighting Ceremony (13 December 2019)

Animal Monuments

Source: JICA Project Team

Figure 52 Environmental Awareness Activities by Reciclagem & Serviços, Lda

2.7.3 Prepare a Program and Action Plan for Public Awareness and Environmental Education based on the Review Results (Activity [6-3])

Output 6 has aimed to build a network with diverse actors working on waste issues in Maputo to conduct sustainable and socially impactful public awareness and environmental education activities, and to establish a system to support each actor. The target groups to which CMM/DSMAS should reach out were identified, programs were discussed for each target group, and action plans were developed. In addition, regarding the source separation pilot project that DSMAS and CMM introduced for their staff, Output 6, in cooperation with Output 3, addressed activities to understand the source separation rules.

Initially, the action plan and program were scheduled to be developed in the first half of 2020, but progress was delayed due to the interruption of review activities caused by the COVID-19 pandemic and because the key members of Output 6 were focused on the activities to combat the COVID-19. The plan was discussed during the first half of 2022.

The programs include the contents for Activity [6-5] "Conduct Public Awareness-raising Activities that Contribute to the Spread of the 5R Concept through Collaboration between Students, Citizens, and Local Community" and for Activity [6-6] "Promote Environmental Education including the Waste Issue in Schools in Maputo City."

Table 41 shows the programs to be implemented.

Table 41 Program and Action Plan for Public Awareness and Environmental Education

Target Activity and Group	Objective	Program
[Activity 6-5] Staff of DSMAS and CMM	· Introduce the source separation and recycling system in municipal buildings.	· In collaboration with Output 3, develop teaching materials and provide instructions to DSMAS and CMM staff on source separation.
[Activity 6-5] Maputo citizen	· Disseminate garbage disposal rules. · Disseminate 5R concept and promote behavior change.	· Support for the "Cleanest Neighborhood Contest: Support the Contest with relevant goods supply and technical advice to formulate the criteria of scoring.
[Activity 6-6] Children	· To raise interest and understanding of waste issues in future generation.	· Environmental Picture Diary: Invite children to draw a picture diary on environmental and waste issues and hold an exhibition.

Target Activity and Group	Objective	Program
	· Disseminate information to parents and families through inter-generational learning.	· Clean-up campaign ("Spo Gomi"): Promote "Spo Gomi," which adds a sports element to the conventional cleanup campaigns.

Source: JICA Project Team

2.7.4 Produce Public Awareness and Environmental Education Materials (Activity [6-4])

The materials necessary for activities were developed as shown below and attached in this report as Appendix 7-1~7-4.

- Source Separation Game Manual
- Eco-point Operation Manual
- Spo Gomi Manual
- Environmental Picture Diary Manual

These manuals were formulated in English and in Portuguese so that they will be used not only in Maputo but also in other municipalities such as Matola and other areas in Mozambique.

Besides, the JICA Project Team procured goods and materials for the following activities:

- Recycle bins, recycle baskets and scales to weigh the waste (source separation workshop)
- Vests, caps, banners, posters, stickers and cleaning materials (Cleaner Neighborhood Contest)
- T-shirts, caps and water bottles (Spo Gomi)
- Paper, crayons and watercolor (environmental picture diary)

Figure 53 shows some materials procured for Cleaner Neighborhood Contest.

Sticker for Cleaner Neighborhood Contest

T-shirts, cap and water bottle for Spo Gomi

Source: JICA Project Team

Figure 53 Materials Procured for Cleaner Neighborhood Contest

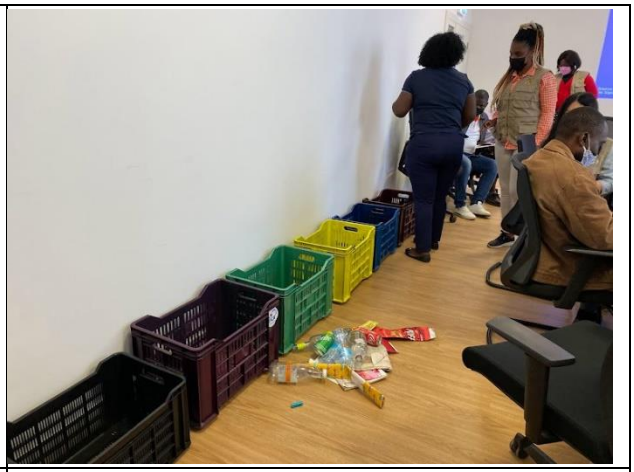
2.7.5 Conduct Public Awareness-raising Activities that Contribute to the Spread of the 5R Concept through Collaboration between Students, Citizens, and Local Community (Activity [6-5])

(1) Workshops on Source Separation Pilot Project

In collaboration with Output 3, waste segregation workshops were held five times at DSMAS, one time at the municipality of Matola and another one at CMM. The participants learned the source separation rules through the game where they segregate various types of waste into six categories, namely: plastic, metal, glass, paper, hazardous waste, and others. On the first and the second workshops, the Japanese expert facilitated all the workshops, while the third workshop was conducted under the collaboration of C/Ps and

the expert. The fourth and fifth workshops at DSMAS, and the workshops in Matola and CMM, were completely organized by the C/Ps. In addition to waste segregation workshops, eco-point operation workshops were organized five times at DSMAS. The persons in charge for each eco-points were pointed out and they all learned how to collect and weigh each type of waste. DSMAS has an intention to expand the source separation practice to other CMM offices such as district offices, private business offices, and households soon. The DSMAS counterparts are expected to be trainers in promoting source separation in Maputo City by utilizing the knowledge and experience obtained from the pilot project. Figure 54 shows the photos of the trainings conducted in this pilot project.

Waste Segregation Workshop in the DSMAS Backyard (31 May 2022)



Waste Segregation Workshop at Matola Municipality (7 July 2022)

Waste Segregation Workshop at CMM (16 November 2022)

Explaining "Why we need recycling?" to the Person in-charge of Eco-points (1 December 2022)

Source: JICA Project Team

Figure 54 Trainings on Source Separation Pilot Project

(2) Support for "Cleaner Neighborhood Contest"

"Cleaner Neighborhood Contest" is a contest where each neighborhood competes with its cleanliness, planting trees, countermeasure to erosion, environmental education, and so on. The JICA Project Team offered technical advice on the formulation of the criteria of evaluation for the contest (Table 42). In addition, relevant goods, such as vests, caps, posters, and stickers as various cleaning materials as prizes, were procured.

The neighborhoods conducted cleaning of roads and drainages with the residents, inspection around the containers, and public awareness raising by the initiatives of secretariats of neighborhoods.

On the 28 November 2022, the prizing ceremony was held and Neighborhood Alto-Maé A (first prize), 3 de Fevereiro (second prize), 25 de Junho A (third prize) won the prizes.

The photos of the activities and the ceremony are shown in Figure 55.

CMM will continue the contest every year and the Municipality of Matola is willing to launch the same type of contest for awareness raising of the citizen.

Table 42 Criteria of Evaluation for Cleaner Neighborhood Contest

Criteria		Point	
Practice	Number of cleaning campaigns	10	50
	Number of places where informal waste dump eliminated	10	
	Number of drainages cleaned up	10	
	Number of places of tree planting in the streets, park and gardens	10	
	Number of actions to combat erosion	10	
Education	Number of activities on environmental education for children	10	20
	Number of activities on awareness raising for community	10	
Impact	Number （or %） of people involved in the activities	10	20
	Diversity of actors involved in the activities	10	
Sustainability	Have activities been carried out continuously throughout the period? Including submission of reports	10	10

Source: JICA Project Team

Cleaning the Neighborhood for the Contest (12 August 2022)

Distributing the Posters, Vests, and Caps to the Neighborhood Office (15 September 2022)

	
Contest Prizes supported by the Project (18 November 2022)	Prizing Ceremony with the City Mayor (18 November 2022)

Source: JICA Project Team

Figure 55 Cleaner Neighborhood Contest

2.7.6 Promote Environmental Education including the Waste Issue in Schools in Maputo City (Activity [6-6])

(1) Spo Gomi

Spo Gomi was launched at the primary school of 25 of Junho. Spo Gomi is a new technique of selective waste collection, developed in Japan, which incorporates elements of sport where teams collect waste within a delimited perimeter and earn points according to the amount of collected waste.

Waste collecting bags with color coded waste types were distributed to the children and they were active to collect waste on the school yard. Finally, they were successful to collect 56.24 kg of waste.

Compared with the traditional cleaning activities, Spo Gomi has an advantage where participants can enjoy waste collection as if it was a sport game. DSMAS recognized its effectiveness, and they desire to keep this activity in its periodical school programs.

Figure 56 shows the photos of the implementation of Spo Gomi.

	
Children with Color-coded Bags for Waste Collection (15 July 2022)	Active Scene of Waste Collection (15 July 2022)

	
Weighing and Recording the Collected Metal Waste (15 July 2022)	Handing Over the Waste to a Recycling Company (15 July 2022)

Source: JICA Project Team

Figure 56 Implementation of Spo Gomi

(2) Environmental Picture Diary

The Environmental Picture Diary was launched at the primary schools of 9 de Agosto and Combatentes de Libertação. It is an activity in which elementary school students freely express their thoughts on environmental issues in drawings and constructing sentences. It has been originally conducted under the African Clean Cities Platform (ACCP) framework.

The students who took part in this activity showed that they have vast knowledge of environmental issues drawing 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. This experience shows that not only absorbing knowledge from the teachers but also expressing their own ideas is quite significant for school children on environmental education.

Figure 57 shows the photos of implementation of environmental picture diary.

	
The Classroom and the Children (7 October 2022)	The Girl drawing the Ocean with a Blue Crayon (7 October 2022)

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Drawing by a Student about Marine Waste
(7 October 2022)

Drawing by a Student about Conservation of Trees
(7 October 2022)

Source: JICA Project Team

Figure 57 Implementation of Eco Picture Diary

2.8 Activities Related to Output 7

2.8.1 Summarize Experience on Realizing ISWM in Maputo City as 'Maputo Model' (Activity [7-1])

The 'Maputo Model' is an important keyword indicated in the project purpose and the overall goal of the PDM. Therefore, the JICA Project Team had discussions on the fundamental concepts such as "what is 'Maputo Model'?" and "how the 'Maputo Model' will be utilized?" to obtain a full understanding among the JICA Project Team and the relevant organizations.

By the discussion among the JICA Project Team, MTA, ANAMM, and Matola City, it was agreed that the definition of the 'Maputo Model' is "the Model compiles the knowledge and lessons learned from the experience in improving its integrated solid waste management in Maputo City". The contents of the 'Maputo Model' was prepared as shown in Table 43. Each activity of the 'Maputo Model' was summarized in one slide so that it can be easily referred by the officers in charge of SWM and the decision makers in the Mozambican municipalities.

In addition, various plans, manuals, and guidelines prepared by the Project was also attached as reference materials and implementation tools of the 'Maputo Model.'

Table 43 Composition of the 'Maputo Model'

Composition	Contents and Reference Documents
Introduction	· The purpose and contents of the Maputo Model, recommendation on the utilization of the 'Maputo Model' according to the characteristics of target cities.
History of SWM in Maputo City'	· The brief history of SWM in Maputo City highlighting the M/P preparation, development of SWM system, supports from international developing partners.
1. Master Plan	· Formulation of Master Plan · Action Plan for Master Plan · Monitoring of Master Plan Reference: · The Master Plan for Urban Solid Waste Management in Maputo City · Action Plan of the Master Plan · Monitoring System of the Master Plan
2. Waste Collection and Transportation	· Waste Amount and Waste Flow Analysis · Monitoring of Secondary Waste Collection · Survey on Primary Waste Collection

Composition	Contents and Reference Documents
	· Waste Collection Improvement Plan · Waste Collection Information Management · Waste Collection Route Management · ICT for Waste Collection Service Management · PDCA Cycle Operation · Business Waste Management Reference: · Plan for Improvement of Waste Collection and Transportation Service · Guidelines on the Improvement of Waste Collection and Transportation in the Urban Area (prepared in the 3R Project)
3. Recycling	· Source Separation of Recyclable Waste · Recyclable Waste Signboards · Networking of Recycling Actors · Recycling Situation Survey · Resolution on Source Separation and Recycling Reference: · Manual on Introduction of Source Separation · Recycling Actor Map and Database in Maputo City · Draft Resolution on the Promotion of Source Separation and Recycling in Maputo City · Guidelines on the Introduction of 3R Activities, Guidelines on the Introduction of Segregated Waste Collection in the Suburban Area (prepared in the 3R Project)
4. Landfill	· Guideline on Operation and Management of Sanitary Landfill · Standard Facilities of Sanitary Landfill · Training on Landfill Operation and Management Reference: · Guideline on Operation and Management of Sanitary Landfill · Training Material of "Guideline on Operation and Management of Sanitary Landfill"
5. Financial Management	· Revenue and Expenditure Analysis · Financial Sustainability Strategy · Cleaning Fee Collection through Electricity Charge · Cleaning Tax for Business Waste Generators · Tipping Fee at Final Disposal Site Reference: · Financial Sustainability Strategy of Solid Waste Management in Maputo City
6. Organizational and Institutional Management	· Organizational Structure Analysis · Legal and Institutional Analysis · Human Resource Management Reference: · DSMAS Organization and Human Resources Development Plan · Plan for Updating SWM Regulations in Maputo City
7. Environmental Education and Awareness-Raising	· Training on Source Separation · Cleaning-up Campaign (Bairro Mais Limpo) · Spo Gomi · Environmental Picture Diary · COVID-19 Prevention Measures Reference: · Manual on Introduction of Source Separation · Manual on Spo Gomi Activity · Manual on Environmental Picture Diary Activity · Training Manual on Prevention Measures of COVID-19
8. Dissemination Plan of Maputo Model	· Municipalities' Guide to Using the Maputo Model · Dissemination Structure · Action Plan for Dissemination of Maputo Model · Dissemination Activities in Matola City

Source: JICA Project Team

2.8.2 Prepare a Dissemination Plan of 'Maputo Model' to the Central and/or Local Governments in Coordination with MTA including Data Collection of Targeted Cities (Activity [7-2])

Based on Article 10 of the "Regulation on Urban Solid Waste Management (Decree No. 94/2014)," MTA has the responsibility in collecting SWM data from the local governments in a form of questionnaires (called as 'urban solid waste data collection sheet') since 2016. The data collection covers a wide range of survey items, including population, major industries, organizations, human resources, and regulation related to SWM, financial status, volume and composition of MSW generation, collection and disposal, methods of waste collection and disposal, and outlines of related facilities.

The JICA Project Team had continuously requested MTA to provide available SWM data to analyze and grasp the current situation of SWM in other cities in Mozambique. However, it was found to be unavailable according to MTA due to lack of resources to conduct the survey or management of collected data.

Nevertheless, although it was scheduled that the Output 7 activities shall be mainly implemented in the latter stage of the project., the JICA Project Team had started communicating and coordinating with MTA, National Association of Mozambican Municipalities (ANAMM), Matola City, and ANGER to foster a cooperative system with the relevant organizations to ensure smooth implementation of the planned activities.

As for Matola City, the former director of DSMAS was appointed as the director for SWM in Matola City in June 2020. It was advantageous in implementing the Output 7 activities as smooth coordination and cooperation between DSMAS and Matola City was performed. It was agreed by the meeting among DSMAS, Matola City, and JET that the JICA Project Team shall implement pilot dissemination activities such as environmental education and awareness-raising activities in Matola City as early as appropriate and feasible.

The JICA Project Team also had a meeting with MTA in July 2020 and discussed ways for collaboration in implementing the Output 7 activities. Besides, the JICA Project Team requested MTA to provide the SWM datasheets in the year 2018 for the four cities, which are Maputo, Matola, Nampula, and Beira, to analyze and grasp current situation of SWM in other cities in Mozambique. However, the datasheets were not available due to the above reasons.

The JICA Project Team also had a meeting with ANAMM in August 2020 to explain the project outline, and both DSMAS and ANAMM agreed to cooperate and collaborate to hold a national SWM seminar at the end of the project.

On the other hand, it was confirmed by the JICA Project Team that ANGER has not yet been functional and had not carried any activities since its establishment in 2017.

The JICA Project Team continuously communicated with the related organizations and held coordination meetings with MTA, ANAMM, Matola City, and ANGER to discuss the dissemination plan of the 'Maputo Model' and to hold a national seminar. The record of the coordination meetings was summarized in Table 44.

Table 44 Record of Coordination Meeting with MTA, ANAMM, Matola City and ANGER

No.	Date	Agenda	Main Discussion
1st	16 February 2023	· Introduction of the Project and Output 7 activities · Discussion on the dissemination plan of the 'Maputo Model' and the national seminar.	· It was agreed that CMM/DSMAS, MTA, ANAMM, Matola City, and ANGER will collaborate in the preparation of the dissemination plan and in holding the national seminar. · It was agreed to hold the seminar in July considering the municipal election scheduled in October,

No.	Date	Agenda	Main Discussion
2nd	20 April 2023	· Discussion about the date and program of the national seminar. · Discussion on dissemination plan of the 'Maputo Model.'	· The date and program of the national seminar was generally agreed. · Demarcation of roles in disseminating the 'Maputo Model' was discussed.
3rd	25 May 2023	· Finalization of the program of the national seminar. · Finalization of the dissemination plan of the 'Maputo Model.'	· The program of national seminar and the dissemination plan of the 'Maputo Model' were discussed and agreed. · The procedures to invite municipalities to the national seminar were discussed and agreed.

Source: JICA Project Team

2.8.3 Start Pilot Dissemination with Matola City to Identify Necessary Consideration in Disseminating 'Maputo Model' to Other Cities (Activity [7-3])

Some activities from the 'Maputo Model' that can be effective in Matola City were selected by the discussion between the JICA Project Team and Matola City, and pilot dissemination activities were conducted in Matola City.

The results of the pilot dissemination activities, the issues in disseminating the "Maputo Model" to other cities in Mozambique were analyzed, and the lessons learned from the pilot activities were reflected in the dissemination plan of the 'Maputo Model'. Through the pilot dissemination activities in Matola, it was considered that it would be effective to gradually disseminate each activity of the Maputo Model according to the capacity of each municipality, and the measures that should be prioritized by small- and medium-sized municipalities were examined as well.

(1) Knowledge Sharing Seminar

The knowledge sharing seminar was held for four times in Matola City to share the experience of Maputo City in improving its integrated SWM. The record of the knowledge sharing seminar was summarized in Table 45 and Figure 58.

Table 45 Record of Knowledge Sharing Seminar in Matola City

No.	Date	Agenda
1st	28 May 2021	· Introduction of the JICA Project · Sharing Maputo City's Experience on the Proof of Service System
2nd	27 April 2022	· Sharing Maputo City's Experience on the Master Plan Preparation · Sharing Maputo City's Experience on the Waste Collection Service Management
3rd	30 November 2023	· Training on Sanitary Landfill Operation and Management
4th	26 April 2023	· Sharing Maputo City's Experience on Developing the Financial Sustainability Strategy of SWM Sector

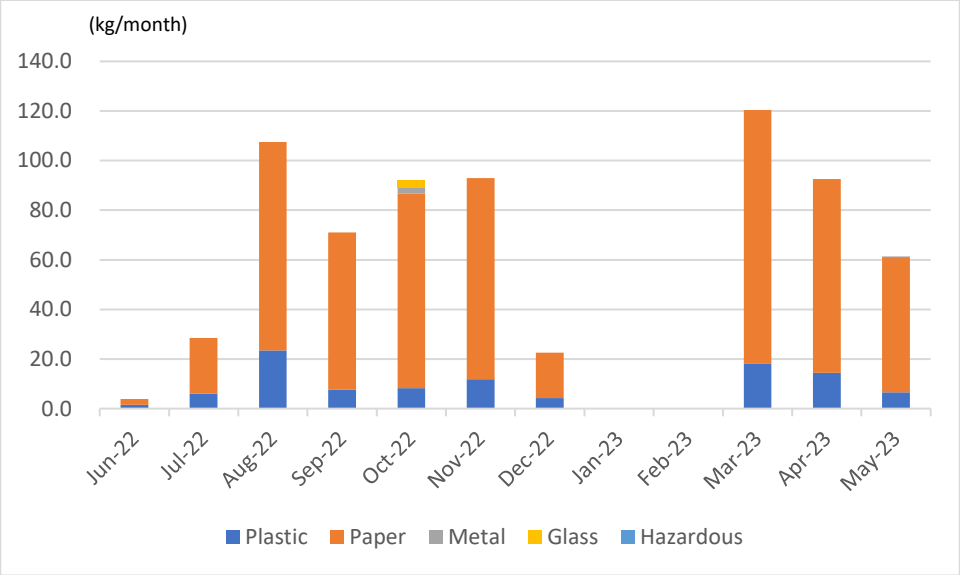
Source: JICA Project Team

Source: JICA Project Team

Figure 58 Knowledge Sharing Seminar in Matola City

(2) Recyclable Waste Source Separation Activity

The source separation of recyclables, which was implemented in DSMAS Office under Output 3 activity was introduced in the Matola City Office from June 2022. The results of monitoring of recovered recyclables in Matola City Office are summarized in Figure 59. Although the monitoring was suspended from time to time especially from January to February 2022, the monthly average amount of recovered recyclable was 77.0 kg/month (Plastic:11.4 kg/month; Paper: 65.0 kg/month, Metal: 0.3 kg/month, Glass: 0.3 kg/month). In total, Matola City succeeded to recover 692 kg of recyclable and hazardous waste from June 2021 to March 2023. Figure 60 shows the scenery of source separation activity in Matola City.



Source: JICA Project Team

Figure 59 Number of Recyclables Recovered in Source Separation PP at Maputo City Office

Source: JICA Project Team

Figure 60 Source Separation PP in Matola City

(3) Environmental Education and Awareness-raising Activity

Spo Gomi activity and environmental picture diary activity, which were conducted by DSMAS as the activities of Output 6, were implemented in schools in Matola City and introduced as methods of environmental education.

As for the Spo Gomi, the staff of Matola City first participated in the DSMAS-led Spo Gomi and learned how to implement it. Then, Spo Gomi was held at an elementary school in Matola City with the support of DSMAS. The rules of Spo Gomi are very simple, so the staff of Matola were able to learn the procedure without any problems. In particular, the staff members who are usually in charge of environmental education were very skilled at speaking in front of children, and there were no problems with facilitation.

Figure 61 shows the Spo Gomi activity conducted at two schools in Matola City.

	
Spo Gomi at the Primary School (4 April 2023)	Spo Gomi at the Secondary School (18 April 2023)

Source: JICA Project Team

Figure 61 Spo Gomi in Matola City

The environmental picture diary in Matola City was conducted at six elementary schools in the city under the leadership of JICA Overseas Cooperation Volunteers, with the aim of entering the 23rd "JQA Global Environment World Children's Drawing Contest". The contest was organized by the Japan Quality Assurance Organization (JQA), which invited entries on the theme of "Happy Time for People and Nature". The children patiently worked on their drawings for about three hours. The environmental picture diary program provided an opportunity to learn about the children's level of knowledge about the environment and their areas of interest. While some children were seen to draw pictures of eco-points regarding waste management, the subsequent knowledge of the children regarding the whereabouts of waste and recycling was unknown. If DSMAS wishes to incorporate field trips to waste-related facilities into environmental education in the future, it is considered that this knowledge will be further deepened. Figure 62 shows the environmental picture diary activity conducted at an elementary school in Matola City.

	
Children drawing in the classroom (16 March 2023)	Children drawing house in the river (16 March 2023)

Source: JICA Project Team

Figure 62 Environmental Picture Diary in Matola City

2.8.4 Organize a National Seminar on ISWM in Cooperation with ANGER and the Relevant Organizations (Activity [7-4])

The national seminar was held in July 2023 with the aim to provide an opportunity to report on the results of the project activities and to be a kick-off meeting to develop nationwide ISWM in Mozambique using the "Maputo Model" after the project.

The program of the national seminar is shown in Table 46 and the presentations and discussions were carried out by the initiative of the C/Ps and the relevant organizations.

A total of 93 participants joined the seminar and the discussion facilitated by the project manager and the chief advisor was held to deepen the participants' understanding of the 'Maputo Model.'

Table 46 Program of the National Seminar on 'Maputo Model'

Date	20 July 2023, 9:00-16:00	
Venue	Conference Room at Hotel Avenida, Maputo City	
Participants	93 persons	
Participating Organization	Mozambican side: CMM/DSMAS, MTA, MINEDH, ANAMM, Matola City, ANGER, officers in charge of SWM in local governments, international developing partners Japanese side: Embassy of Japan, JICA, JICA Expert Team	
Time	Agenda	Presenter
8:00-9:00	*Registration/Preparation*	DSMAS/JET
9:00-9:05 (5 min)	Welcome notes by the KaMpfumu Municipal District Councilor	Ms. Maria Nhancale, CMM, KaMpfumu District Councilor
9:05-9:10 (5 min)	Background by CMM Spatial Planning, Environment and Construction Councilor	Mr. Silva Magaia, CMM, Spatial Planning, Environment and Construction Councilor
9:10-9:15 (5 min)	Intervention by JICA	Mr. Kazuki Otsuka Chief representative of JICA Mozambique office
9:15-9:25 (10 min)	Guest Remarks by MTA, ANAMM, and Matola City	Ms. Guilhermina Amurrane, Director of Environment, MTA Mr. Carlos Mucapera, General Secretary, ANAMM Ms. Florência Muianga, SWM, Environment, Municipal Parks and Gardens Councilor, Matola
9:25-9:30 (5 min)	Speech by His Excellency the Mayor of the Municipal Council of Maputo	His Excellency Eneas Da Conceição Comiche Mayor, CMM
9:30-9:45	*Family Photo*	
9:45-9:55 (10 min)	Introduction of the JICA Project	Mr. Sérgio Manhique Director, DSMAS
9:55-10:05 (10 min)	Introduction of Maputo Model - Master Plan Preparation and Monitoring-	Ms. Meriamo Stela Novela Deputy Director, DSMAS
10:05-10:20 (15 min)	Introduction of Maputo Model - Waste Collection and Transportation Improvement-	Mr. Simão Pedro Chief of Section, DSMAS
10:20-10:30 (10 min)	Introduction of Maputo Model - Promotion of Recycling -	Ms. Rute Massinge Chief of Section, DSMAS
10:30-10:40	*Coffee Break*	
10:40-10:55 (15 min)	Discussion, Q&A	All participants
10:55-11:05 (10 min)	Introduction of Maputo Model - Sanitary Landfill Guideline and Training -	Mr. Leonardo Almajane Chief of Section, DSMAS
11:05-11:20 (15 min)	Introduction of Maputo Model - Financial Management -	Mr. Faustino Titos Tsotsane Head of Department, DSMAS

11:20-11:30 (10 min)	Introduction of Maputo Model - Organizational and Institutional Management -	Ms. Linda Verdeano Chief of Section, DSMAS
11:30-11:40 (10 min)	Introduction of Maputo Model - Environmental Education and Awareness Raising -	Ms. Nilza Zandamela Head of Department, DSMAS
11:40-11:50 (10 min)	Dissemination Plan of Maputo Model	Mr. Sergio Manhique Director, DSMAS
11:50-12:05 (15 min)	Discussion, Q&A	All participants
12:05-13:35	*Lunch*	
13:35-13:55 (20 min)	Efforts for Integrated Solid Waste Management in Matola City	Mr. João Mucavele Director, Matola City
13:55-14:15 (20 min)	Support to Municipalities for Integrated Solid Waste Management by MTA	Mr. Samson Cuamba Head of Department, MTA
14:15-14:30 (15 min)	Support to Municipalities for Integrated Solid Waste Management by ANAMM	Mr. Pedro Laice Head of Department, ANAMM
14:30-14:40 (10 min)	Importance of the Inter-Municipal Organization for Integrated Solid Waste Management (AGNER)	Mr. Jorge Paulino Member, ANGER
14:40-15:40 (60 min)	Discussion, Q&A Mr. Sergio, DSMAS Mr. Joao, Matola City Mr. Samson, MTA Mr. Laice, ANAMM Mr. Hosono, JICA Expert Team	Mr. Benildo Pinto Technician, CMM
15:40-15:50 (10 min)	Closing remarks by CMM	Mr. Silva Magaia, Councilor, CMM

Source: JICA Project Team

2.9 Activities on COVID-19 Prevention Measures

2.9.1 Outline

(1) Background

The Mozambican government declared a state of emergency on 30 March 2020 in response to the global spread of the new coronavirus. Since Mozambique's Constitution allows a state of emergency to be declared for a period of one month and extended for up to three times, the state of emergency was once terminated on 29 July 2020, but a second state of emergency was declared on 5 August 2020, and a state of disaster was declared on 4 September 2020.

Since all Japanese experts returned to Japan in late March 2020, JET had been providing advice on COVID-19 prevention and response measures in waste management upon consultation from C/Ps. On 17 July 2020, DSMAS requested the JICA Mozambique Office to provide a more comprehensive support for COVID-19 prevention and response, and JICA decided to provide additional support in view of the importance of waste management for maintaining public health even under the COVID-19 pandemic.

(2) Objectives and Components

The activities for COVID-19 prevention and response have the following four objectives and consist of the components shown in Table 47.

1) To ensure the safety of workers and citizens engaged in waste management under the COVID-19 pandemic.
2) To take necessary measures to ensure the continuation of waste collection and treatment operations to sustain public health even under the further spread of COVID-19.
3) To strengthen the capacity of DSMAS to respond to emergencies such as the spread of infectious diseases.
4) To share experiences and lessons learned in responding to the COVID-19 pandemic to other member cities and countries of the ACCP.

Table 47 List of Activities for COVID-19 Prevention and Response

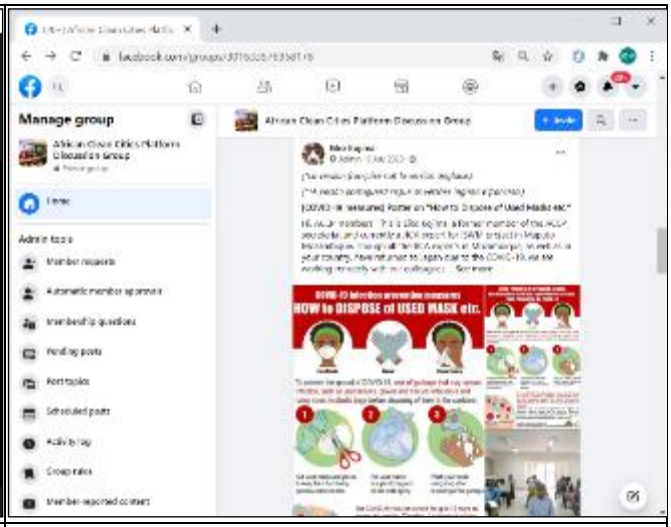
Activities	Responsible Division	JET
(1) Awareness raising for community	REAS, DGIA	Kojima, Stella
(2) Procurement and storage of equipment for COVID-19 prevention	Property Division, DARHF (Storage)	Kojima, Stella
(3) COVID-19 measures for DSMAS staff	REAS, DGIA	Kojima, Stella
(4) COVID-19 measures for collection workers of microenterprises	REAS, DGIA; DGRSU	Kojima, Otsuka, Stella, Mario
(5) COVID-19 measures for waste pickers in Hulene	REAS, DGIA; DGRSU	Kojima, Stella
(6) Supervise and instruct large-scale collection service providers	DGRSU	Otsuka, Mario
(7) Measures for infectious waste generated in hospitals and clinics	DGRSU	Otsuka, Mario

Source: JICA Project Team

(3) Sharing Experience and Disseminating Information

In addition, in relation to the above objective 4), sharing experiences and lessons learned, Deputy Director Teresa presented the activities for COVID-19 prevention in waste management in Maputo Municipality in a webinar held by the Urban Task Force for COVID-19 established by ANAMM and UN-Habitat (12 cities including Maputo and Matola participated) on 23 October 2020. Also, a post was made to the ACCP Facebook Discussion Group (See Figure 63).

Presentation at Urban Task Force (23 October 2020)



Post to ACCP Discussion Group

Source: JICA Project Team

Figure 63 Sharing Information about the COVID-19 Prevention Activities

2.9.2 Awareness Raising for Community

A flyer was prepared for Maputo citizens on how to dispose used masks, gloves, tissues paper, and other household waste with infection risk. The flyer that was prepared by the Japanese Ministry of the Environment for Japanese citizens suggests that waste with infection risk should be disposed in plastic bags and that hands should be washed after disposal. While referring to this leaflet, in Maputo City, there was a problem of used masks being picked up and reused by waste pickers, so the procedure was revised to (1) cut them with scissors so that they cannot be reused by a stranger, (2) put them in a plastic bag and tie the mouth tightly, and (3) wash hands after disposal.

In May 2020, the Civic Education Office, in collaboration with the Ministry of Health of Mozambique, carried out trainings on COVID-19 measures for community leaders in each ward, where the flyers prepared by the Project were used. Figure 64 shows photos of training and flyers for community.

Training for Community Leaders (May 2020)

Flyer for Citizens on "How to Dispose of Waste at Infection Risk "

Source: JICA Project Team

Figure 64 Activities on Awareness Raising for Community

2.9.3 Procurement of Equipment for COVID-19 Prevention

With the support of the JICA Mozambique Office, equipment for COVID-19 measures for DSMAS staff, microenterprise collection workers, and waste pickers as shown in Table 48 were procured and delivered on 27 October 2020. On 30 October 2020, a handover ceremony for the equipment and training materials was held at the CMM City Hall with the attendance of the Mayor of Maputo, Mr. Eneas Comiche, the Extraordinary and Plenipotentiary Ambassador of Japan, Mr. Hajime Kimura, and the Chief Representative of the JICA Mozambique Office, Mr. Hiroaki Endo. At the ceremony, infection prevention measures such as ensuring social distance between participants, temperature check, and hand disinfection at the entrance were thoroughly implemented. Figure 65 shows some photos of the ceremony.

Table 48 List of Provided Equipment for COVID-19 Measures

Target	Item	Quantity	Note
DSMAS staff (14 sections + 1 JET, 183 persons+ 6 JET local staff)	Mask	400	2 for each person
	Face shield	200	1 for each person
	Hand sanitizer 500 ml	150	10 for each section
	Hand soap 250 ml	150	10 for each section
	Medical thermometer	15	1 for each section
	Sanitizer for equipment (25 l)	1	
	Spray bottle	5	4 for DSMAS, 1 for JET
Collection workers of microenterprises (46 microenterprises, 934 persons)	Mask	950	1 for each person
	Puncture-resistant gloves	950	1 for each person
	Face shield	950	1 for each person
	Hand sanitizer 500 ml	250	5 for each ME
	Hand soap 250 ml	500	10 for each ME
	Medical thermometer	46	1 for each ME
	Sanitizer for equipment (5 l)	46	1 for each ME
	Spray bottle	92	2 for each ME

Target	Item	Quantity	Note
Waste pickers in Hulene (800 persons)	Mask	800	1 for each person
	Puncture-resistant gloves	800	1 for each person
	Face shield	800	1 for each person
	Hand sanitizer 250 ml	800	1 for each person
	Hand soap 250 ml	800	1 for each person
Total	Mask	2,150	
	Puncture-resistant gloves	1,750	
	Face shield	1,950	
	Hand sanitizer 500 ml	400	
	Hand sanitizer 250 ml	800	
	Hand soap 250 ml	1,450	
	Medical thermometer	61	
	Sanitizer for equipment (5 l)	46	
	Sanitizer for equipment (25 l)	1	
	Spray bottle	97	

Source: JICA Project Team

Provided Equipment for COVID-19 Measures

From Left: Ambassador Kimura, Mayor Comiche, and Chief Representative Endo

Participants in the Ceremony

Presentation of Equipment from JICA to CMM

Source: Communication and Image Department, CMM

Figure 65 Handover Ceremony of the Equipment for COVID-19 Measures (30 October 2020)

2.9.4 COVID-19 Measures for DSMAS staff

(1) Preparation of Training Material for DSMAS Staff

The members involved in Output 6 (Environmental Education and Public Awareness) took the lead in developing training materials on infection prevention for DSMAS staff. Firstly, JET drafted the training materials by referring to the information published by the Ministry of Health of Mozambique and the Ministry of Health, Labour and Welfare of Japan, as well as the "Guidelines for Prevention of Novel Coronavirus Infection in Offices" published by the Japan Business Federation. After the discussions with the C/Ps in terms of whether the drafted materials were easy to understand and whether they were in line with the DSMAS workplace environment, revisions were made. It was finalized after the director and deputy director confirmed the contents. The training materials consisted of 24 slides, and the main contents are as follows: (1) Purpose of the training, (2) Symptoms and characteristics of COVID-19, (3) Routes of infection, (4) Proper use and disposal of masks, (4) Infection prevention measures in offices, (5) Infection prevention measures in daily life, (6) Introduction of Japanese measures: "three risks," (7) Infection situation in the world, and (8) Conclusion (See Appendix 9-1). The lectures for DSMAS staff using this material had to be delivered independently by C/Ps themselves, as the Japanese experts were not in Maputo. Therefore, after completion, the materials were read thoroughly again together with the lecturers, including the Head of the Civic Education Office and the Chief of the Department of Environmental Management and Inspection, to ensure that they fully understood the contents of the materials.

(2) Implementation of Trainings for DSMAS Staff

Training for DSMAS staff was conducted eight times from 15 to 23 October. It deserves recognition that DSMAS took the initiative in planning and implementing these series of trainings with the support of JET's local staff. During the implementation of the training, measures were taken to prevent infection, such as ensuring social distance between participants, checking temperature and disinfecting hands at the entrance, and ventilating the meeting room thoroughly. Booklet materials, masks, and face shields were distributed to the participants. Figure 66 shows photos of trainings and materials.

As of February 2021, training and distribution of equipment has been completed for about 90% of the 183 DSMAS staff members. The remaining 10% who have not yet taken the training due to long vacations or work-related reasons are listed by the Human Resources Division, and training and equipment distribution were conducted as needed. On the other hand, basic infection prevention measures such as wearing masks and washing hands were not always observed in the DSMAS. Following the return of the long-term Japanese expert in charge of this activity to Maputo in late January, the Project reviewed and implemented additional activities to ensure thorough infection prevention within the DSMAS workplace.

Training for DSMAS staff（15 October 2020）

Training for DSMAS Staff（19 October 2020）

Temperature Check and Hand Disinfection at the Entrance

Training Materials for DSMAS Staff

Poster for COVID-19 Measures（for daily life）

Poster for COVID-19 Measures（for office）

Banners for COVID-19 Measures

Source: JICA Project Team

Figure 66　Activities on COVID-19 Measures for DSMAS Staff

2.9.5　COVID-19 Measures for Collection Workers of Microenterprises

Training and equipment for COVID-19 measures were provided to 46 microenterprises and 934 collection workers engaged in primary collection in the suburban areas of Maputo City.

(1)　Preparation of Materials for Collection Workers

Prior to the preparation of training materials, telephone interviews were conducted with 15 microenterprises (3 businesses in each district x 5 districts) to find out about (1) infection prevention measures they are currently taking, (2) issues in collection operation under the COVID-19 pandemic, (3) changes in waste

collection, and (4) equipment and information needs. Based on the results, the training materials were prepared by referring to the guidelines, posters and videos on infection prevention measures in waste collection, and transport operations published by the Japanese Ministry of the Environment and the Japan Environmental Sanitation Center. In addition to the C/Ps of DSMAS, Mozambican Association of Microenterprises for Service Provision (AMEPS) was also involved in the discussion of the materials to consider local collection methods and ease of understanding. The materials consisted of 24 slides in total; the first half was almost the same as the materials for DSMAS staff, which include ((1) objectives, (2) symptoms and characteristics, (3) infection routes, and (4) how to wear masks), and the second half was designed to introduce specific infection prevention measures for collection work, such as (5) health management and proper equipment before work, (6) securing social distance from residents and precautions for handling garbage during work, and (7) disinfection of equipment and washing of work clothes after work (See Appendix 9-2).

(2) Implementation of Trainings for Collection Workers

A total of nine training sessions were held from 23 to 27 November 2020, with two to three participants from each business. The lecturers were from the Department of Environmental Management and Inspection and the Department of Urban Solid Waste Management. After the training, the equipment and training materials for COVID-19 measures were distributed to the participants, who were requested to distribute them to collection workers who did not attend the training and to share the infection prevention measures they learned in the training.

(3) Monitoring Survey

On 10 February 2021, to monitor the status after the training, the Department of Environmental Management and Inspection and JET visited three microenterprises and conducted interviews on (1) evaluation of the training contents, (2) status of equipment utilization and implementation of infection prevention measures, and (3) additional support needs. The business operators commented, "There is a lot of information about general infection prevention measures, but there is no information specific to waste collection, so the training was very useful," and "We instruct the collection workers in the daily meeting about infection prevention measures and how to use the equipment. It was also confirmed that the equipment distributed was generally being used appropriately, especially the hand sanitizer and sanitizer for equipment, which were more than half consumed in about three months. Figure 67 shows photos of trainings, materials and the monitoring survey.

Training for Microenterprises（23 November 2020）

Training for Microenterprises（24 November 2020）

Training Material for Collection Workers

Monitoring Survey（10 February 2021）

Source: JICA Project Team

Figure 67　Activities on COVID-19 Measures for Collection Workers of Microenterprise

2.9.6　COVID-19 Measures for Waste Pickers in Hulene

Educational materials (A4 size, trifold) for waste pickers working at Hulene dumping site were prepared and distributed along with the equipment for COVID-19 measures on 22 December 2020.

Initially, DSMAS did not identify the waste pickers at the dumping site, and there was a possibility that unrelated neighbors would not be recognized even if they tried to receive the equipment. Thus, prior to the distribution, registration of waste pickers was undertaken for about two weeks without informing them of the distribution. At Hulene dumping site, picking activities are divided into three shifts: morning, afternoon, and late night, and the registration work was carried out on each shift. The number of waste pickers was estimated to be about 800 in advance, and the educational materials and equipment were prepared for that number. However, more than 1,000 people registered, and the materials and equipment could not be distributed to all of them.

On the day of distribution, the CMM Police Department and Social Welfare Department cooperated. Although there was a conflict with some waste pickers who tried to grab the equipment loaded on the vehicles, the police intervened and settled the situation. Figure 68 shows photos of distribution activities and educational materials.

Distribution of Materials and Equipment at Hulene Dumping Site

Leaflet for Waste Pickers

Source: JICA Project Team

Figure 68 Activities on COVID-19 Measures for Waste Pickers

2.9.7 Supervise and Instruct Large-scale Waste Collection Service Providers (WCSPs)

To understand the status of COVID-19 control in waste collection and transportation service by large-scale WCSPs (Ecolife, Enviroserv, Clean Africa), a business continuity plan (BCP) for the spread of COVID-19 was submitted by Ecolife and Enviroserv and the contents of their BCPs were reviewed. It was also confirmed that Clean Africa has not developed a BCP for the spread of COVID-19 infection. In the above BCPs, the basic infection control measures for COVID-19 and the measures to be taken when an infected person is confirmed are specifically described, but there was no specific description of the COVID-19 infection control measures for waste collection operations.

Therefore, based on Japan's "Guidelines for COVID-19 Control in the Waste Management Industry," COVID-19 infection control measures in waste collection operations (before, during, and after operations) were explained to the C/Ps by the JICA Project Team, and the JICA Project Team recommended to use it as a reference for guidance against large-scale WCSPs.

2.9.8 Measures for Infectious Waste Generated in Hospitals and Clinics

Several web meetings were held with the Directorate of Health of Maputo City (MOH) to identify the status of infectious waste handling in hospitals and clinics. Maputo City has both private and public medical institutions, of which public medical institutions (5 public hospitals and 28 clinics) are under the jurisdiction of the Maputo Health Department of the Ministry of Health.

Waste generated from public medical institutions is separated at the source, and infectious waste is transported to the medical institutions with incineration facilities (four hospitals and one clinic) for treatment and disposal. Non-infectious waste is also treated and disposed of within each hospital by simple incineration or pit landfill. According to the Directorate of Health of Maputo City, due to the spread of COVID-19 infection, all waste generated from public medical institutions are not discharged to the municipal waste collection and disposal route by CMM/DSMAS.

In private medical institutions, the waste generated is sorted at the source, and hospitals that can treat the waste within their own facilities are treated by incineration or disposed pit landfill, wastes from other hospitals are collected and treated by licensed collectors. However, since private medical institutions are under the management of the Environmental Hygiene Centre/Section of Environmental Sanitation of the Health Department of Maputo City, the Ministry of Health, web meetings were held with this department to confirm the details. As a result of meetings, it was reported by MOH that private medical institutions are not well managed and may be discharging their waste into the municipal waste collection and disposal route by CMM/DSMAS. Therefore, after discussing with DSMAS, it was agreed to request the MOH to strengthen the guidance on the discharge of infectious wastes to private medical institutions.

In addition, the MOH identified shortages in the number of collection and transportation vehicles for infectious waste and the insufficient treatment capacity of infectious waste incineration facilities as issues in medical waste treatment.

3. ACHIEVEMENTS OF THE PROJECT

3.1 History of PDM Modification

3.1.1 PDM Version 1

The first version of the project design matrix (PDM) and plan of operation (PO) was approved in the first joint coordination committee (JCC) held in January 2020 by revising the PDM and PO (Version 0) attached in the record of discussion (R/D) of the Project signed on 19 July 2019. The modification was made mainly to set "objectively verifiable indicators" and their "means of verification" in accordance with the planned project activities.

3.1.2 PDM Version 2

The second version of the PDM and PO was approved in the fourth JCC held in June 2022, mainly to set the target values of the indicators considering the assessment of status and capacity of the counterparts (C/Ps). Besides, Activity [1-6] and Activity [1-7] were added to enforce the implementation of the master plan (M/P), and adjustment on the project activities was made to take Katembe Landfill Development Plan into account, and to enforce business waste management.

The extension of the project duration for ten months by considering the impacts of the global spread of the coronavirus disease 2019 (COVID-19) as agreed in the minutes of the meeting in August 2021 was also reflected in the second version of the PDM and PO.

3.1.3 PDM Version 3

The third version of the PDM was approved in the sixth JCC held in July 2023, mainly to set the target values of the "overall goal" of the PDM by discussing the target after completion of the Project.

3.2 Achievements of the PDM

3.2.1 Project Purpose

The achievement of the project purpose was assessed as shown in Table 49, and it was assessed that five indicators out of the seven set indicators were achieved.

The result of the questionnaire survey on the citizen's satisfaction and cooperation on solid waste management (SWM) in Maputo City could not reach to the set target; however, it should be noted that this indicator was set with the purpose to emphasize the importance of periodically investigating citizen's satisfaction and cooperation on SWM by City Council of Maputo (CMM)/ Directorate of Municipal Service of Environment and Waste (DSMAS).

The regulation on promotion of source separation and recycling and the plan for updating regulations related to SWM were drafted under Output 3 and Output 5 activities, respectively; however, they were not yet approved by CMM during the project period. It also should be noted that this ambitious target was set in the beginning of the Project to motivate the DSMAS counterparts.

Hence, it can be assessed that the project purpose was mostly achieved with the ownership and commitment of the counterparts.

Table 49 Achievement of the Project Purpose

Narrative Summary	Objectively Verifiable Indicators	Achievement
[Project Purpose] The capacity for implementing ISWM is enhanced based on the SWM master plan (M/P) of Maputo City, and the capacity	1) The progress rate of the SWM M/P implementation increases from 15% at the beginning to 67% at the end.	**Achieved.** The progress rate of the SWM M/P implementation was 77% in June 2023.
	2) MSW collection service coverage (number of bairros where waste collection service is provided) is improved from 56 (89%) at the beginning to 58 (92%) at the end (SDG 11.6.1)	**Achieved.** MSW collection service coverage is 58 bairros (92%) as of June 2023.

Narrative Summary	Objectively Verifiable Indicators	Achievement
development experience is summarized under the name of the 'Maputo Model'.	3) Amount of collected recyclables by source separation at CMM/DSMAS and the related organizations increases from 0 kg/month at the beginning to 100 kg/month at the end. (SDG 12.5.1)	**Mostly achieved.** The average amount of collected recyclables by source separation pilot project was 91.3 kg/month (DSMAS: 14.4 kg/month, Matola: 76.9 kg/month).
	4) The average score of the capacity assessment at the organizational level shows an improvement from 2.2 at the beginning to 3.5 at the end.	**Achieved.** The average score of organizational capacity was 4.0.
	5) The average score of the capacity assessment at the individual level shows an improvement from 2.8 at the beginning to 4.0 at the end.	**Achieved.** The average score of organizational capacity was 4.2.
	6) The citizen's satisfaction and cooperation on SWM in Maputo City shows an improvement from 70% (satisfaction) and 82% (cooperation) at the beginning to 80% (satisfaction) and 90% (cooperation) at the end.	**Not achieved.** The citizen's satisfaction and cooperation on SWM in Maputo City was 70% (satisfaction) and 80% (cooperation) at the endline survey in May 2023.
	7) Draft regulation on source separation and the updating plan of ordinances and regulations on SWM is approved by CMM.	**Not achieved.** The regulation on promotion of source separation and recycling and the plan for updating regulations related to SWM were drafted by the project team but not approved by CMM yet.

Source: JICA Project Team

3.2.2 Outputs

The achievement of the outputs was assessed as shown in Table 50, and it was determined that the 18 indicators out of the 20 set indicators were achieved.

The only two indicators that could not reach the set target are: 1) the amount of collected recyclables by source separation at DSMAS, and 2) the percentage of administrative officers who understand and act on 5Rs concept and garbage disposal rules.

Therefore, it is necessary for the DSMAS counterparts to improve the operation of recyclable waste source separation and enhance understanding and behavior of 5Rs concept and garbage disposal rules.

Hence, it can be assessed that the outputs were mostly achieved with the ownership and commitment of the counterparts in charge.

Table 50 Achievement of the Outputs

Narrative Summary	Objectively Verifiable Indicators	Achievement
[Output 1] The capacity for analyzing current issues and challenges of SWM in Maputo City is enhanced.	Action plan for the M/P is prepared.	**Achieved.** Action plan for the M/P was prepared.
	Monitoring system for the M/P is established.	**Achieved.** Monitoring System for the M/P was established.
	Periodical monitoring on the revised M/P is implemented.	**Achieved.** Periodical monitoring on the M/P was implemented.
	Mid-term review report of the M/P is prepared.	**Achieved.** The mid-term review report of the M/P was prepared.

Narrative Summary	Objectively Verifiable Indicators	Achievement
[Output 2] The capacity for supervising the waste collection and transportation service is enhanced.	The draft plan to optimize waste collection and transportation service in Maputo City is prepared.	**Achieved.** The waste collection and transportation service improvement plan in Maputo City was prepared.
	Revision of contracts with the WCSPs is proposed in accordance with the draft plan.	**Achieved.** The revision of contract with WCSPs was proposed in the waste collection and transportation service improvement plan.
[Output 3] The capacity for minimizing waste generation and promoting 5Rs (Rethink, Refuse, Reduce, Reuse, Recycle) are strengthened.	More than three offices of CMM and the related organizations introduce the source separation PP.	**Achieved.** A total of four offices (DSMAS, CMM, Matola City and Kampufumo District) introduced the source separation PP.
	Amount of collected recyclables by source separation at DSMAS doubles (30 kg/month) from the start of the pilot project.	**Not achieved.** The average amount of collected recyclables by source separation pilot project at DSMAS was 14.4 kg/month.
	Draft regulation on source separation is prepared.	**Achieved.** The draft resolution on promotion of source separation and recycling was prepared.
	The Recycle Forum is organized biannually.	**Achieved.** A total of seven times of recycling-related actors networking meetings were held in 2022 and 2023 after the COVID-19 pandemic became under control.
[Output 4] The technical capacity for operation and management of final disposal is enhanced.	The Guideline on Operation and Management of Sanitary Landfill is prepared.	**Achieved.** The Guideline on Operation and Management of Sanitary Landfill was prepared.
	More than 50 staff participate in the training on sanitary landfill operation and management.	**Achieved.** A total of 56 officers from DSMAS, MTA and Matola City participated in the training
[Output 5] The financial, organizational, and institutional capacities in SWM are enhanced.	The financial plan for cost recovery on SWM is proposed.	**Achieved.** The financial sustainability strategy of SWM in Maputo City was proposed.
	The updating plan of ordinances and regulations on SWM is proposed.	**Achieved.** The plan for updating regulations related to SWM in Maputo City was proposed.
	The plan for organizational and human resource development in DSMAS is proposed.	**Achieved.** The DSMAS Organizational and Human Resources Development Plan was proposed.
[Output 6] The capacity for raising public awareness on the environment including waste issues and environmental education at various levels are strengthened.	The percentage of administrative officers who understand and act on 5Rs concept and garbage disposal rules is increased from 11.5% (understanding) and 50.9% (behavior) at the beginning to 70% and 80% at the end.	**Not Achieved.** The percentage of administrative officers who understand and act on 5Rs concept and garbage disposal rules increased from 44.2% (understanding) and 44.2% (behavior).
	Awareness-raising and environmental education activities in which the Project is involved are conducted 20 times.	**Achieved.** A total of 41 times of awareness-raising and environmental education activities were conducted in the project.

Narrative Summary	Objectively Verifiable Indicators	Achievement
[Output 7] The experience of realizing ISWM in Maputo city is summarized as the 'Maputo model' and disseminated to other cities.	The 'Maputo Model' is compiled.	**Achieved.** The Maputo Model was compiled.
	A dissemination plan of the 'Maputo Model' is prepared.	**Achieved.** The dissemination plan was prepared as a part of the Maputo Model.
	A national seminar on the 'Maputo Model' is organized.	**Achieved.** The national seminar was successfully organized in July 2023.

Source: JICA Project Team

4. RESULTS OF JOINT REVIEW

4.1 Review of the Project Based on DAC Evaluation Criteria

4.1.1 DAC Evaluation Criteria

The Japan International Cooperation Agency (JICA) consistently conducts its project evaluations by applying the "DAC Evaluation Criteria[1]" as an international perspective for official development assistance (ODA) evaluation established by the Development Assistance Committee (DAC) of the Organization for Economic Co-operation and Development (OECD) and JICA's own rating system.

In accordance with the revision of the DAC evaluation criteria in December 2019, JICA has revised its project evaluation criteria as shown in Table 51. The results of evaluation for six criteria are classified into four ranks, which are Very high (Score 4), High (Score 3), Mostly Achieved as Planned (Score 2), and Low (Score 1).

In this chapter, the results of joint review of the project evaluation for the six criteria conducted by the Directorate of Municipal Service of Environment and Waste (DSMAS) and the JICA Expert Team (JET) are described.

Table 51 DAC Evaluation Criteria Applied in JICA Technical Cooperation Project

Criteria	Description
Relevance	Validity with project implementation (development needs) Focus on "Beneficiary." Consideration for inclusiveness and equity. Appropriateness of the project plan and logic of approach
Coherence	Consistency with development assistance policies of the Japanese government and JICA Synergistic effect/mutual relations with JICA's other projects (technical cooperation, loans, grant aid, etc.) Complementarity, harmonization, and coordination with other assistance/projects in Japan, other development organizations, etc. Consistency with global framework (international targets, initiatives, standards, etc.)
Effectiveness	The degree of achievement of target level in target year of expected project outcome (differential results across the groups)
Impact	Positive and negative indirect and long-term effects (systems and norms, people's well-being, human rights, gender equality, and the environment)
Efficiency	Comparisons of planned and actual projects inputs, project period, and project cost
Sustainability	Outlook on sustainability of effects that are realized by the project for aspects of policy/political, institutional/organizational, technical, financial, social and environment, risk, and operation and maintenance

Source: Project Evaluation in JICA | Our Work | JICA

4.1.2 Relevance

The Project performed various activities with the aim to enhance the capacity of the DSMAS counterparts for implementing the integrated solid waste management (ISWM) based on the Master Plan for Urban Solid Waste Management in Maputo City (M/P), which was approved in 2018 with the technical support from JICA 3R Project.

Besides, the five-year development plan (2019-2023) of the City Council of Maputo (CMM), which was approved in 2019, is the plan to instruct future development strategies and directions on overall municipal services in Maputo City. The plan sets six pillars for governance priorities and the urban solid waste management is described under pillar 5, which is "Infrastructure Development and Provision of Basic

[1] The OECD DAC Network on Development Evaluation (EvalNet) has defined six evaluation criteria – relevance, coherence, effectiveness, efficiency, impact, and sustainability – and two principles for their use. These criteria provide a normative framework used to determine the merit or worth of an intervention (policy, strategy, program, project, or activity). They serve as the basis upon which evaluative judgments are made. Evaluation Criteria - OECD

Services to Citizens. Under each pillar, strategic objectives are proposed, and the "Strategic Objective 48" is the part mostly dealing with urban solid waste management.

Hence, the "Relevance" of the Project was assessed as "Very High" (Score 4).

4.1.3 Coherence

The Ministry of Foreign Affairs of Japan sets "Country Development Cooperation Policy for the Republic of Mozambique" in 2020, and this Project is positioned under the "Environment and Climate Change Program" for the "Priority Area 3: Sustainable Use of Natural Resources and the Natural Environment."

Also, the Project is aligned with "JICA's Position Paper on SDGs: Goal 12" and "JICA's Position Paper on Solid Waste Management". In addition, the African Clean Cities Platform (ACCP), led by the Ministry of Environment in Japan and JICA, was established in April 2017 to contribute to the achievement of Sustainable Development Goals (SDGs) by sharing knowledge and experience and building human and organizational capacity to improve urban waste management in Africa, thereby promoting public and private investment.

Regarding synergy and complementarity with other development partner, the World Bank (WB) has been supporting Maputo City from 2021 through "Maputo Urban Transformation Project", which includes the components such as closure of Hulene dumping site and construction of Katembe New Sanitary Landfill.

Hence, the "Coherence" of the Project was assessed as "Very High" (Score 4).

4.1.4 Effectiveness

The "Effectiveness" of the Project was assessed as "High" (Score 3) because the objectively verifiable indicators of the project purpose and each output were mostly achieved as discussed in Chapter 3.

4.1.5 Impact

The Project introduced the source separation pilot projects in DSMAS and some governmental offices, which was expected to increase the municipal solid waste (MSW) recycling rate. The Project also promoted identification of recycling-related actors, grasping amount of recycled material by each actor, and networking of the identified recycling-related actors. These database and platform are expected to be a foundation for further promotion of recycling activity in and around Maputo City.

Besides, Mr. Silva Magaia, the Councilor for Spatial Planning, Environment and Construction of CMM and the Project Director made a presentation of the Maputo City's practice on ISWM improvement at the JICA Clean City Initiative (JCCI) International Seminar held on 2 February 2023.

It is also worth noting that the Project collaborated with another JICA technical cooperation project for the education sector and solid waste issue is expected to be included in science textbooks in Mozambique.

Hence, the "Impact" of the Project was assessed as "High" (Score 3) at the time of project completion.

4.1.6 Efficiency

The inputs to the project were properly mobilized and utilized, and the project purposes were mostly achieved.

It should be noted that the Project has experienced difficulty in operation due to coronavirus disease 2019 (COVID-19) pandemic, and the counterpart training in abroad had to be cancelled. However, the JICA Project Team could perform the planned project activities through enhanced communication via web meetings.

Hence, the "Efficiency" of the Project was assessed as "High" (Score 3).

4.1.7 Sustainability

The activities implemented under the Project are in line with CMM's five-year development plan (2019-2023) and the Master Plan for Urban Solid Waste Management in Maputo City (2018). Therefore, it is

expected DSMAS will continue the practice of the project activity for improving the ISWM even after the Project.

Moreover, it is worth noting that CMM/DSMAS has already started discussions and actions to realize the proposals and recommendations made by the Project such as waste collection and transportation service improvement plan, the financial sustainability strategy, the DSMAS organizational and human resources development plan, etc.

The realization and implementation of the proposals and recommendations made by the Project will be a critical factor for future sustainability of the Project.

Hence, the “Sustainability” of the Project was assessed as "High (Score 3)" at the time of project completion.

4.2 Key Factors Affecting Implementation and Outcomes

The main factors that contributed to the effective and efficient implementation of the project are as follows:

- Consistent with JICA’s technical cooperation to the solid waste management (SWM) sector in Maputo City

  This Project aimed to strengthen the capacity of the DSMAS counterparts in the implementation of the SWM M/P in Maputo City by succeeding the outcomes and achievements of the JICA 3R Project, which supported the formulation of the M/P. Many of the key project members had experience in the JICA 3R Project and were able to smoothly understand and apply the activities and operation structure of the Project. The counterparts were also highly motivated to implement the M/P that they had formulated in the JICA 3R Project. Consistent with JICA’s technical cooperation to the SWM sector in Maputo since 2013 has brought significant advantage on the implementation and outcomes of the Project.

- Integrated and collaborative activities among each output working group

  As stated in the project title, the Project practiced integrated solid waste management activities, and many collaborative activities among the Outputs were implemented. For example, Output 2 and Output 5 teams collaborated in the business waste generators survey and the study of business waste management measures, and Output 3 and Output 6 teams collaborated in the source separation pilot project (PP) and recycling-related actors networking meetings. The DSMAS organizational improvement plan, human resource development plan, and the plan for updating regulations related to SWM in Maputo City under Output 5 were developed by compiling the findings from each output activities. All project activities were implemented in line with the M/P, and progress and issues of the activities were monitored and assessed through the action plan (A/P) and M/P monitoring under the Output 1 activities. The integrated and collaborative approach in implementation of the project activity enhanced effectiveness and efficiency of the teamwork and contributed in bringing fruitful outcomes of the Project.

- Holding regular progress meetings and setting-up working groups for each output

  Regular progress meetings with the counterparts (C/Ps) were held during the project period to confirm and share the progress and schedule of the project activities. During the COVID-19 pandemic situation, most of the progress meetings were held in the form of online meetings, but the ownership of the C/Ps, who continuously and willingly participated in the progress meetings despite various difficulties such as time differences and internet problems, was noteworthy.

  In each output working group, individual consultation between the JICA experts in charge and the C/Ps in charge were carried out, and enthusiastic discussions and activities were carried out even under the various restrictions caused by the COVID-19 pandemic. Whenever a problem related to the project management arose, it was discussed in the meetings with the project manager (DSMAS Director) and the main C/Ps and was dealt with appropriately. The progress of the project activities was reported to the project director (CMM Councilor) at appropriate times.

4.3 Evaluation on the Results of the Project Risk Management

The COVID-19 pandemic since the end of 2019 posed a major risk to the implementation of the Project. The impact of the pandemic was prolonged; therefore, the project duration was extended for ten months by amending the record of discussions (R/D) signed on 19 July 2019 as agreed in the minutes of the meeting in August 2021.

Nevertheless, the JICA Project Team could perform the planned project activities through enhanced communication via web meetings; thus, it was assessed that the project risk was well managed, and the Project was operated smoothly even under the difficulties caused by the pandemic.

4.4 Lessons Learned

4.4.1 Output 1

- As a seminar and workshop related to the analysis and evaluation of the current situation of municipal waste management was held as the "Urban Solid Waste Management and Good Environmental Practices Forum" organized by CMM. Through such collaboration, it re-recognized the importance for constant cooperation and information sharing with the Ministry of Land and Environment (MTA) and other related organizations.
- During the activity to identify priority issues in the M/P and to prepare the A/P, it was recognized that both CMM and DSMAS did not realize the lack of the consistency between the contents of the M/P approved in 2018 and the contents of the five-year development plan of the CMM. Therefore, it was necessary to clarify the relationship between the annual activity plan based on the five-year development plan and the A/P.
- Although the A/P was drafted as one of the outputs of the previous JICA project, the approved M/P was not accompanied by the A/P, so it was necessary to explain the purpose and content of the A/P once again in this project. Due to time limitation and other reasons, however, some actions remained as they were without appropriated modifications.
- Having opportunities on the development of the M/P monitoring system and the implementation of its monitoring, C/Ps could understand the contents of the M/P and grasp its progress. On the other hand, since the monitoring indicators of the approved M/P did not set quantitative target values to be achieved, progress monitoring had to be carried out with reference to the target values in the draft M/P developed during the previous JICA Project.
- It is a very good practice for DSMAS, through the monitoring of both M/P and A/P, to formulate a core monitoring team under the leadership of the deputy director of DSMAS, and by also involving other counterparts in charge of each content. On the other hand, as it is observed that there is still a tendency to rely on the involvement of JET experts in conducting the monitoring, DSMAS is expected to implement the monitoring of M/P and AP regularly with its ownership soon.
- Almost all C/Ps could participate in the mid-term review of the M/P. Then, various discussions were exchanged regarding on its contents and the results were summarized as recommendations for revision of the M/P by the Maputo Urban Transformation Project (PTUM). On the other hand, it was found that the existing M/P was approved in an inadequate state in terms of structure, expression, and consistency while various changes were made during the approval process. Therefore, securing of appropriate approval process could be a critical issue on the next revised version of the M/P.

4.4.2 Output 2

- Trial monitoring of the waste collection and transportation service was conducted in one of the districts and the weekly meetings were continued during the trial monitoring period. Knowledge and motivation of C/Ps for waste collection and transportation service management were improved by participatory information sharing, such as understanding the actual situation in the field, presenting and sharing of identified problems, exchanging opinions on measures for improvement. Regular

meetings with relevant sections and departments to share problems and discuss countermeasures should be held continuously for capacity development.

- As mentioned in the waste collection improvement plan, DSMAS needs to improve the waste collection plan, rather than leaving waste collection services fully dependent on micro-enterprises (MEs) and Waste Collection Service Providers (WCSPs). It is important to implement the plan by a Plan-Do-Check-Action (PDCA) cycle operation. Therefore, this Project compiled recommendations for future waste collection improvement plan and organizational structure. It is expected that the PDCA cycle will be implemented while referencing those recommendations.
- The waste collection and transportation services were often suspended because of inadequate management of the landfill site, which inhibited receiving the waste. The landfill site is the final destination of waste. Therefore, stability and continuity of landfill operation is a necessary requirement for proper waste collection and transportation services.

4.4.3 Output 3

- The source separation PP was conducted at DSMAS Office, Matola City Office, CMM City Hall, and Kampfumu District Office. The waste segregation bins and baskets, the color-coded signboards for each recyclable, and the operation manual were developed during the activity. The DSMAS counterparts enhanced knowledge and experience on planning, preparation, implementation, and monitoring of the source separation PP.
- The recycling-related actors networking meetings were held seven times during the Project. It contributed in identifying recycling-related actor in and around Maputo City and strengthening the networking among them. The JICA Project Team succeeded in identifying 38 recycling actors and an estimate of 8,270 t/year (22.7t/day) of recyclable waste was recovered on average in the city.
- The resolution on promotion of source separation and recycling was drafted based on the lessons learned from the Output 3 activities.

4.4.4 Output 4

- The draft of the Guideline on Operation and Management of Sanitary Landfill and its training materials were prepared by the JET and they were finalized after the review of the DSMAS counterparts. The Mozambican counterparts had difficulty in understanding the details of sanitary landfill operation and management as there is no sanitary landfill for municipal solid waste in the country yet. Hence, it is necessary for the Mozambican counterparts to continue improving their understanding on sanitary landfill operation and management by engaging in the ongoing sanitary landfill projects in Katembe and Mathlemele.
- The JICA Project Team had continuously communicated with the WB (PTUM) to grasp the progress and status of the Katembe Sanitary Landfill Construction Project, and with MTA (FNDS) and Matola City to grasp the progress and status of the Mathlemele Sanitary Landfill Construction Project. The coordination meeting with the relevant organization was quite effective in sharing and discussing SWM issues among the stakeholders.

4.4.5 Output 5

- The years of closely working together between JET and C/Ps have created an environment of genuine trust and respect. This means, while there were typical bottlenecks in data collection, especially in finance, there were other important information shared in confidence, which were essential in finding explanations regarding various "unorthodox" practices in DSMAS, and CMM, in general. This helped JET to carefully navigate around delicate matters while ensuring that project objectives were achieved.
- It allowed JET to understand fully the local and national context, which means strategies, tools, templates, and other project outputs were very well grounded, relevant, and practicable for the C/Ps.

- Models and templates were devised as simple, practicable, and flexible. They were able to closely mimic the legally acceptable formats, such as financial documents (i.e., budgets, statements of expenditures) while introducing improvements for quicker analysis and easier information sharing. Because the models and templates were practical, the C/Ps continued to use them even during the interim period between the 3R Project and this project.
- Collaborating in-person, or even remotely during the pandemic has let counterparts observe and assimilate, to a certain degree, the work ethics and practices of the JET, which, overall, improved behaviors towards delivery of, or attending to, official tasks.
- Because of work relations that have grown over time, on-the-job capacity building was more effective and evident on many of the counterparts. Moreover, because of the collaborative environment that the technical cooperation encourages, ownership towards project results is equally shared between JET and counterparts, where successes are celebrated and challenges are hurdled as one project team.

4.4.6 Output 6

- A core working group for public awareness and environmental education was set up within DSMAS. Meetings with MTA and the Ministry of Education and Human Development (MINEDH) were held and commitments of cooperation for future activities were confirmed. Since information was regularly shared with the MTA and MINEDH through participation in JCC meetings and recycling-related actors' meetings, concrete collaboration will be the next step.
- The JICA Project Team collected information on various actors involved in environmental education and public awareness activities in Maputo through interviews and site visits. To share information and collaborate with these entities, collaborating with Output 3, these entities were invited to recycling-related actors' meetings. At the recycling-related actors meeting, DSMAS also made a presentation on its own public awareness and environmental education, and shared with the participants that there were issues such as collaboration with other organizations, difficulties in changing the behavior of residents, and incorporating environmental education into the school curriculum.
- The action plan for Output 6 and the public awareness and environmental education programs were discussed and the following are implemented as main activities.
    - For environmental education for children, while taking advantage of the existing eco-school program, environmental picture diary and clean-up campaign (Spo Gomi) were newly introduced to expand the contents. Since the children and students enjoyed and actively participated in the activities and the effectiveness of the activities was confirmed, DSMAS decided to incorporate these activities into its own menu of environmental education activities and continue to work on them.
    - For Maputo citizens, the existing Cleanest Neighborhood Contest was supported, and in collaboration with Output 3, educational materials on source separation and recycling were developed and taught to municipal employees in the source separation PP at DSMAS office, CMM City Hall, and Matola City Office. Through the source separation PP, DSMAS has accumulated knowledge and experience in instructing sorting methods and developing effective educational materials for guidance and awareness raising.

4.4.7 Output 7

- The 'Maputo Model' was compiled by summarizing the knowledge and experience of DSMAS in promoting ISWM. The model was prepared in MS PowerPoint format and each topic was summarized in one slide so that it can be easily referred by decision makers and SWM officers of Mozambican municipalities. Besides, the detailed documents, manuals and tools developed under the activities were attached in the 'Maputo Model' as reference materials. The experience of

compiling the "Maputo Model" and introducing it to other cities in Mozambique gave DSMAS a great deal of confidence and contributed greatly to strengthening the capacity of C/P.

- The coordination meetings with MTA, National Association of Mozambican Municipalities (ANAMM), Matola City, and National Solid Waste Management Federation (ANGER) were held three times to discuss the dissemination plan of the 'Maputo Model' and preparation for the national seminar. It was agreed among the relevant organizations that it will be necessary for them to cooperate and collaborate in disseminating and promoting ISWM in the country by inputting resources of each organization.
- Considering the budgetary, staffing, and other constraints faced by Mozambican municipalities, it will be useful to utilize online conferencing systems to enhance communication and knowledge sharing among the municipalities.

5. FOR ACHIEVEMENT OF OVERALL GOALS AFTER THE PROJECT COMPLETION

5.1 Prospects to Achieve the Overall Goal

The overall goal and the objectively verifiable indicators set in the sixth joint coordination committee (JCC) meeting with its explanation are summarized as shown in Table 52. The prospect and recommendations to achieve the overall goal was examined and discussed in the following sections:

Table 52 Indicators for Overall Goal

Narrative Summary	Objectively Verifiable Indicators	Explanation
[Overall Goal] Integrated solid waste management (ISWM) is established in a sustainable manner in Maputo City and the 'Maputo Model' is disseminated to other cities.	1) MSW collection rate increases from 95% to 97%. (SDG 11.6.1)	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 District and others.
	2) MSW recycling rate increases from 1.7% to 5%. (SDG 12.5.1)	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 an MRF after closure of the Hulene dumping site.
	3) The concept of the 'Maputo Model' is disseminated inside/outside Mozambique.	DSMAS will provide trainings, lectures, workshops, and seminars to other municipalities in cooperation with MTA, ANAMM, and ANGER.

Source: JICA Project Team

5.1.1 MSW Collection Rate

To monitor the municipal solid waste (MSW) collection rate, it is necessary for Directorate of Municipal Service of Environment and Waste (DSMAS) to continuously collect and analyze the data on MSW generation amount and MSW collection amount.

The former data can be obtained by estimation based on population and MSW generation unit following the methodology set in the master plan (M/P). It is recommended that DSMAS will update the city's population data based on the census survey and conduct the waste amount and composition survey to update the waste generation unit.

The latter data can be obtained by analyzing the track scale data at Hulene dumping site or Katembe Landfill in the future. Hence, it is important for DSMAS to ensure stable operation of the track scale at the landfill and analyze the obtained data.

The target MSW collection ratio of 97%, the 2%-point increase from the status, can be achieved by promoting collection service in Katembe and Kanyaka districts, where primary collection service is not yet provided, and expanding primary collection service coverage area in Albazine and Costa do Sol Bairros.

It is worth noting that the DSMAS's capacity to obtain the abovementioned data by conducting necessary survey, and to analyze it by following the said methodology is important, rather than relying on the accuracy of calculated MSW collection ration as it still contains estimation and assumptions due to lack of available data.

5.1.2 MSW Recycling Rate

To monitor the MSW recycling rate, it is necessary for DSMAS to continuously collect and analyze the data on MSW generation amount and MSW recycling amount.

The former data can be obtained by the same methodology as the MSW collection rate.

On the other hand, the latter data can be obtained by conducting the recycling situation survey, which identifies recycling actors, their handling recyclable items, and the amount of recovered recyclables. Hence, it is important for DSMAS to ensure annual implementation of the recycling situation survey, which was conducted in the Project.

The target MSW recycling ratio is at 5%, which is a 3.3%-point increase from the current status, and can be achieved by promoting networking of recycling-related actors and installation of a MRF after the closure of the Hulene dumping site.

It is worth noting as well that the DSMAS's capacity to obtain the abovementioned data by conducting necessary survey, and to analyze it by following the said methodology, is important, rather than relying on the accuracy of calculated MSW recycling ration as it still contains estimation and assumptions due to lack of available data.

5.1.3 Dissemination of the 'Maputo Model'

The dissemination activity of the 'Maputo Model' to other municipalities in Mozambique shall be conducted in the form of training, lecture, workshop, seminar, etc., which can be organized by DSMAS in collaboration with Ministry of Land and Environment (MTA), National Association of Mozambican Municipalities (ANAMM), and National Solid Waste Management Federation (ANGER).

DSMAS should take initiative to hold coordination meetings with MTA, ANAMM, and ANGER, and implement training, lecture, workshop, and seminar on the 'Maputo Model' and keep records of such dissemination activities.

5.2 Plan of Operation and Implementation Structure of the Mozambican Side to Achieve the Overall Goal

To achieve the overall goal, the plan for operation and implementation structure was summarized as shown in Table 53.

Table 53 Plan of Operation to Achieve the Overall Goal

No.	Activity	Responsibility	Target Date
1-1	A/P monitoring	DSMAS	Biannually
1-2	M/P monitoring	DSMAS	Annually
1-3	Revision of the M/P	CMM/DSMAS	December 2028
2-1	Implementation of the waste collection and transportation service improvement plan	RGC/DSMAS	December 2024
2-2	Estimation of MSW collection ratio	DSMAS	Annually
3-1	Enactment of resolution on promotion of source separation and recycling	CMM/DSMAS	December 2025
3-2	Conduct recycling situation survey to update recycler map and database	REA/DSMAS	Annually
3-3	Estimation of MSW recycling ratio	DSMAS	Annually
4-1	Construction, operation and management of Katembe and Mathlemele sanitary landfills by utilizing the Guideline on Operation and Management of Sanitary Landfill	DGRSU/DSMAS	December 2025

No.	Activity	Responsibility	Target Date
5-1	Enforcement of the financial sustainability strategy on SWM in Maputo City	RAF/DSMAS	December 2024
5-2	Implementation of the DSMAS organization and human resource development plan	RHH/DSMAS	December 2024
5-3	Implementation of the plan for updating regulations related to SWM in Maputo City	CMM/DSMAS	December 2025
6-1	Conduct environmental education and awareness-raising activity by utilizing the manuals and tools developed in the project	REA/DSMAS	Continuous
7-1	Implement dissemination activity of the 'Maputo model'	CMM/DSMAS, MTA, ANAMM, ANGER	Continuous

Source: JICA Project Team

5.3 Recommendations for the Mozambican Side

5.3.1 Output 1

- Since the M/P should be the most basic planning document for proper solid waste management and 5R practices for Maputo City, active involvement of DSMAS who implements the M/P itself is crucially important. In other words, it is recommended that DSMAS should participate in all M/P updating processes, from current situation analysis to planning, implementation, and monitoring. In particular, because an appropriate analysis of the current situation is the basis of future planning, DSMAS should be aware of its heavy responsibility as an executing body of the M/P in the actual field of waste management.
- In addition, during the approval process of the updated M/P, explanations by DSMAS itself should be given to the City Council of Maputo (CMM) executives. At that time, it should be confronted earnestly without prejudice that the ability of DSMAS is still low.
- Generally, to formulate an appropriate M/P, it is beneficial to provide support from external experts and consultants, etc., as necessary, to complement the existing capabilities of DSMAS. On the other hand, DSMAS must strive to improve its technical capabilities with its strong ownership. Thus, necessary trainings and educational opportunities should be actively provided to DSMAS and other stakeholders for this purpose.
- Proper implementation of the M/P can be only possible with the monitoring, evaluation, and improvement as necessary in line with the Plan-Do-Check-Action (PDCA) cycle. Therefore, it is recommended to implement the monitoring of the M/P regularly by following the action plan (A/P), which may be also prepared together with the updating of the M/P, and to report the results of monitoring. In addition, the consistency between the contents of M/P and CMM's five-year development plan must be ensured.

5.3.2 Output 2

- The need for waste reduction to extend the life of the landfill and to reduce the financial burden on the CMM's waste management services are clarified by this project. Measures for waste reduction were recommended in the waste collection improvement plan, mainly focusing on the business waste management. Some specific examples include modification of regulations for business waste management, establishment of requirements for business operation licenses, educational activities with REA for business entities regarding business waste management such as information on licensed waste collection service providers and recyclers, and inspection by the Supervision Section (RFM) of the DSMAS on waste management practices among businesses.
- The number of staff in the Department of Urban Solid Waste Management (DGRSU) of the DSMAS is insufficient considering its allocated budget and work load, ranging from contract management for primary and secondary waste collection services, monitoring and inspection of waste collection service, illegal dumping management, waste receiving management, and landfill operation

management at Hulene dumping site. In addition, the staff's capacity such as data management are also required. As mentioned in Output 5, it is necessary to improve the organizational structure and human resource management based on the proposals such as clarifying the job descriptions with each relevant section, strengthening cooperation among the relevant sections, and appropriate allocation human resource within DSMAS.

- Delay in payment by CMM for waste collection service made to the waste collection service providers (WCSPs) to suspend their waste collection service frequently. This delay in payment also affected DSMAS's performance in contract management such as giving administrative directives and/or issuance of penalties to WCSPs. Execution of budget control through checking the budget against actual performance would be vital to maintain the function of DSMAS as an administrative body over WCSPs.
- With the planned operation of Katembe Sanitary Landfill and a waste transfer station in the future, management practices regarding the final landfilling is expected to improve. However, continued capacity development of DSMAS as an administrative body of not only of waste collection services but also of landfill and transfer station management, will be needed to ensure sustainable waste management services.
- Decisions to change, add, or eliminate waste collection container were often made by top-down approach of the CMM but not by DSMAS's decision. As a result, the waste collection service management by DSMAS was sometimes confused and affects contract management, monitoring and supervision, as well as cost for waste collection service. Therefore, coordination with CMM for better understanding and management regarding waste collection services is necessary.

5.3.3 Output 3

- DSMAS should promote the expansion of source separation practice in other CMM offices, business offices, and households in the city, by utilizing the developed materials and tools, knowledge, and experience obtained from the pilot project (PP) in the Project.
- DSMAS should establish a platform to link and connect each recycling-related actor. Besides, DSMAS, in collaboration with the recycling-related actors, should periodically conduct the recycling situation survey and continuously update the recycler map and database for promotion of recycling in Maputo region.
- CMM/DSMAS should enact and enforce the resolution on promotion of source separation and recycling to further promote the recycling activity in Maputo City.

5.3.4 Output 4

- As there is no sanitary landfill for MSW in Mozambique yet, DSMAS counterparts will need to further enhance their knowledge and experience on sanitary landfill operation and management by utilizing the developed guideline and by practice of Katembe and Mathlemele sanitary landfill projects.
- DSMAS should continue holding coordination meetings with the World bank (WB), Matola City and MTA to promote Katembe and Mathlemele sanitary landfill projects as well as to collaborate in improving integrated solid waste management (ISWM) in Mozambique.

5.3.5 Output 5

- It had been repeatedly emphasized that about 90% of the DSMAS's budget is spent on large contracts, and this scenario is not anticipated to change in the short- to medium-term. Thus, it is highly recommended that DSMAS takes contracts management seriously and that more technical expertise be built within DSMAS for better leverage in dealing with the contractors.
- DSMAS should not allow itself to be distracted by complex ideals, when most of its issues are, in fact, fundamental and can be addressed with fundamental solutions. For example, the financial

sustainability strategy that was developed through collaborative efforts between JET and counterparts (C/Ps) offers very practicable solutions to the perennial problem of inequitable cost distribution, non-transparency in revenue collections, and counterproductive systems and practices.

- The Administration and Finance Section (RAF) of the DSMAS should have more participation in project prioritization within the DSMAS, it should also have a key role in the drafting of terms of references (TORs) for contracts, evaluating bids, and then monitoring the performance of contractors.
- The chiefs of RAF and its staff must be consistent in holding weekly meetings as this opens communication lines among colleagues. Various issues, some of which had been very critical and has caused losses in revenue, could have been resolved sooner, or "unorthodox" practices could have been called out earlier if only members of RAF were able to openly communicate their concerns in an official venue.

5.3.6 Output 6

- Collaboration with MTA and the Ministry of Education and Human Development (MINEDH) is recommended for the following reasons.
  - MTA has developed textbooks on environmental education, but these textbooks are not being used in the actual field.
  - MTA is also aware of the problem of not being able to grasp what activities are being conducted by each of the entities involved in environmental education and public awareness activities.
  - REA wishes to incorporate environmental education into the school curriculum, which will require collaboration with MINEDH.
- Environmental education for children should include out-of-school activities in addition to existing programs. Visits to recycling facilities and cleaning activities in the community, etc., with due consideration for safety, would provide better awareness for children. By having instructors from waste collection companies, recycling facilities, and other related parties serve as instructors, it is possible to raise awareness and strengthen cooperation among all parties involved.
- Currently, REA's environmental club activities are conducted at some elementary schools in Maputo, and it is hoped that these activities will be expanded horizontally. One way to do this is to train elementary school teachers to provide environmental education without REA's direct presence.
- Environmental education and awareness-raising in cooperation with other DSMAS departments should be considered, such as education on cleaning fee with RAF, business waste management rules with RFM, and illegal dumping prevention with the Public Removal Section (RRP) of the DSMAS. It will be very effective to strengthen awareness-raising activities that are integrated with DSMAS's waste management operations.

5.3.7 Output 7

- CMM/DSMAS, MTA, ANAMM, Matola City, and ANGER should continue cooperation and collaboration in disseminating the 'Maputo Model' in Mozambican municipalities. MTA should take the initiative in promoting ISWM as it is the national government ministries that has the jurisdiction over waste management.
- MTA should make its best effort to collect solid waste management (SWM) data from the Mozambican municipalities in the form of questionnaires (called as 'urban solid waste data collection sheet') as stipulated on Article 10 of the "Regulation on Urban Solid Waste Management (Decree No. 94/2014).

5.4 Monitoring Plan from the End of the Project to Ex-post Evaluation

The monitoring plan from the end of the project to ex-post evaluation was prepared as shown in Table 54.

The monitoring form to be utilized in the implementation of each action is attached to the report as Appendix 11-1. The use of this monitoring form was agreed upon in consultation with DSMAS.

Table 54 Monitoring Plan from the End of the Project to Ex-post Evaluation

No.	Monitoring Item	Responsibility	Report/Record	Frequency
1-1	A/P monitoring	DSMAS	Record of A/P monitoring	Biannually
1-2	M/P monitoring	DSMAS	Record of M/P monitoring	Annually
1-3	Revision of the M/P	CMM/DSMAS	Progress of the M/P review and revision	Annually
2-1	Implementation of the waste collection and transportation service improvement plan	RGC/DSMAS	Progress of the implementation of the plan	Biannually
2-2	Estimation of MSW collection ratio	DSMAS	Report on MSW collection ratio	Annually
3-1	Enactment of resolution on promotion of source separation and recycling	CMM/DSMAS	Progress of formalization of the resolution	Annually
3-2	Conduct recycling situation survey to update recycler map and database	REA/DSMAS	Report on recycling situation survey	Annually
3-3	Estimation of MSW recycling ratio	DSMAS	Report on MSW recycling ratio	Annually
4-1	Construction, operation and management of Katembe and Mathlemele sanitary landfills by utilizing the Guideline on Operation and Management of Sanitary Landfill	DGRSU/DSMAS	Progress of the sanitary landfill projects. Record of training on sanitary landfill	Biannually
5-1	Enforcement of the financial sustainability strategy on SWM in Maputo City	RAF/DSMAS	Progress of enforcement of the strategy	Quarterly
5-2	Implementation of the DSMAS organization and human resource development plan	RHH/DSMAS	Progress of the implementation of the plan	Quarterly
5-3	Implementation of the plan for updating regulations related to SWM in Maputo City	CMM/DSMAS	Progress of the implementation of the plan	Biannually
6-1	Conduct environmental education and awareness-raising activity by utilizing the manuals and tools developed in the project	REA/DSMAS	Report on awareness-raising activity	Biannually
7-1	Implement dissemination activity of the 'Maputo Model'	CMM/DSMAS, MTA, ANAMM, ANGER	Record of dissemination activity	Biannually

Source: JICA Project Team