INTEGRATED URBAN SOLID WASTE MANAGEMENT PLAN (PGIRSU)

VILA DA MANHIÇA MUNICIPAL COUNCIL

Prepared by:

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Datasheet

Title:	Urban Solid Waste Integrated Management Plan Vila da Manhiça Municipal Council (2023 - 2027)
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Index

Figures

Tables

List of Attachments

Annex 8- Municipal Waste Bin Registration Form Annex 9 -

Collection point inspection record Annex 10 – Equipment

Inventory Model

Annex 11– Attendance List of the Public Consultation Meeting of the Integrated Solid Waste Management Plan of Vila da Manhiça (06/02/2023) and Photographic Images of the Meeting

Terminology

Packaging:is the placement of solid waste inside appropriate, lined containers, which guarantee their tightness, in regular hygienic conditions, with a view to their subsequent storage and collection.

Utilization or Valorization– use of waste or components thereof through recycling processes, reuse aimed at obtaining secondary raw materials with the aim of reintroducing waste into production and/or consumption circuits in similar use, without altering them.

Rural or predominantly rural area– area that, being an integral part of the municipality, has rural characteristics, namely a low population density.

Urban area– area within municipalities with very high population and housing density, with good access and orderly occupation.

High-density suburban areas– made up of informal settlement areas with a high population and housing density, whose internal roads are almost non-existent and are particularly difficult to access.

Medium-density suburban areas– composed of relatively organized settlement areas, resulting in an average population density, where there are wide access roads.

Storage– temporary and controlled deposition of Urban Solid Waste (MSW), for an undetermined period of time, prior to its treatment, use or disposal.

Controlled landfill– infrastructure whose purpose is to deposit waste on land, according to management plans and which does not have leaching, waterproofing and gas management control systems.

Landfill– a place specially prepared for the deposit of RSUs, normally constructed in such a way as to have minimal impacts on the environment and public health, using cells with variable length and width, where they are unloaded and spread in strips of small thickness and, subsequently compacted, with earth being placed over each cell.

Capitation– unitary production of waste. For domestic MSW, it is defined in kilograms per inhabitant and unit of time (kg/inhabitant/day), and can be expressed in other units depending on the respective sector, for example kg/bed/day for MSW from hotel establishments.

Urbanized center (or cement city)– forms the center of the city/village and is normally made up of commercial areas with residential areas of buildings and/or individual houses (villas), where most public institutions are also located. This area is normally characterized by wide avenues (some paved).

Placing– activity of depositing and packaging MSW, by its producers, in locations, equipment or facilities previously defined by the Municipal Council of Vila da Manhiça.

Composting– method for decomposing organic material existing in waste, under appropriate conditions, in order to obtain an organic compound.

Deposition– packaging of urban waste in locations or equipment previously determined by the Municipality, in order to be collected.

Final destination– last stage of the process of eliminating RSUs, consisting of their deposit in appropriate locations, so as to cause minimal damage to public health and the environment.

Elimination– any operation that aims to provide a final destination for MSW.

Environmental impact study– component of the Environmental Impact Assessment process that technically and scientifically analyzes the consequences of the implementation of development activities on the environment, for activities classified as category A and A+.

MSW Management– all viable procedures with a view to ensuring environmentally safe, sustainable and rational management of waste, taking into account the need for reduction, placement, collection, transport, storage and/or disposal of waste, as well as the subsequent protection of waste sites disposal in order to protect human health or the environment against the harmful effects that may arise from them.

Municipal Cleaning– various procedures that include the scanning and management of MSW and aim to clean the Municipality.

Waste Operator– entity that carries out activities related to waste management.

Producers– all public, private, commercial and industrial entities that manage and produce MSW, which may be household (family units), public or private.

Recycling– process of transforming solid waste, which involves changing its physical, physico-chemical or biological properties, with a view to transforming it into inputs or new products.

Collection– operation of collecting, sorting and/or mixing MSW, with a view to its transportation.

Reduction– set of all activities and measures aimed at reducing the production of MSW.

Residue– object or substance that the holder disposes of or has the intention or obligation to discard.

Biomedical waste– hazardous waste resulting from human and veterinary diagnosis, treatment and research activities.

Hazardous waste– waste that contains a risk characteristic because it is flammable, explosive, corrosive, toxic, infectious or radioactive, or because it presents any other characteristic that constitutes a danger to the life or health of humans and other living beings and to the quality of the environment.

Commercial solid waste– those of commercial origin, which have the characteristics of domestic solid waste, such as those from commercial establishments, offices, restaurants and other similar materials.

Industrial solid waste equivalent to urban waste– those of industrial origin that have characteristics of domestic urban solid waste, such as those from cafeterias, canteens and offices.

Urban solid waste(RSU) – any substances or objects with a predominantly solid consistency (non-hazardous) that the holder discards or has the intention or obligation to discard.

Green waste– those arising from the cleaning and maintenance of gardens, public green spaces or cultivation areas and homes, namely clippings, trunks, branches, cutting grass and herbs

Transfera – component of the cleaning system of the Municipality of Vila da Manhiça which, prior to its elimination, combines transport and storage operations with the use of public or private stations suitably designed for this purpose.

Transport– any physical transfer operation of MSW, using its own vehicles from the production sites to the disposal sites, with or without passing through transfer stations.

Waste treatment– any waste recovery or disposal operation, including preparation prior to recovery or disposal, comprising mechanical, physical, thermal, chemical or biological processes, which change the characteristics of waste in order to reduce its volume or dangerousness.

Scan– set of activities carried out by Municipal Services or duly licensed private entities with the purpose of freeing roads and other public spaces from MSW.

ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
ACIDECO	Christian Community Development Association
AL	Local Authorities
AIA	Environmental Impact Assessment
AM	city Council
ANAMM	National Association of Municipalities of Mozambique
ANE	National Highway Administration
CFM	Mozambique Railways
CHISM	Health Research Center in Manhiça
CMVM	Vila da Manhiça Municipal Council
DTAS	Technical Directive for the Implementation and Operation of Sanitary Landfills in Mozambique
DUAT	Right to Use and Benefit from Land
AND THE	Simplified Environmental Study
EDM	Electricity of Mozambique
CUTE	Strengths – Opportunities – Weaknesses – Threats
SUNSET	Integrated Urban Solid Waste Management
hab	Population
IFC	International Finance Corporation
INE	National Statistics Institute
INSS	National Social Security Institute
MAEFP	Ministry of State Administration and Public Service
MTA	Ministry of Land and Environment
NGO	Non-governmental organization
PNGA	National Environmental Management Program
PQG	Government Five-Year Program
PDUL	Urban and Local Development Project
PEU	Urban Structure Plan
PGIRSU	Integrated Urban Solid Waste Management Plan

Acronym	Meaning
LOL	Solid Waste
CSR	Commercial Solid Waste
RSD	Domestic Solid Waste
RSLP	Solid Waste from Public Cleaning
MSW	Urban solid waste
SATCC	Southern African Transport and Communications Commission
TIR	Internal Rate of Return
NPV	Net present value

1. Introduction

In recent years, the Municipality of Vila da Manhiça has seen growth in its population and an increase in population density in the urban center. This growth is accompanied by an increase in waste generation in the Municipality. Consequently, increasing the pressure on existing resources for the management of urban solid waste. This population increase, accompanied by an increase in waste generation, constitutes an important issue that requires strategic intervention.

The Integrated Urban Solid Waste Management Plan (PGRSU) is an instrument that provides measures and actions aimed at sustainable management of urban solid waste and support to overcome the current challenges faced by the Municipality and citizens.

PGIRSU identifies strategic programs and approaches to improve the collection, transportation and disposal of municipal solid waste, while ensuring that waste services are delivered in a long-term sustainable manner through supportive financial mechanisms, sound policies and institutional frameworks and monitoring. Thus, goals and actions were identified and proposed, with a view to encouraging the reinforcement of political commitment, participation and collaboration of the main public, private and civil society actors (citizens, companies, academia and other interested parties) to guide efficient and efficient practices. effective waste management in Vila da Manhiça.

The current PGIRSU meets the requirements established by the Regulation on Urban Solid Waste Management (Decree 94/2014 of 31 December). This, in its Article 8, establishes the obligation to prepare Integrated Urban Solid Waste Management Plans, which must be approved by the Municipal Assemblies or District Governments and valid for a period of 5 years, and can be updated whenever justified. It is within this context that the current Integrated Management Plan for the Municipality of Vila da Manhiça is presented. This document is valid for five years, covering the period between 2023-2027.

1.1 Objectives of PGIRSUs

The global objective of PGIRSU is to define the framework for the implementation of integrated management, with regard to the collection, storage, transport, treatment and final disposal of urban solid waste, prioritizing meeting environmental and public health requirements, based on cost-efficiency and sustainability assumptions.

This PGIRSU was developed based on the following specific objectives:

- Develop a PGIRSU for Vila da Manhiça aligned with the guidelines, strategies, goals and programs currently defined in the regulations;
- Develop tools to facilitate the Vila da Manhiça Municipal Council (CMVM) in implementing the PGIRSU;
- Train the Municipality and main actors in the preparation and updating of PGIRSUs;
- Formulate waste management strategies appropriate to the current context and with short and medium-term strategic goals and objectives in mind;
- Propose goals and actions to be incorporated into the Municipal Planning Cycle;
- Identify performance indicators for monitoring the effectiveness of the implementation of the Municipality's PGIRSU.

1.2 Scope and aspects of Integrated Urban Solid Waste Management

The elements and aspects associated with Integrated Urban Solid Waste Management are presented in**Figure 1** below. These elements were the subject of analysis during the preparation of the current Integrated Urban Solid Waste Management Plan.

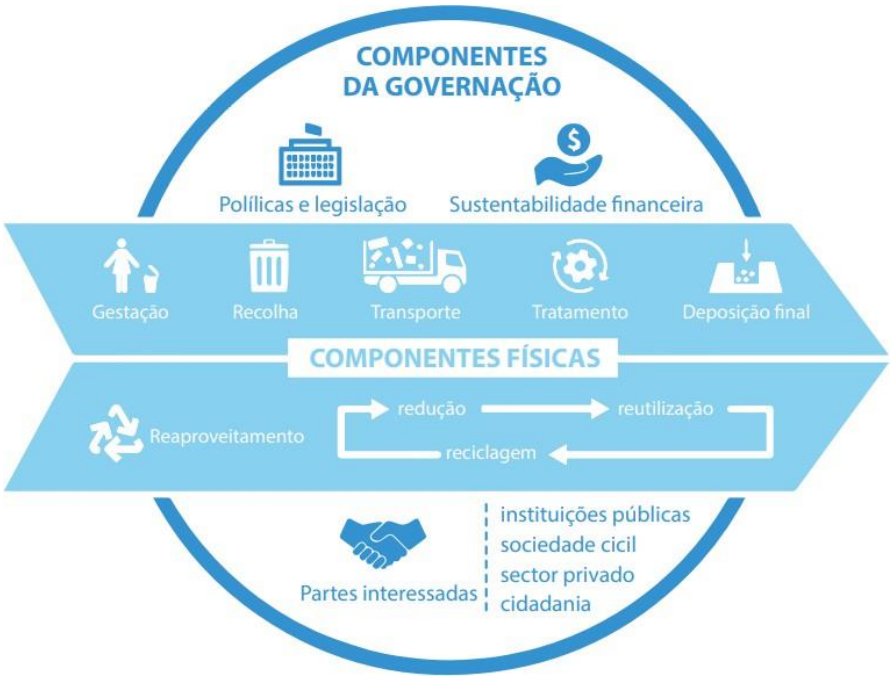

Figure 1: Elements and aspects of integrated waste management[1](source: Guide for preparing integrated management plans)

The PGIRSU resulted from an analysis of the institutional and governance framework for solid waste management. It took into account national strategies, laws and regulations, as well as, at Municipal level, the standards, code of behavior and organizational structure of the solid waste management sector.

To support the analysis of the financial sustainability of the sector and proposed solutions, the following aspects were evaluated:

- Existing tariff system (garbage tax), its levels and costs associated with this charge (data were collected from the last three years 2019, 2020, 2021);
- Number of taxpayers and respective categories (eg general, commercial, etc.) of the tariff system;
- Costs associated with GIRSU. In addition to investments in equipment, operating expenses associated with i) personnel, ii) fuel & lubricants, iii) maintenance, iv) Contracts were analyzed.

[1]*Source: Guide for preparing integrated management plans (MTA, 2020)*

with provision of waste management operations services, and v) Expenses with studies and other costs.

The physical component focused on the flow of urban solid waste management from generation to final disposal. The collection services provided by the Municipal Council, the conditions of waste disposal sites (dumps), the locations and means used to manage solid waste in Vila da Manhiça were evaluated. The valorization of waste and participation of actors were other aspects analyzed during the preparation of the current Plan.

2. Methodology

The methodology applied was based on the Guide for the Preparation of Integrated Urban Solid Waste Management Plans, published in 2020 and developed within the scope of the Urban and Local Development Project (PDUL) implemented under the supervision of the Ministry of Land and Environment (MTA).

The methodology for preparing the current PGIRSU for the Municipality of Vila da Manhiça encompassed the following steps:

1. Working group formation
2. Collection of basic information
3. Diagnosis and consultation (through information sharing, intermediate products and collection of sensitivities and comments)
4. Formulation of the integrated urban solid waste management strategy
5. Definition of goals and indicators
6. Presentation of the Integrated Urban Solid Waste Management Plan.

2.1 Formation of the Working Group

The preparation of the current PGIRSU followed an inclusive and participatory process involving representatives from different councils at the level of the Municipal Council and external actors identified by the Municipal Council as being relevant and active in the management of urban solid waste. In the initial phase of preparing the PGIRSU, a Working Group composed, mainly, of the Councils and Departments of the Municipal Council (see**Table 1**).

Table 1:PGIRSU Working Group

At the.	Name	Institution	Department / Council
1	Samuel Bicane	CMVM	Councilor for Construction, Urbanization and Energy
two	Manuel Pedro Massingue	CMVM	Head of Health – Construction, Urbanization and Energy Council
3	Isaac Gove	CMVM	Physical Planner – Urbanization and Energy Construction Council
4	Carlos Manhusse	CMVM	Head of Sanitation and Water Supply - Construction Council Urbanization and Energy
5	Domingos Timba	CMVM	Economic Activities Technician – Economics and Finance Council
6	Violet Atália Dimande	CMVM	Economics and Finance Council

The working group identified other actors and interested parties with regard to different areas of domain and interest in waste management. The list of actors and interested parties is included in Annex 1. It must be regularly updated by the Municipal Council to allow new actors and interested parties to be properly identified and, consequently, engaged on urban solid waste management issues in the Municipality of Vila da Manhica.

2.2 Collection of basic information

This stage essentially comprised a survey and pre-analysis of basic information on the governance and physical components relating to the management of urban solid waste at the Municipality level.

The collection of information initially consisted of a bibliographical data survey and then a detailed field survey.

The field survey corresponded to the descriptive-qualitative method based on the application of previously prepared questionnaires aimed at technicians/work groups, Municipal managers with the aim of collecting general and specific information about GRSU.

a) Qualitative method

- Direct observation (semi-structured/with a checklist);
- Focus group meetings;
- Photographic reporting and spatial analysis;
- Unstructured or semi-structured interviews;
- Document analysis and evaluation by staff of public institutions and services.

a) Quantitative method

- Statistical document analysis;
- Visits and mapping of solid waste collection sites (with and without containers);
- Visit and mapping of formal and informal dumps.

To serve as a guide during data collection, a Matrix to support the collection of basic information was shared with the Municipal Council and working group (see Annex 2).

3. Public Hearing

A public consultation meeting on the Integrated Urban Solid Waste Management Plan of the Municipality was held on June 2, 2023. This meeting aimed to promote the involvement of the main municipal actors involved in the management of urban solid waste in the Municipality of Vila da Manhiça (CMVM). This meeting was held with the aim of:

- Present to interested and affected parties the summary of the Urban Solid Waste Management Plan of the Municipal Council of Vila da Manhiça, prepared by the team of consultants with the support of the work team formed by the Municipal Council of Vila da Manhiça and other actors, under coordination from the team of the National Directorate of the Environment (DINAB), of the Ministry of Land and Environment (MTA).

- Confirm the premises and data used during the process of preparing the PGIRSU for the purposes of defining the governance and operational reference framework for the waste management sector in the Municipality
- Collect opinions and sensitivities about the management solutions proposed in PGIRSU.
- Raise awareness and collect comments on the strengths, weaknesses, opportunities and threats identified around the issue of urban waste management in the Municipality.
- Present the proposed waste management strategy and identify issues that require a change to the proposed approach.
- Identify, with the Municipal Council and interested parties, potential constraints to achieving the waste management goals identified in the PGIRSU
- Obtain consensus on urban solid waste management goals and their respective implementation calendar.

The main topics presented during the meeting are presented in the Table below.

Item no.	Study Stage	Specific Topics
1	Working group to prepare the PGIRSU	• Presentation of the composition of the working group involved in preparing the PGIRSU (mainly composed of members of the Municipal Council)
two	Collection of basic information	• Presentation of the methodology applied during the preparation of the PGIRSU and information obtained
3	Diagnosis	• Summary of the administrative, institutional and technical-legal framework for waste management • Characterization of the current management of urban solid waste at the Municipal level • Presentation of the financial framework (summary of income and expenses)
4	Diagnosis	• Joint review of the SWOT analysis (SWOT - Strengths, Opportunities, Weaknesses and Threats)
5	Formulation of the Waste Management Strategy	• Proposal to review the organizational structure for urban solid waste management • Waste collection options and Table of advantages and disadvantages of the proposed collection systems • Final waste disposal proposal • Waste recovery initiatives • Financial planning and strategies to improve financial sustainability
6	Formulation of the Waste Management Strategy	• Presentation of objectives, targets and monitoring indicators
7	Discussion	

The meeting was moderated by the Municipal Council of Vila da Manhiça, under the leadership of the President of the Municipal Council and the Vice-President of the Municipal Assembly. The meeting had 92 participants, 41 women and 51 men. Various groups participated in the meeting, from members of the Municipal Assembly, representatives of councils, Neighborhood Secretaries, Head of Localities, Associations, State institutions as demonstrated through the Attendance List presented in the Annex

11. The same attachment presents some images photographed during the event.

During the meeting, several interventions were made by the different participants. Some of them, with the aim of reinforcing the message brought by the Plan and presented by the Consultant, others to clarify some doubts and obtain additional information and others to make suggestions and comments. Below, the main comments and questions presented during the interventions are summarized:

- The need to raise awareness about health risks when collecting recyclable waste by collectors.
- Need to build a fence around the dumpster to prevent residents from accessing the site.
- Complaints about the lack of containers in some rural areas.
- Need for lectures aimed at residents on how to implement selective collection.
- Need to consider incentives for the practice of segregation by residents.

4. General Context and Administrative Division

Vila da Manhiça, headquarters of the district of the same name, is located along the EN1 road, approximately 80 km north of the city of Maputo, limited to the north by the 3 de Fevereiro Administrative Post, to the south by the town of Maciane , to the East by the Administrative Post of Calanga and to the West by the Districts of Magude and Moamba. In the figure below, the map of the geographic location of Vila da Manhiça is represented, marked by the presence of the Incomáti river valley.

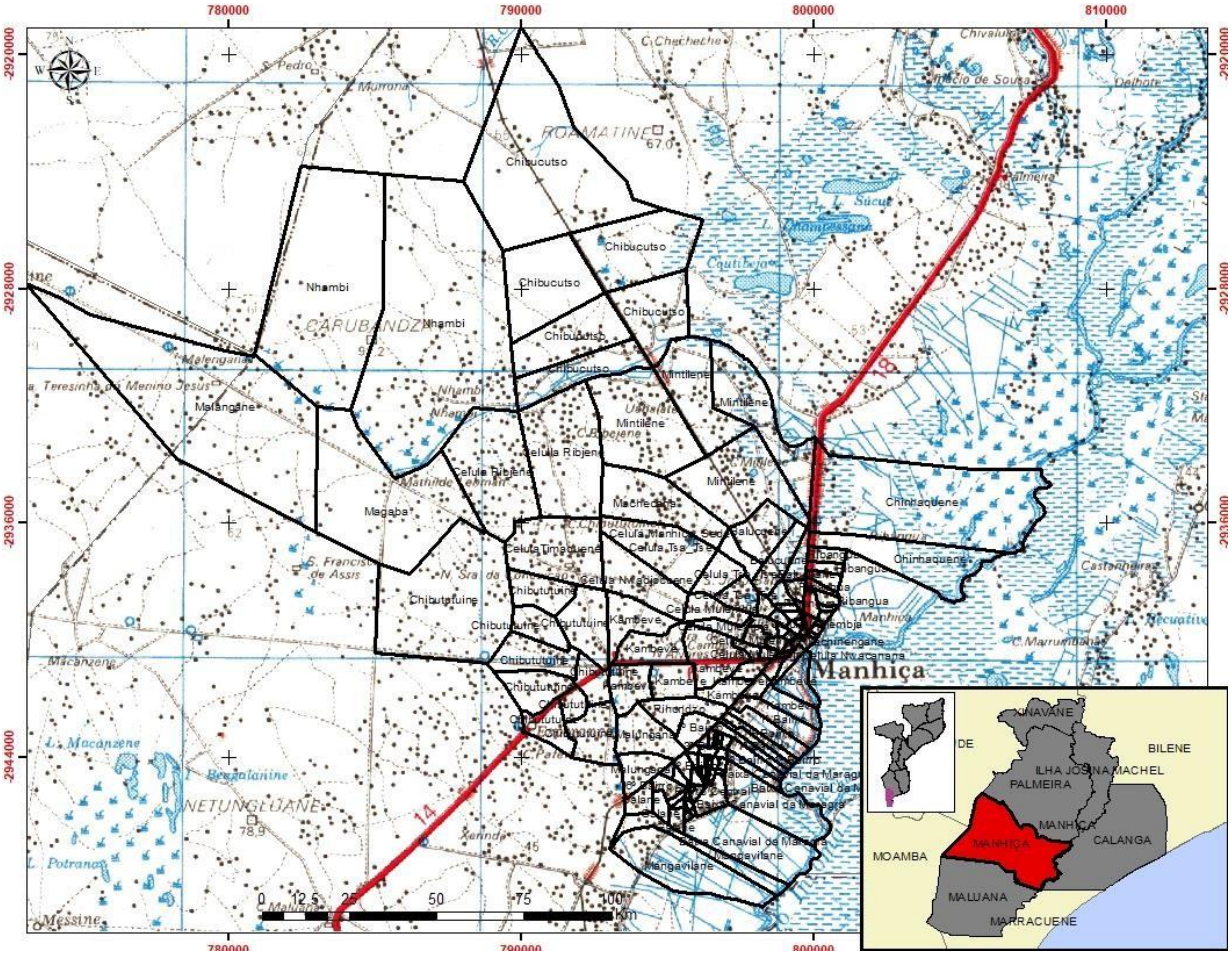

Figure 2: Geographical framework of the Municipality of Vila da Manhiça

According to its administrative division, the Municipality of Vila da Manhiça (elevated to this category in 1998) with an area of 250 km2 is divided into two locations, namely Manhiça-Sede and Maciana. These localities are made up of 22 neighborhoods.

Although an Urban Structure Plan for the Municipality of Vila da Manhiça is still being prepared, the town currently has more than 57 thousand inhabitants.

Once crossed by the EN1, Vila da Manhiça establishes connections with Maputo and Xai-Xai and has a relatively significant and operational network of secondary and tertiary roads.

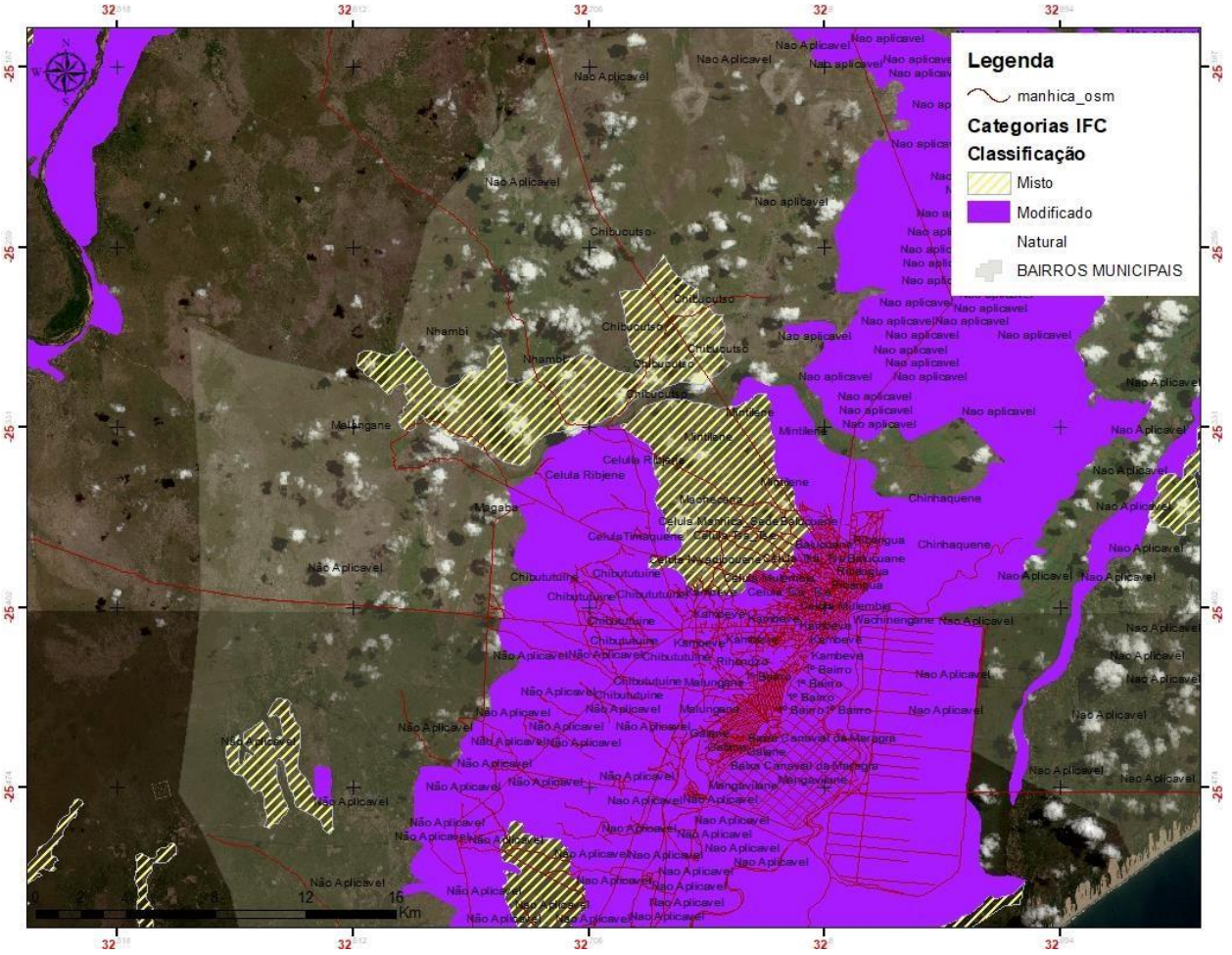

Figure 3: Current land use in the Municipality of Vila da Manhiça

According to the categorization of the International Financial Corporation (IFC), the Municipality of Vila da Manhiça has only 3 classes of land use, (**Figure 3**) depending on the degree of presence of the population. These are mixed, modified and natural. Along the Posto Municipal Sede (localities of Manhiça-sede and Maciana), modified areas predominate, corresponding to areas of expanding urban and housing construction and areas considered rural housing.

Outside of these areas, green natural areas predominate, characterized by being low-lying areas susceptible to flooding, pasture areas and service areas (cement city).

5. Municipal Characterization

5.1 Demographic description

The Municipality of Vila da Manhiça was elevated to the category of Town on May 18, 1957 and became a Municipality in 1998, with an elected local Government. The Municipality's bodies are an Assembly with members with legislative and deliberative power and the Municipal Council with executive power.

In 2017, the population of Manhiça was 57,512 inhabitants, according to the 2017 census. Administratively, the town of Manhiça is divided into two localities, namely, Manhiça-Sede and Maciana. Localities are divided into Neighborhoods (see**Table 2**) and these, in turn, into cells.

Table 2: Administrative Division of Vila da Manhiça

	Location	Towns/Village/Neighborhoods
Municipality of Vila da Manhiça	Manhiça Headquarters	Mulembja, Aerodrome, Manhiça-Sede, Chibucutso, Mitilene, Cofi, Ribângua, Manhiça-Cimento, Ribjene, Balucuene, Chafutene, Wenela, Tsa-tsé
	Subtotal	**13**
	Maciana	Maciana, Chibututuine, Cambeve, Rihondzo, Galane, Madzule, Mphundlanine, Phungane It is Combatant
	Subtotal	**9**

A**Table 3** below shows the population distribution by neighborhood, taken from the Vila da Manhiça Sanitation Action Plan (2019). According to the information contained, the Manhiça-Sede neighborhood is the most populous in the village.

Table 3: Population Distribution by Neighborhood (source: CMVM, 2019)

At the.	Neighborhood Name	Number of Blocks	Number of Families	Number of people
Location of Manhiça-Headquarters				
1	Manhiça-Headquarters	33	1316	6580
two	Aerodrome	9	373	1865
3	Mytilene	5	190	950
4	Chibucutso	7	290	1450
5	Cofi	1	35	175
6	Ribângua	21	849	4245
7	Chafutene	5	209	1045
8	Wenela	11	439	2195
9	Manhiça-Cement	6	233	1165
10	Ribjene	12	186	930
11	Tsa-tse	15	614	3070
12	Balucuene	19	749	3745
13	Mulembje	16	639	3195
Subtotal		160	6122	**30610**
Locality of Maciana				
14	Maciana	10	406	2030
15	Cambeve	38	1528	7640
16	Galane	18	719	3595
17	Chibututuine	12	496	2480
18	Madzule	13	534	2670
19	Phundlanine	14	541	2705
20	Phungane	15	584	2920
21	Combatants	13	528	2640
22	Rihondzo	1	43	215
Subtotal		134	5379	**26895**
Total		**294**	**11501**	**57505**

The following table (**Table 4**) includes population data from the 2017 census and projections for the period between the years 2017 – 2030. Providing a current perspective (2022) and the Plan implementation period (2023- 2028) and a broader horizon until 2030. The projections were calculated based on the average population growth rate of Maputo Province of 3% (INE, 2017).

Table 4: Population Projection of the Municipality of Vila da Manhiça

Year	Population
2017 (INE)	**57512**
2018	59237
2019	61014
2020	62845
2021	64730
2022	**66672**
2023	68672
2024	70733
2025	72854
2026	75040
2027	77291
2028	79610
2029	81998
2030	84458
2031	86992
3032	89602

According to CMVM data, population growth throughout the Municipality is notable. The new occupation areas are located along the Kambeve – Maciana urban expansion and to the north in Balucuane (site of the official municipal dump).

5.2 Urban description

From an urban planning and infrastructure distribution point of view, the areas closest to the town are organized and divided compared to areas further away, such as the Mulembje and Tsa-Tsé neighborhoods. These have an organized structure, however, there are already constructions that do not respect the territorial order. The Kambeve and Galane cells are currently experiencing accelerated rural expansion. The headquarters neighborhood and the Tsa-Tsé and Ribangua cells constitute the central reference point in the Municipality. Considering the

most important characteristics for the physical planning of GIRSU (population density, type of housing, access, etc.), it is possible to group these areas into 2 main categories. Each category is analyzed specifically in the planning process, choice of collection and transport systems, etc.

Table 5: Characteristics of access and use of land

Urban category	Road network	Land use and coverage
urbanized center	Main (EN1)-Main trunk / Road Stem	Residential / services
Suburban low density/rural	Third/secondary	Cultivation areas/villages

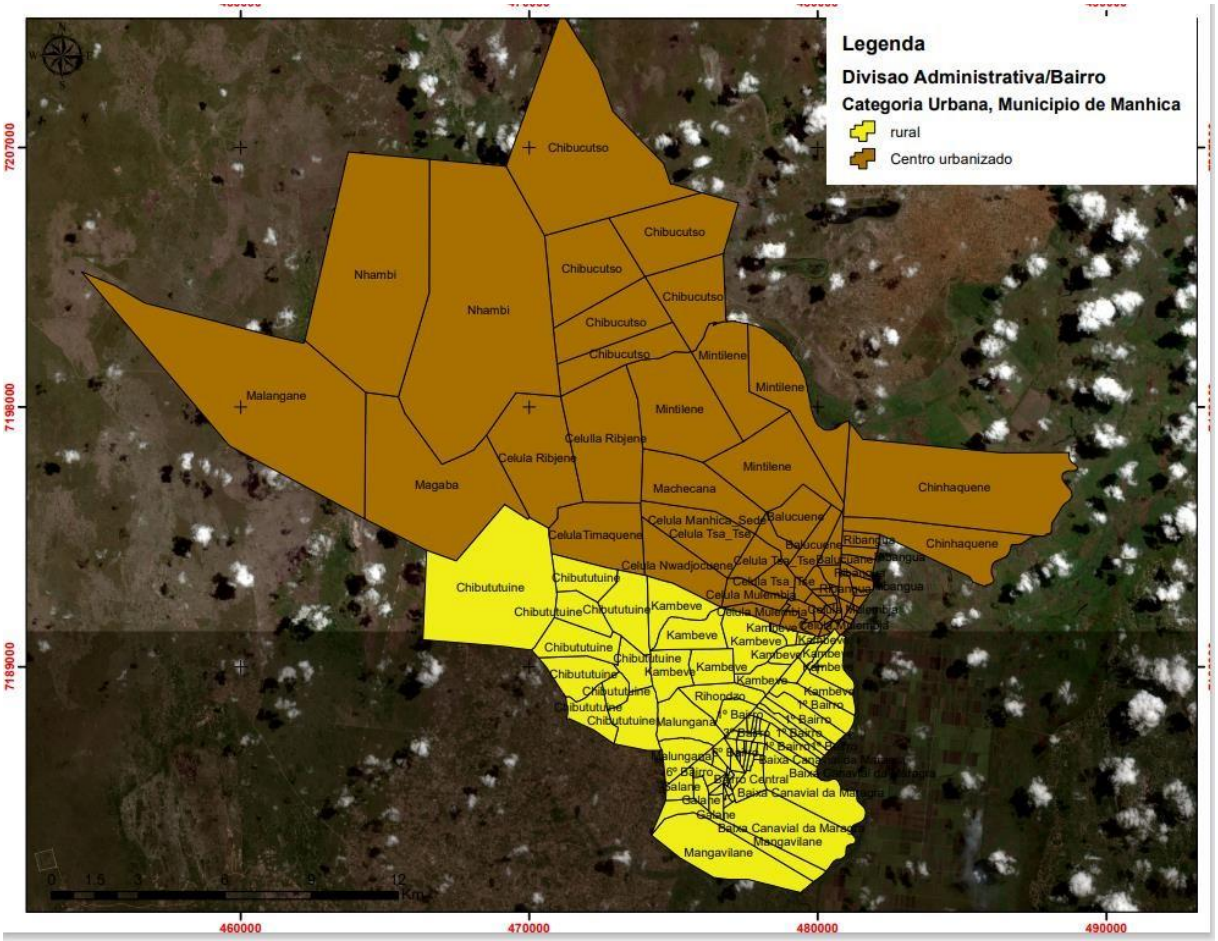

Figure 4: Urban Categories of the Municipality of Vila da Manhiça

According to the National Road Administration (ANE), roads are classified into 3 categories, namely main, secondary and tertiary roads. According to the urban categorization defined in**Table 5** Above, main, secondary and tertiary roads are identified in the municipality. For urban roads, the classification is based on 3 categories (Main trunk, Trunk and secondary) according to the combined classification (ANE and SATCC2).

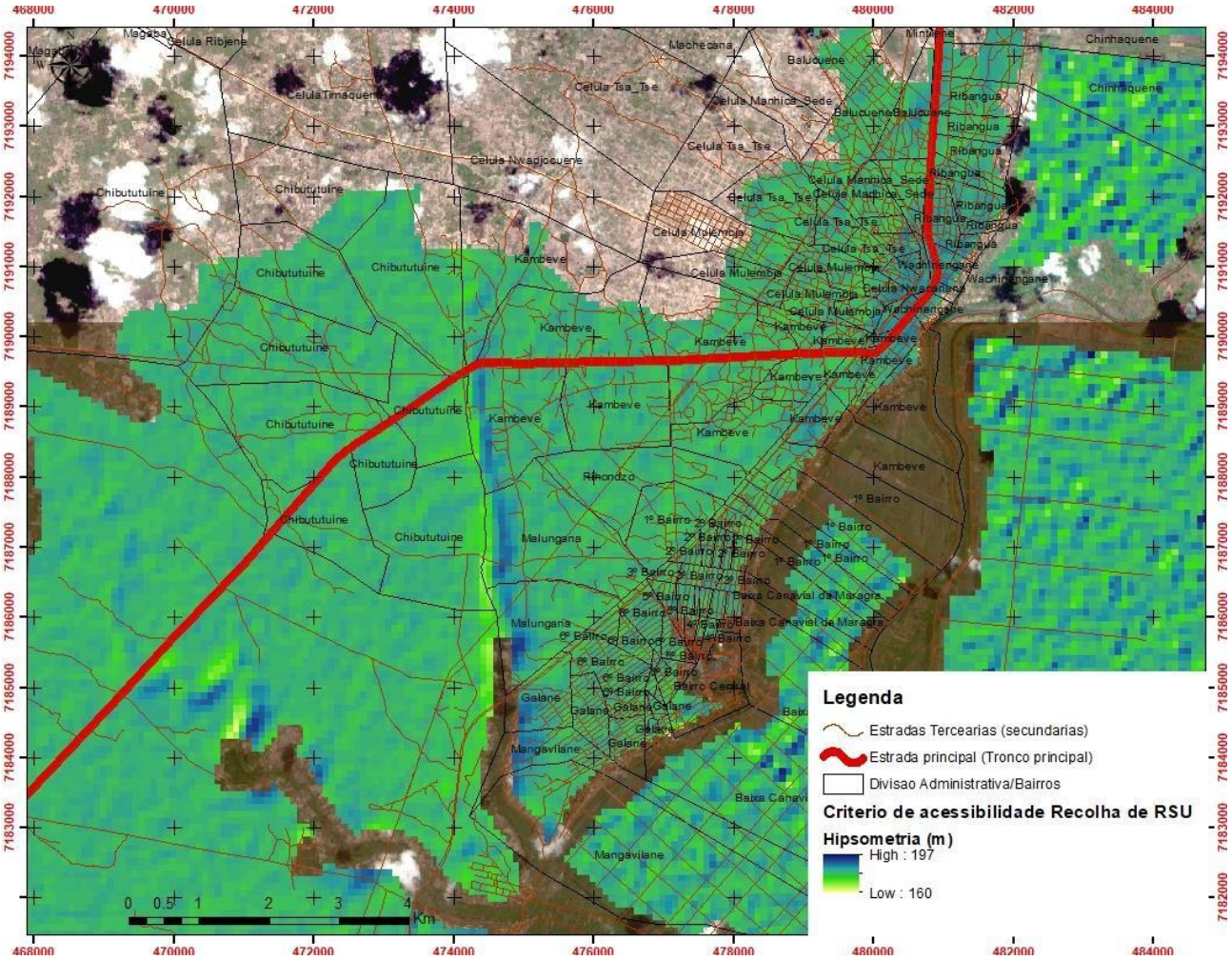

Figure 5: Access in the neighborhoods of the Municipality of Vila da Manhiça

[two]*Southern African Transport and Communications Commission*(Southern African Transport and Communications Commission)

5.2.1 urbanized center

The urbanized center (“cement city”) is made up of commercial areas with residential and commercial areas of small buildings and individual houses (villas), and also houses most public institutions. This area is crossed by national road number one (EN1) which connects to the city of Xai-Xai. The streets within the neighborhoods/cells are made of dirt, except for those located in the municipality's headquarters cells. They offer access conditions for MSW removal vehicles, with free spaces for placing containers. The urbanized center includes neighborhoods in the town of Manhiça-Sede.

Figure 6: Urbanized center, Municipality of Vila Manhiça

5.2.2 Rural areas

These suburban areas are made up of relatively organized settlement areas, resulting in a low population density and the existence of access roads on the main streets, guaranteeing access conditions for MSW collection vehicles. The low density areas correspond mainly to part of the Maciana locality and its cells.

Figure 7: Rural area, Municipality of Vila da Manhiça

5.3 Economic and social aspects

The municipality of Vila da Manhiça has an economic profile based on agricultural activities, service provision and commerce.

In addition to the Municipal Council and the Municipal Assembly, some district bodies and services are installed and operating in the Municipality of Manhiça, namely: the district government, district services (Economic Activities; Education, Youth and Technology; Health, Women and Social Action and, Planning and Infrastructure), Registry and Notary Services, Meteorological Services, Judicial Court, District Attorney's Office, Police Command of the Republic of Mozambique, a district INSS delegation and a Community Radio and Television station.(CMVM , 2019)

The Municipality of Vila de Manhiça also has representation from international NGOs such as ONGAWA-Engenharia sem Fronteira, ADPP – Voluntary Organization in Mozambique, CISMO- Health Research Center in Manhiça and ACIDECO- Christian Community Development Association. It also has some delegations from some Banks

such as Banco Millenium BIM, Banco BCI, Banco Barclays, Moza Banco, Banco Bayporte, Banco de Micro-Finanças and Banco Malyeso. It has some large companies, with representation at the town's headquarters, such as Açucareira da Maragra, UNITRANS transport company, MCC-Transportes, Telecommunications de Moçambique EP, Electricidade de Moçambique EP, CFM- Caminhos de Ferro de Moçambique, T-MCEL, Vodacom, Movitel, two ENGEL and PETROMOC gas stations, 3 private pharmacies. (CMVM, 2019)

In addition, there are 682 tents in operation in the Headquarters village, 164 tents in Maragra, 62 Aerodrome tents, 59 water holes from private operators, 121 shipyards and workshops, 180 commercial establishments, 1 private funeral agency, 2 Matadores 1 private and 1 managed by the Municipal Council, 2 driving schools, 8 restaurants, 20 bakeries. (CMVM, 2019)

The school network in the Municipality of Vila de Manhiça is made up of 34 schools, of which 30 Primary schools of the 1st and 2nd grades 2 General secondary schools and
1 community, 1 Teacher Training Institute and 1 polytechnic medium institute in Alvôr. (CMVM, 2019)

Vila da Manhiça has 5 health centers, 3 of which are maternity wards, a rural hospital and a district hospital. The district hospital is the main reference health unit, serving the entire Municipal area as well as the District. (CMVM, 2019)

Table 6: Commercial Activity Indicators3

Type of Institution	Number
Trades	
Shops and other points of sale (stalls, grocery stores, warehouses, bakeries, slaughterhouses, etc.)	**202**
Provision of services (welding, hairdressing, tailoring, workshops, shipyards, offices, etc.)	**139**
Hotels, restaurants and guesthouses	**8**
Industries	
Diverse industry	**1**
Total: Commerce and Industries	350
Markets (8 markets)	
Total Stalls and Stalls	**908**
Public and Private Institutions	
Schools	**34**
Hospitals and health centers	**5**
State Institutions (CMVB, District Services, etc.)	**10**
Total Institutions	1302

[3]Data extracted from the Vila da Manhiça Sanitation Action Plan. Prepared by the Municipal Council of Vila da Manhiça in 2019. This data is considered a reference for the current PGIRSU.

6. Administrative, Institutional, Technical-legal Context of MSW management

6.1 Policies and Strategies

6.1.1 National Development Strategy (2015-2035) and Government Five-Year Plan (2020-2024)

The development strategy of the municipality of Vila da Manhiça is aligned with the various segments of economic policy. At the national level, the National Development Strategy 2015-2035 defines priority areas, including the transformation of agriculture and fisheries, the revitalization and expansion of the manufacturing industry, the promotion of the extractive industry and development for ecological, cultural, historical tourism, between others.

The National Development Strategy 2015-2035 is implemented with five-year plans. The Government's Five-Year Program (PQG) 2020-2024 focuses its government action on improving the well-being and quality of life of Mozambican families, reducing social inequalities and poverty, creating an environment of peace, harmony and tranquility, with a strong stimulus for job creation. In light of this plan, the State's fundamental action is directed towards three priorities, namely: i) Developing human capital and social justice; ii) Boost economic growth, productivity and job creation; and iii) Strengthen the sustainable management of natural resources and the environment. The latter being fundamental, when referring to the management of urban solid waste, not only from the perspective of handling and disposal in an environmentally safe way, but also from the perspective of its use as a resource through the implementation of recovery initiatives.

The Municipality of Vila da Manhiça draws up its Annual Economic and Social Plans taking into account the objectives and goals of the Government's Five-Year Program.

6.1.2 National Environmental Management Program

The National Environmental Management Program (PNGA), approved by the Council of Ministers in 1995, guides environmental management strategies and policies in Mozambique. This legal tool thus represents the main plan for the environment in Mozambique, containing the National Environmental Policy, the Environmental Legislation Framework and the Environmental Strategy.

The Ministry of Land and Environment (MTA) is the entity responsible for supervising the implementation of the PNGA and, for this purpose, environmental rules and regulations have been approved. The MTA is therefore responsible for evaluating the policies of other ministries, as well as promoting and implementing an adequate environmental policy.

The implementation of the PNGA requires a series of actions at all levels and sectors and according to the PNGA, the MTA, in close coordination with other ministries and private and civil groups, should work with a view to:

- Development of intersectoral policies for sustainable development;
- Development and promotion of integrated resource use planning;
- Promotion of sector legislation and establishment of standards and criteria for environmental protection and sustainable use of the country's natural resources;
- Creating conditions for law enforcement and environmental monitoring.

6.1.3 Framework applicable to GRSU

In Mozambique, the Constitution of the Republic and Law No. 20/97 of 1 October – Environmental Law grant all citizens the right to live in a balanced environment as well as the duty to protect it.

In this sense, Decree No. 94/2014 of 31 December was published - Regulation on the management of Urban Solid Waste, which in its article
8th states that all entities, public or private, that develop

activities related to waste management, must draw up a management plan for the waste they manage.

This Decree states that, in terms of waste management, it is incumbent upon:

- To the Ministry that oversees the Environment Sector: issue and publish rules of mandatory compliance on the procedures to be observed in the context of waste management; Carry out environmental licensing for facilities or waste storage and/or disposal sites; Monitor compliance with the provisions of this regulation as well as the rules on waste management; Ensure public participation in the licensing process, as well as access to relevant information on waste management.
- For Local Authorities, in the areas under their jurisdiction, to approve specific rules on waste management; set tariffs for the provision of services to the public through its own means, particularly in the context of waste collection, deposit and treatment;
- Operations intended for the treatment and final disposal of solid urban waste are subject to prior environmental licensing, in accordance with the Regulation on the Environmental Impact Assessment Process (AIA)

Other existing legal or normative instruments relating to solid waste management are summarized in**Table 7**, below.

Table 7: Legislation applicable to GRSU

Legislation	Description
Law 20/97, of October 1st, or Environment Law	- Defines the legal bases for the use and management of the environment, in order to guarantee the sustainable development of the Country. In its article 9, it prohibits the deposit on the ground, subsoil, or release into the atmosphere of any toxic or polluting substances.
Integrated Solid Waste Management Strategy Urban in Mozambique for the	- Provides general guidelines for GIRSU in Mozambique - It presents a systematic approach including the components of production minimization, packaging, collection, transportation, treatment and final disposal

Legislation	Description
period 2013 – 2025 (2012)	- Defines key short, medium and long term activities for the different components of GIRSU - Identifies the responsibilities of Municipal Councils.
Regulation on the Management of Hazardous Waste (Decree no. 83/2014, of 31 December)	- Defines the main categories of dangerous RS (Annex 9); - Establishes the responsibility of the producer of hazardous waste for their management (Article 4); - Establishes the obligation for all entities involved in hazardous waste management to prepare a Hazardous Waste Management Plan; - It establishes in its Article 13 that hazardous solid waste must be segregated according to the classes defined in the regulation, with each producing or handling entity having at least technical conditions for packaging the waste in its possession; - Assigns responsibility for collecting hazardous solid waste exclusively to producing entities (Art.15); - Establishes certification requirements for transporters and operators of hazardous waste (Article 16).
Regulation on Biomedical Waste Management (Decree no. 8/2003, of 18 February)	- Establishes the rules for the management of biomedical waste with a view to safeguarding the health and safety of workers in health units, auxiliary workers and the general public and minimizing their impact on the environment.
Technical Directive for the implementation and Operation of Sanitary Landfills in Mozambique – DTAS (2010)	-Defines procedures for the implementation and operation of Sanitary Landfills or controlled Landfills -Establishes criteria for the selection of suitable locations for the implementation of landfills -Defines requirements for the construction and operation of landfills
Directive for the Construction, Operation and Closure of Controlled Landfills (Ministerial Diploma no. 31/2018)	- Establishes principles, standards and guidelines for the construction, operation and closure of Controlled Landfills, with a view to protecting the environment and public health, within the framework of the objective of sustainable development - Defines criteria for identifying candidate locations
Regulation on the Management and Control of Plastic Bags (Decree no. 16/2015 of 5 August)	- Establishes standards for the production, import, sale and use of plastic bags; - Introduces a ban on the production, import, sale and use of bags less than 30 micrometers thick;

Legislation	Description
	- It also prohibits the free distribution of plastic bags.
Regulation on the Environmental Impact Assessment Process - AIA (Decree no. 54/2015 of 31 December)	Establishes environmental impact assessment standards; - Classifies projects into A+, A, B and C; - Defines the main EIA components for different classifications; - Category A - subject to an Environmental Impact Study (EIA): Landfills for more than 150,000 inhabitants, incinerators, management systems for health units and hospitals; - Category B - subject to a Simplified Environmental Study (EAS): Management systems for rural hospitals and small medical establishments.

6.2 Categorization and organizational structure of the Municipal Council

In accordance with the normative framework of decentralization, the Municipality's bodies constitute: the Municipal Assembly, the President of the Municipal Council and the Municipal Council.

Municipal Assembly is the representative body of the Municipality endowed with deliberative powers. It holds five ordinary sessions per year but can also meet extraordinarily to discuss specific issues that justify its convening.

The President of the Municipal Council is the singular executive body of the municipality, who is democratically elected by the residents through universal suffrage. The Municipal Council is the collegial executive body of the municipality, made up of the President of the Municipal Council and councilors chosen and appointed by him. According to the Organic Statute of the Municipal Council of Vila da Manhiça (2019), the following councils are part of the structure of the Municipal Council:

1. Council for Administration, Finance, Planning and Human Resources
2. Urbanization, Construction and Energy Council

3. Agriculture, fishing, environment council
4. Council in Industry, Business, Tourism, markets, fairs,Transport and Communication
5. Council for Youth, Culture, Sport and Technology and council for youth, sport, culture and technology.
6. Social Council, Health, Education and Gender

Also part of the structure of the Municipal Council are the Municipal Police Command, the Office of the President of the Municipal Council, the UGEA and municipal localities.

6.2.1 Postures and regulations for GRSUs

The Municipal Council of Vila da Manhiça has a Code of Posture issued in 2012. This constitutes the instrument through which the Municipality guides itself in the use of spaces and public well-being, relations between the citizen and their Municipality. This document gives legitimacy to the Municipality to determine the due conduct and posture mandatory for residents, control and maintain the urban environment in terms of hygiene and public health, peace, comfort, healthiness, repelling pollution of any nature; It is through this instrument that the Municipality establishes the conditions for the installation and operation of economic activities carried out in public spaces. However, the Posture needs to be revised to better fit the Municipality's current reality (challenges and opportunities) and better adapt to the Municipality's strategic objectives and development goals.

The following provisions relevant to hygiene and health (Chapter II) stand out from the municipal Code of Posture:

- The cleaning service of streets, squares and public places is the direct and exclusive responsibility of the Municipal Council of Vila da Manhiça, except in cases of concession and those provided for in this code (Article 27)

- Waste from homes, in urban areas, will be collected in appropriate containers, with lids, to be removed by the public cleaning service or in plastic bags that facilitate removal (Article 27)
- In suburban areas, communities must place waste in their own containers and deposit waste in their own places (Article 27)
- Waste from factories and workshops, remains of construction material, debris from demolitions, straw or waste from commercial houses that must be removed at the expense of the respective tenants or owners to a place determined by the Municipality will not be considered as garbage (Article 27)
- Article 27 establishes that it is prohibited, under penalty of fine in case of non-compliance:

    a) Burn, even in your own backyards, garbage or any other bodies;

    b) Fill public roads with garbage, old materials or any debris;

    c) Remove materials or debris from construction or demolition of buildings without using appropriate instruments.

The only offense subject to a fine relating to waste management is that against the provision in article 27.

6.2.2 Institutional Organization related to GRSUs

The following table summarizes the main competencies and obligations of Municipal Councils with regard to GIRSU within their area of jurisdiction, based on the different laws and other legal documents in force.

Table 8: Summary of the powers and obligations of Municipal Councils

Legislation	Responsibility / Powers of the Municipal Council
Local Authorities Law – Law no. 2/97, of February 18	- Responsibility for the environment, basic sanitation and quality of life (Article 6, b); - Powers to approve regulations and positions, establish municipal taxes and other revenues within the scope of waste collection, deposit and treatment (Article 45, no. 3).
Finance and Municipal Assets Law - Law no. 11/97 of 31 May	- Obligation to respect the principles of "equality and contributory capacity of the respective populations"; - Obligation to "act fairly, with the setting of values [in tasks] that exceed a balanced relationship between the consideration for the services provided and the amount received by the local authority being prohibited"; - Responsibility for RS collection and treatment systems and public cleaning (Article 25); - Possibility (after approval by the Municipal Assemblies) of creating autonomous services or public companies, as well as authorizing the concession of the operation of public services through a public tender.
Law 1/2008 of January 16th (law relating to local government)	- Competence for public investment in "Waste collection and treatment system and public cleaning" (Article 27.b); - Application of tariffs or fees for the provision of services for the collection, deposit and processing of RS (upon approval by the municipal assembly); - Setting tariffs whenever possible on the basis of cost recovery (Article 74).
Integrated MSW Management Strategy in Mozambique for the period 2013 – 2025 (Micoa, 2012)	- Responsibility for approving legal and financial instruments such as municipal regulations, urban cleaning regulations, tax code with the inclusion of public cleaning fees; - Responsibility for mobilizing resources and organizing different stakeholders for sustainable management of RS, including studies for the rehabilitation of current open dumps for other uses.

Legislation	Responsibility / Powers of the Municipal Council
Regulation on Urban Solid Waste Management (Decree no. 94/2014 of December 31st)	Competencies (Article 5) - Ensure adequate GRSU and promote good practices; - Ensure that all those involved in GRSU comply with the law / Suspend illegal GIRSU activities; - Prepare and approve regulatory documents; - Ensure financial sustainability; - Management of hazardous waste (including hospital) outside the jurisdiction of CMs (Article 7). Obligations (Articles 6, 8) - Ensure disposal in identified and environmentally sound locations; - Avoid and prohibit the burning and open disposal of MSW; - Keep the Annual Registration Form updated; - Develop and implement a PGIRSU (valid for 5 years).

In accordance with the CMVM's organic statute, solid waste management is the responsibility of the Municipal Health and Cemeteries Section belonging to the Urbanization, Construction and Energy Council. This council is also subject to the following sections:

- Urbanization and Registration Section
- Water Supply and Sanitation Section
- Construction, Housing and Energy Section
- Roads and Bridges Section.

The healthcare sector currently has the following workforce:

- City councilor
- Head of Health and Cemeteries Services
- Support staff, namely sweepers, drivers, waste collection assistants, administrative staff. Of these:

- 22 are permanent staff
- 17 casual staff.

The level of education of employees in the area of urban solid waste management is evidenced in the**Table 9**, below.

Table 9: Education level of employees in the GRSUs area

School level	Number of employees
Higher level	02
Middle level	04
Basic level	07
Elementary level	21
No schooling	06
Total	**39**

Regarding the organizational structure, it is important to highlight the following aspects:

- There is no defined organizational chart for the Health and Cemeteries Section. The structure is defined at the global council level.
- There are no inspectors allocated to the GRSU area. The Municipal Police are solely responsible for monitoring and imposing fines.
- There is no staff allocated to the municipal dump to control the final disposal of RSUs.
- The municipality does not have a worker training plan.
- Training activities in the area of waste management do not cover the level of drivers, collection assistants and sweepers.
- Responsibilities for the management of urban solid waste by other areas and councils of the Municipal Council are not defined and established. Therefore, all responsibilities inherent to waste management are understood to be the sole responsibility of the Urbanization, Construction and Energy Council. However, in practice, there are dependencies with other areas, such as:

- The formalization of training plans for the Health sector, by the Council for Administration, Finance, Planning and Human Resources.
- Monitoring compliance with easements on landfills, by the Agriculture, Fisheries and Environment Council.
- Coordination with the Youth, Culture, Sports and Technology Council on the extraordinary collection of waste at major events and shows held in Vila da Manhiça.

7. Current Characterization of GIRSU

7.1 Quantity and composition of RSUs

The main types of RSUs in the Municipality of Vila da Manhiça are the following:

- Domestic solid waste (RSD)
- Commercial Solid Waste (CSR) and Industrial
- Solid waste from public cleaning (RSLP)
- Inert waste.

A**Table 11** Below highlights the types of management systems and equipment used by the Municipal Council to manage the different types of urban solid waste.

According to information obtained by the Health and Cemeteries Section, a solid waste characterization campaign was carried out in 2019 in Vila da Manhiça. A**Table 10** presents typical composition of solid waste by waste category.

The characterization was confirmed in the field by the team developing the current Plan, and the following was noted:

- Production of a significant portion of plastic waste (bottles, buckets and basins)
- Large production of green organic waste (branches, leaves, grass, etc.)
- Generation of a considerable portion of cardboard and paper.

Table 10: Composition of urban solid waste4

Waste categories	Composition in percentage (%)
Organic material (inc. fines)	36.94
Plastic	11.26
Glass	1.8
Paper card	8.5

[4]*Reference characterization campaign carried out in Manhiça (2019)*

Waste categories	Composition in percentage (%)
Metal	8.56
Fabric/Rubber	2.56
Others	2.25
Total	**100%**

Table 11: Classification of MSW, Municipality of Manhiça village

Main Types of RSU	SOLUTIONS/OPTIONS
Domestic solid waste (RSD)	- **System:**6m3 containers - **Equipment:**Container/tractor ships
Commercial solid waste (CSR)	- **System**: 6m3 containers/small individual containers (110 liters max.) - **Equipment**: Container truck/truck
Solid waste from public cleaning (RSLP)	- **System:**6m3 containers - **Equipment:**Container/tractor ships
Live or dead animals	- **System:**Direct bin collection - **Equipment:**Container ships
Hospital solid waste	- **System:**6m3 containers - **Equipment:**Container ships
Market and fair waste	- **System**: 6 m3 containers **Equipment:**Container/tractor ships

To quantify the volumes of RSUs generated in the Municipality, reference indicators were used based on secondary information. A per capita production of 0.5 kg/inhabitant/day was therefore used to estimate the volumes of domestic solid waste generated in the Municipality of Vila da Manhiça. Table 12 provides estimates of RSD volumes generated based on population growth projections taking as a reference the average growth rate for Maputo Province of 3% extracted from

data from the 2017 population census published by the National Statistics Institute (INE).

As it was not possible to obtain updated data for the calculation of commercial and industrial waste and others, a percentage of 10% of domestic solid waste was assumed for the industrial and commercial sector. Table 12 below provides estimates of the volumes generated. The data in the table is presented in a time frame of 5 years (implementation period of the current PGIRSUs) and 10 years counting from the year of preparation of the current Plan (2022).

Table 12: Projection of RSU generation volumes

Year	Population	Volumesof RSDs (kg)	REI and RSC (Kg)	Volumetotal MSW (Kg/d)
2017 (INE)	**57512**	28756	2875.6	31632
2018	59237	29619	2961.9	32581
2019	61014	30507	3050.7	33558
2020	62845	31422	3142.2	34565
2021	64730	32365	3236.5	35602
2022	**66672**	**33336**	**3333.6**	**36670**
2023	68672	34336	3433.6	37770
2024	70733	35366	3536.6	38903
2025	72854	36427	3642.7	40070
2026	75040	37520	3752.0	41272
2027	77291	38646	3864.6	42510
2028	79610	39805	3980.5	43786
2029	81998	40999	4099.9	45099
2030	84458	42229	4222.9	46452
2031	86992	43496	4349.6	47846
3032	89602	44801	4480.1	49281

Based on the estimates presented in the Table above, it is estimated that approximately 36 tons of Urban Solid Waste (MSW) are currently generated daily in the Municipality of Vila da Manhiça.

7.2 Equipment for collecting and transporting urban solid waste

The Municipal Council of Vila da Manhiòa has its own means to collect and transport waste from collection or generation points to the place of disposal in the bin. Table 13 below presents the list of available means and their main characteristics.

Table 13: Means of collecting and transporting CMVM RSUs

	Medium 1 - Container Truck (1)	**Medium 2 - Carrier Truck Containers (2)**	**Truck**	**Tractor 1**	**Tractor 2**
Features of the medium					
Kind of equipment	Truck - Containers	Door Truck -Containers	Manual truck	Manual	tipping tractor
Equipment, brand, model registration	Leland, anchock	Tata, track	Nissan, U.D.	Agritera	Sonalika, T.D.
Status (active, broken, obsolete)	Operational	Operational	Operational	Operational	Damaged(more than 6 months, slight damage)
Year of Acquisition	2014	2021	2006	1998	2005
Breakdown period					
Type of breakdown					
Capacity	6m3 container	6m3 container	6 tons	2.5 tons	4.5 tons
Description of use					
Use (collection, urban cleaning, disposal, regularization in the trash	Collection at "collection points" with containers for disposal in the trash	Collection at "collection points" with containers for disposal in the trash	Collectiondoor to door	Collectiondoor to door	Collectiondoor to door
Collection Zone	At sites with containers in Vila da Manhiça	In places with containers from Vila da Manhiça	Residential zones	Residential zones difficult to access	Residential zones difficult to access

	Medium 1 - Container Truck (1)	Medium 2 - Container Truck (two)	Truck	Tractor 1	Tractor 2
Final destination	Municipal Dumpsters	Municipal Dumpsters	Municipal Dumpsters	Municipal Dumpsters	Municipal Dumpsters

The mechanized means listed above are the only ones that the Vila da Manhiça Municipal Council has, it should be noted that one of the tractors was out of order (since April 2022) and, according to the Health Section, it was a minor breakdown.

In addition to the means specified in Table 13, a Bulldozer was allocated to the Health Section, acquired in 2021. However, it is mainly used to open access roads.

The Municipality has other materials used in collection and sweeping, namely gloves, uniforms, caps, boots, masks, brooms, hoes, shovels, wheelbarrows, shovels and rakes.

7.2.1 Equipment maintenance

The Municipal Council outsources all maintenance services for GRSU equipment. In the event of a breakdown, the Urbanization, Construction and Energy Council, through the Health and Cemeteries Section, submits a request to the UGEA to proceed with the formal process of contracting services until approved by the President of the Municipal Council. The Municipal Council does not have a routine maintenance plan or records of equipment breakdowns and repairs.

7.3 Collection of RSUs

Currently, the Municipality of Vila da Manhiça has 29 6m3 containers, spread throughout the Municipality, mostly concentrated in the urbanized center and medium-density rural suburban areas (see Figure 8), with a

reinforcement in terms of the number of containers in the markets. In general, the containers are in good condition.

Plastic containers of 1100 liters are also observed along the main road on EN1.

In this Municipality, the balanced management of MSW is well known, although they do not yet have an Urban Structure Plan (still in preparation) and an updated Integrated Urban Solid Waste Management Plan. The CMVM has the means for both the collection and deposit of RSU and in terms of scheduling, collection is carried out from Monday to Saturday without interruption and also on public holidays. Collection is carried out exclusively by the CMVM and does not involve private operators. In terms of scope, collection services cover the entire Municipality.

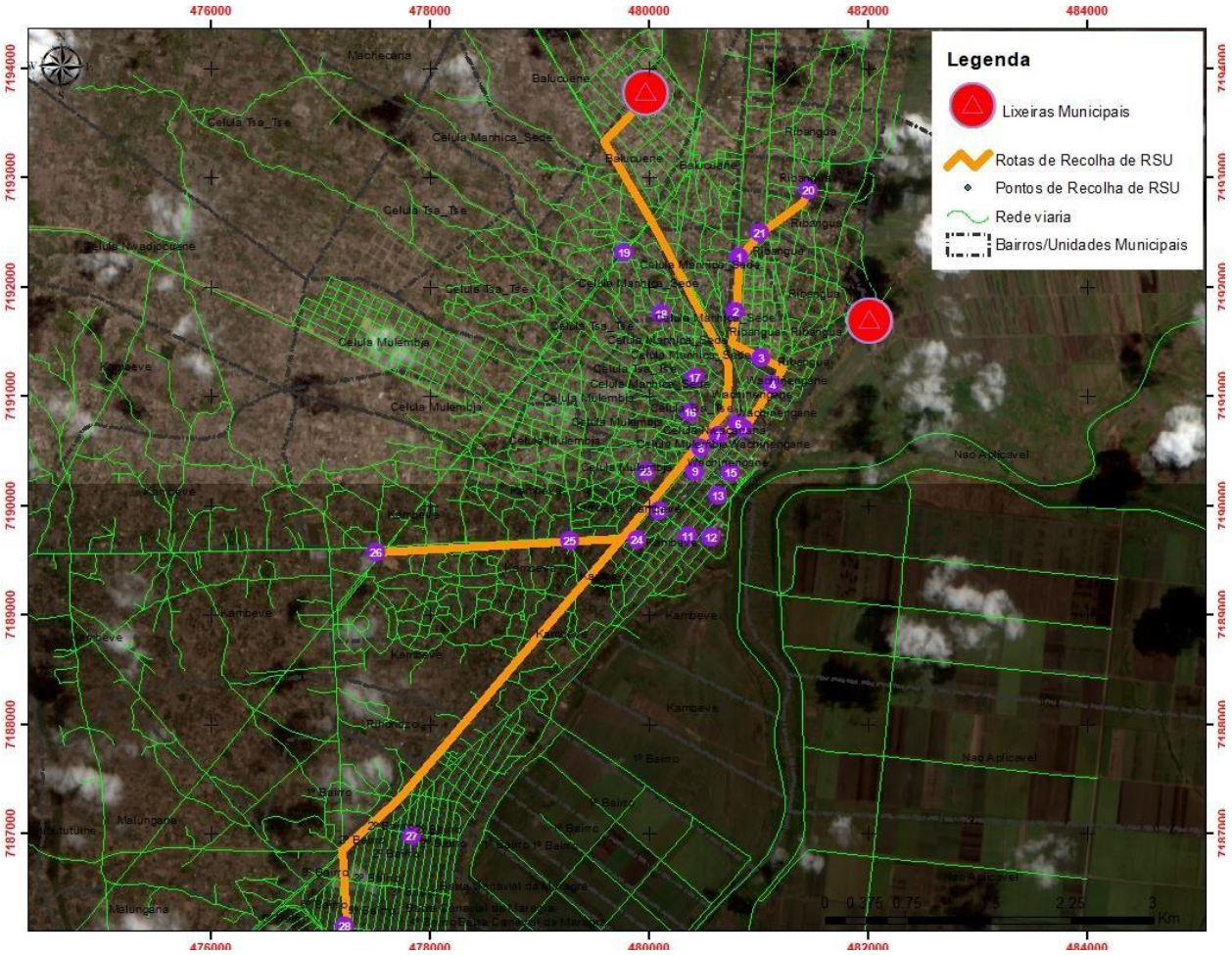

Figure 8: Distribution of containers and waste collection routes at CMVM

The Municipality does not have a MSW collection and transportation plan, although it has satisfactory results in terms of urban cleaning. However, the itinerary follows a certain schedule (in this case, every day of the week, including Sundays) and starting point, for collection at MSW collection points. In this case, it begins in Vila Cement, cells of Manhiça - headquarters, therefore, within the town of Manhiça and then moves on to the neighborhoods found in the town of Maciana, followed by final deposition.

The following table shows the minimum time taken during the collection of MSW, from each collection point with a container, taking the main bin as a reference.

Table 14: Minimum time and distances traveled during MSW collection

#	Distance (m)	Time (min.)
0	1316	1.97
1	1221	1.83
two	1034	1.55
3	1049	1.57
4	1506	2.26
5	1519	2.28
6	1725	2.59
7	1926	2.89
8	2104	3.16
9	2583	3.87
10	2565	3.85
11	2442	3.66
12	2105	3.16
13	1875	2.81
14	1875	2.81
15	1832	2.75
16	1668	2.5
17	1895	2.84
18	1473	2.21
19	1310	1.96
20	1275	1.91
21	2449	3.67
22	2449	3.67

#	Distance (m)	Time (min.)
23	2909	4.36
24	3389	5.08
25	4873	7.31
26	6292	9.44
27	7313	10.97
28	7015	10.52
29	8651	12.98

In the cells of Bairro Ribangua (door-to-door collection site) many residents individually dispose of waste in the nearby bin. Therefore, in general terms, primary collection is often triggered by the population itself, although CMVM is available. 8 trips are made daily by container trucks. This procedure is repeated until the route is completed. It should be noted that the Municipal Council does not have statistics on the quantities of RS collected.

Regarding MSW collection points, their distribution throughout the different urban neighborhoods is represented in the following figure (Figure 9).

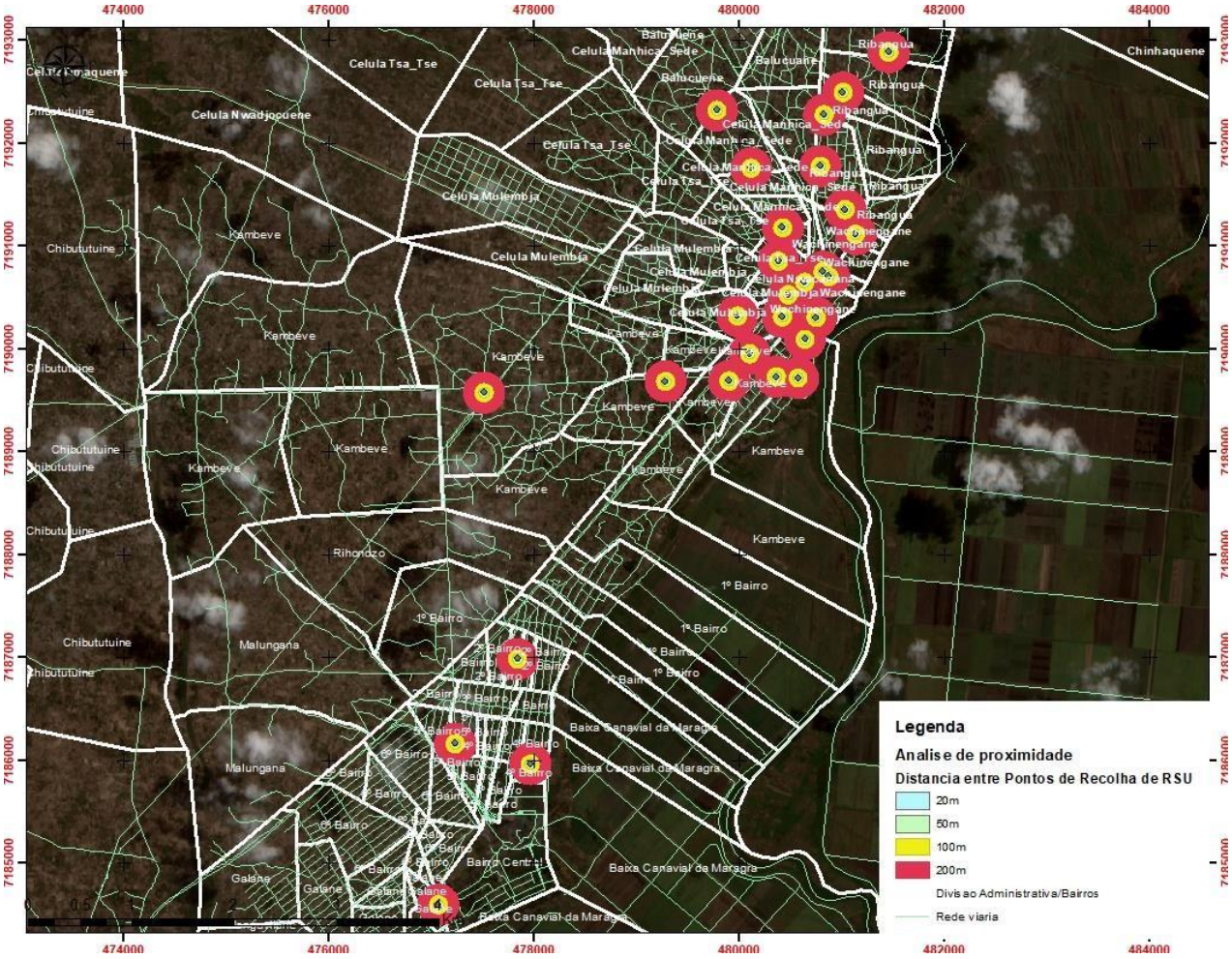

Figure 9: Minimum distances between MSW Collection Points, Municipality of Manhiça

Throughout the municipality of Vila da Manhiça, the distribution of containers at some point follows a certain regularity in terms of allocation (average distance of 200m).

7.4 Final Deposition of RSUs

MSW has its final destination in the main Municipal dump, Balucuane dump, although there is a second dump to assist in the disposal of waste (see photos in Figure 11). The location of the main municipal dump appears to be appropriate and safe, with its delimitation and surveillance lacking. As can be seen on the map below (Figure 10), the disposal of MSW is possible over a minimum distance of 2.5 - 5km from the MSW collection points, between the towns of Manhiça-sede and Maciana.

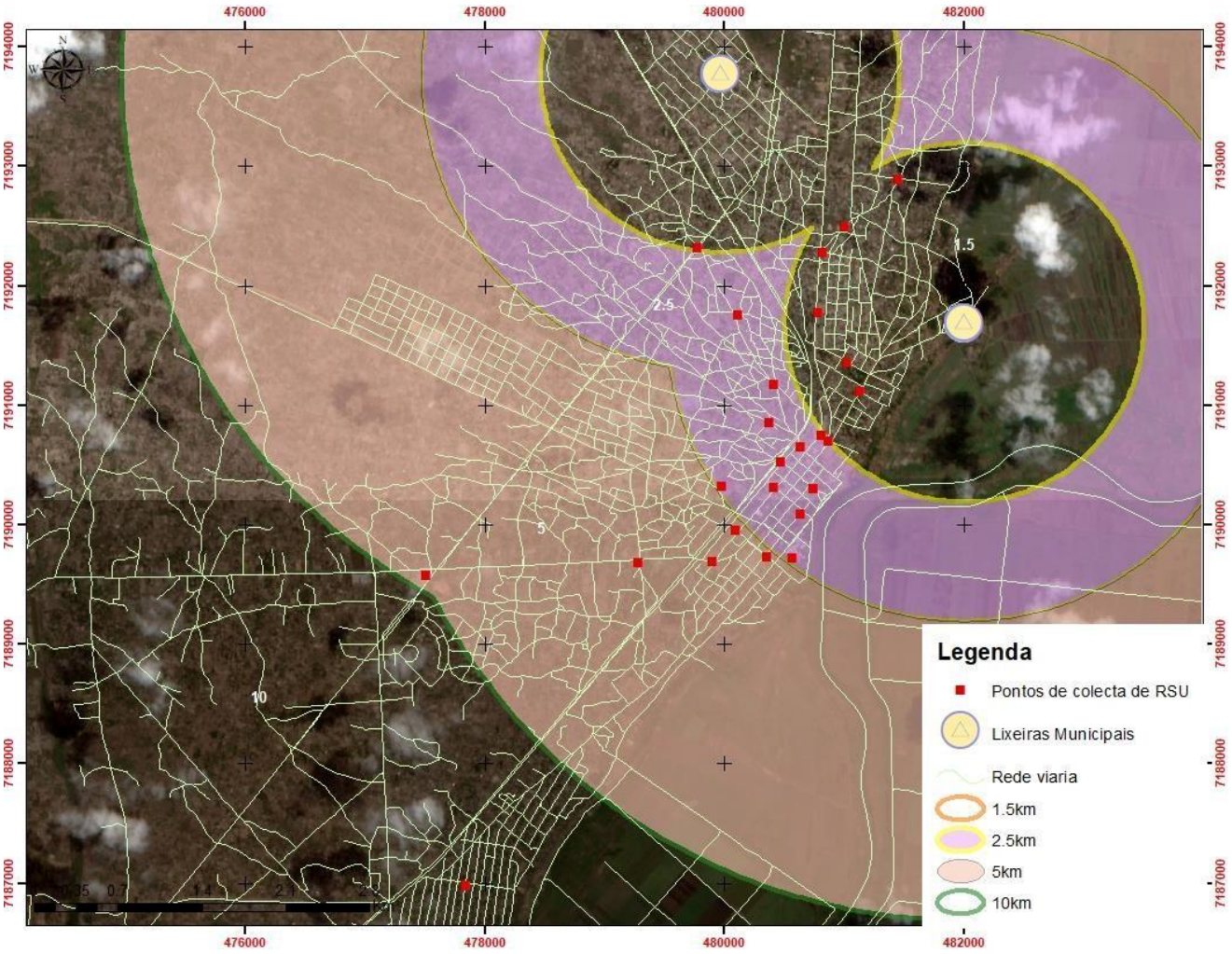

Figure 10: Minimum distances from the MSW deposition point in the CMVM

Figure 11: Photos of the main trash can (on the left) and the auxiliary trash can (on the right)

7.5 Urban Cleaning

In addition to collecting MSW, the Municipal Council cleans roads and public spaces (sweeping).

There is effective management and commitment to fully carrying out urban cleaning services, however, some aspects are weak in the operational structure, namely:

- Weak or non-existent operational control regarding the amount of solid waste;
- Lack of an updated PGIRSU.

7.6 Valorization of urban solid waste

In the Recycling and reuse component, the municipal dumps in operation, with a greater incidence in the Balucuane Dumpster, house a small number of informal people who selectively collect solid waste. However, the quantities and the market where these wastes are destined and sold are unknown. The points of action vary from the containers spread throughout the municipality as well as in the Lixeira.

The municipality does not have a system for separating and reusing different types of waste, although it has identified a space close to the dump to accommodate the future Recyclable Collection and Transfer Center.

7.7 Collection System Productivity

The productivity of the current CMVM collection system was calculated (see Table 15) based on the available means, the routes and distances traveled from the collection points to the disposal site, as well as the frequency of collection and duration of the activity. The calculation methodology used is summarized in Annex 3.

Table 15: Productivity of resources available at CMVM

	Medium 1 - Container Truck (1)	Medium 2 - Container Truck (2)	Medium 3 - Truck	Half 4 -Tractor 1	Medium 5 - Tractor 2
Features of the medium					
Kind of equipment	Truck - Containers	Truck - Containers	Manual truck	Manual	tipping tractor
Equipment,brand, model registration	Leland, anchock	Tata, track	Nissan, U.D.	Agritera	Sonalika, T.D.
Status (active, broken, obsolete)	Operational	Operational	Operational	Operational	Broken (more than 6 months, minor damage)
Year of Acquisition	2014	2021	2006	1998	2005
Breakdown period					
Type of breakdown					
Capacity	6m3 container	6m3 container	6 tons	2.5 tons	4.5 tons
Description of use					
Use (collection, urban cleaning, disposal, regularization in bin	Collection at "collection points" with containers for disposal in the bin	Collection at "collection points" with containers for disposal in the bin	Door to door collection	Door to door collection	Door to door collection

	Medium 1 - Container Truck (1)	Medium 2 - Container Truck (2)	Medium 3 - Truck	Half 4 -Tractor 1	Medium 5 - Tractor 2
Collection Zone	At sites with containers in Vila da Manhiça	At sites with containers in Vila da Manhiça	Residential zones	Difficult to access residential areas	Difficult to access residential areas
Final destination	Municipal Dumpsters	Municipal Dumpsters	Municipal Dumpsters	Municipal Dumpsters	Municipal Dumpsters
Daily effort (distances, duration)					
Planned shift of operation	**6:00am-2:00pm**	**6:00am-2:00pm**	6:00am-2:00pm	6:00am-2:00pm	
Number of trips to the trash can per day	**8**	**8**	two	3	
average distance round trip traveled (km)	**6**	**6**	**6**	**6**	
Average distance between collection points (km)	0.2	0.5	0.1	0.1	
Collection locations (informal and others) - applicable to tractors, trucks					

	Medium 1 - Container Truck (1)	Medium 2 - Container Truck (2)	Medium 3 - Truck	Half 4 -Tractor 1	Medium 5 - Tractor 2
Average volume collected at informal collection points and other specific locations (kg)					
Volume of Waste generated per family/household (kg) accumulated over two days - applicable to door-to-door collection			2.5	2.5	
Total number of residences			650	650	
Area occupied by each residence km			0.03	0.03	
Total distance traveled per day (km)	49.6	52	31.5	37.5	
Speedsaverages (km/h)	40	40	40	35	
Total travel time per day during the transport (min) Subtotal 1	74	78	47	64	

	Medium 1 - Container Truck (1)	Medium 2 - Container Truck (2)	Medium 3 - Truck	Half 4 -Tractor 1	Medium 5 - Tractor 2
Average loading time at the collection point (min)	25	25	0.5	0.5	
Average duration for container replacement (min)	15	15			
Average duration of deposition in the trash bin (min)	15	15			
Durationloading (C), unloading (D) and deposition (D) per location (min)	55	55	0.5	0.5	
Total daily CDD duration (all locations) min - Subtotal	440	440	325	325	
Total duration of operation (Subtotal 2)	514	518	372	389	
Total hours worked per day (Subtotal 1 + Subtotal 2) - Hours	**9**	**9**	**6**	**6**	
Working day	8	8	8	8	

	Medium 1 - Container Truck (1)	Medium 2 - Container Truck (2)	Medium 3 - Truck	Half 4 -Tractor 1	Medium 5 - Tractor 2
Overtime (-) worked and free hours after the operation (+) - assuming a working day from 8H	-1	-1	two	two	
Collected volumes					
Medium capacity (m3)	6	6	16	7	
Number of containers handled by day	8	8			
Number of houses covered in door-to-door collection / number of locations by tractor			650	650	
Average volumes produced per household (kg)/locations			2.5	2.5	
Specific weight average adopted (ton/m3)	0.36	0.36			
Average % of loaded capacity	100	100			

	Medium 1 - Container Truck (1)	Medium 2 - Container Truck (2)	Medium 3 - Truck	Half 4 -Tractor 1	Medium 5 - Tractor 2
Total volume of MSW collected (tons/day)	**17.3**	**17.3**	**1.6**	**1.6**	**0.0**
Guys					
No. of drivers	1	1	1	1	
No. Of Helpers	two	two	two	two	
Number of txova helpers	at	at	at	at	
Total number of personnel	3	3	3	3	
Productivity of the Environment					
Productivity - ton/hour	**2.02**	**2.00**	**0.26**	**0.25**	
Productivity - kg/hour	**2015.55**	**2001.54**	**261.92**	**250.46**	
Productivitydaily 8H) - ton/day	**16.12**	**16.01**	**2.10**	**2.00**	
Maximum volumes collected per day/half (m3)	**45**	**44**			
Maximum volumes collected per day (kg)			**2095**	**2004**	
Number of containers	**7**	**7**			

	Medium 1 - Container Truck (1)	Medium 2 - Container Truck (2)	Medium 3 - Truck	Half 4 -Tractor 1	Medium 5 - Tractor 2
Maximum number of houses covered			**838**	**801**	
Collected (adjusted) volumes - no overtime					
Volume of MSW collected daily (adjusted) - ton/day	**17.3**	**17.3**	**1.6**	1.6	
Number of collections weekly	6	6	6	6	
Number of annual collections	313	313	313	313	
Total volume collected annually (ton)	**5406**	**5406**	**508**	**508**	
Total volume collected annually by the Municipal Council (tone)	**11829**				
Total volume generated from estimated RSU (2022)	**13140**				
Collection service coverage (2022) (%)	**90.0**				

The level of coverage of waste collection services provided by the Vila da Manhiça Municipal Council is approximately 90% (see Table 15). This value reflects the reality observed during the fieldwork carried out as part of the preparation of the current PGIRSU, highlighting the following aspects:

- In general, the streets and pedestrian crossings in the village are clean.
- In container locations, there was no waste scattered on the floor
- The waste stored in most containers did not reach the capacity limit of the containers
- There was a certain regularity in the distribution of containers over short distances (average of 200m).

The main factors that contribute to the comprehensive coverage of collection services in the Municipality are:

- The availability of suitable resources, 2 container ships, 2 tractors and a truck
- Availability of containers and in good condition
- Collection frequency, 6 times a week and on holidays. Allowing comprehensive collection and preventing containers from overcrowding.

The data used to obtain the productivity of the means and the current coverage of collection services bring together a set of applicable reference indicators, calculation hypotheses based on information collected in the field (eg monitoring of loading and unloading operations, trips to the dump , etc.) and operational flow (routes, collection points, characteristics of the means, etc.). A

Table 16, below provides information on the indicators and calculation assumptions adopted to obtain means productivity and coverage of collection services.

Table 16: Indicators and calculation hypotheses

Item	Value	Source / Justification
Population growth		
Population growth	**3%**	Average value for the province of Maputo (INE)
MSW production		
RSD Capitalization	0.5 kg/person/day	Value adopted based on published studies, adapted to the context of the Municipality
Capitation of Industrial RS and Commercial RS and other Solid Waste (inc. from markets and sweeping)	10% RSD	
Other key data for calculation		
EDM Coverage	62%	Coverage rate at the level of Maputo province (website energypedia.info, accessed Nov. 2022)
Garbage fee collection coverage by EDM	60%	Adopted value
Household Size	5 people / household	Average value at country level (2017 census): 4.4 people / household
Specific weight	**0.36**	Adopted based on the general characteristics of RSUs
Average speed of waste collection vehicles	40 km/h (container and tipper trucks) 35km/h (tractors)	Taking into account traffic and the conditions of some roads that give access to the dump
Annual rate of increase in commercial sector taxpayers	5%	Adopted value

7.8 Description of the GRSUs Financial Framework

The Administration and Finance Council holds all responsibilities for the financial management of the Municipal Council, without the exception of Urban Solid Waste Management. Therefore, a coordination relationship prevails with the Construction, Urbanization and Energy Council with regard to financial issues relating to GRSU.

7.8.1 GRSUs revenue structure

The Municipality of Vila da Manhiça, as enshrined in the Environmental Law and also in the Local Authorities Law, has charged waste collection fees to producers of domestic, industrial and commercial waste. The waste collection fee is charged together with the sanitation fee charged to residents.

O**Table 17** provides the framework of the current tariff structure for SURM.

Table 17:GRSUs tariff structure

Tariff	Value/month (Mt)
Domestic	20
Commercial	30
Industrial	30

7.8.2 Sustainability analysis of the MSWM sector

For the purposes of detailed analysis based on real data, records of expenses and revenues of the MSW sector over the last 3 years (2019-2021) were requested. The year 2021 was used as a reference for determining the sector's expenses. As for revenue, according to information obtained by the Council responsible for Waste Management, the waste fee is charged directly by the Municipal Council together with the fee of sanitation.

Table 18 presents the sector's annual revenues (ref. Year 2021) while Table 19 depicts the Municipal Council's expenses in relation to GRSUs.

Table 18: Revenues from the MSW Sector (2021)

Annual Revenues	Meticais
Amount collected through collection of garbage fees	129,663
Amount collected resulting from special collection service	0
Amount collected by depositing in the trash/landfill	0
Amount collected by fines	51,749
Others (Mention)	0
Total revenue	**181,412**

Table 19: Expenses of the MSRM Sector (2021)

Description of expenses	Value of expenses in 2021	Adjusted value of expenses (exc. Acquisition of means of transport and packaging)
Personnel – Salary and allowances	2,725,800	2,725,800
Fuels and lubricants	9,000,000	9,000,000
Vehicle maintenance	4,979,000	4,979,000
Acquisition in equipment incleaning and personal protection	2,800,000	0
Acquisition of means of transport	4,500,000	0
Acquisition of materials for packaging	1,250,000	0

Description of expenses	Value of expenses in 2021	Adjusted value of expenses (exc. Acquisition of means of transport and packaging)
Expenses in hiring ofcollection/cleaning service	0	0
Civic education campaigns and training in the area of waste urban solids	30,000	30,000
Others (Mention)	0	0
Total Expenses	25,284,800	**16,734,800**

Taking into account expenses for the year 2021, a cost per ton of approximately 1200 meticais was calculated. This cost includes vehicle maintenance expenses, purchase of fuel and lubricants, salaries and allowances for GRSU staff.

The MSWM sector is not sustainable. Records show that the average percentage of expenditure coverage by sector revenue is just 1%. Currently, the sector's expenses are covered by the municipality's general budget and the Municipal Council's Investment Fund.

Drastic interventions will be necessary to improve the revenue picture of the solid waste management sector.

There is a perception on the part of the council to fairly allocate the percentage of the cleaning fee indexed to the energy bills paid by residents in order to guarantee greater robustness in the management of urban solid waste.

7.9 Social aspects and practices

The table below summarizes the findings regarding practices and social aspects associated with waste management, based on observations in the field, review of documentary information and reports from the Municipal Council team and engaged external actors.

Table 20: Fines proposed in the revised Postura

Aspect	Findings
Storageprimary and transport	• In the areas covered by the collection, the primary storage of RS by residents and their transport to the disposal points is mainly done using small volume containers (buckets, basins, etc.). Plastic bags are also used.
Waste treatment at source	• Practice of burning waste • Waste is often buried at or near the source • Non-biological hospital waste (common waste) is collected and incinerated in tanks within the hospital premises or nearby. It is not the responsibility of the Municipality to collect it.

8. SWOT Analysis (Strengths, Opportunities, Weaknesses and Threats – SWOT)

Forces	Weaknesses
• Distribution of containers regularly and comprehensively in the Village • Containers are in good condition • High level of coverage (90%) of waste collection services carried out by the Municipal Council. • Ongoing project to improve sanitation infrastructure in the town, including awareness-raising activities for residents. • Equipment maintenance services are outsourced • .Uninterrupted collection service 6 days a week and on holidays • Location identified by the Municipal Council for the construction and operation of a Recyclable Collection and Transfer Center.	• There is no defined organizational chart for the Health and Cemeteries Section. The structure is defined at the global council level. • There are no inspectors allocated to the GRSU area. The Municipal Police are solely responsible for monitoring and imposing fines. • There is no staff allocated to the municipal dump to control the final disposal of RSUs. • The municipality does not have a worker training plan. • Training activities in the area of waste management do not cover the level of drivers, collection assistants and sweepers. • Responsibilities for the management of urban solid waste by other areas and councils of the Municipal Council are not defined and established. Therefore, all responsibilities inherent to waste management are understood to be the sole responsibility of the Urbanization, Construction and Energy Council. However, in practice, there are dependencies with other areas: • Weak or non-existent operational control regarding the amount of solid waste; • Lack of a PGIRSU. A Waste Management Plan was drawn up, however this Plan does not present the structure and content of a PGIRSU in accordance with the guidelines established in the country. • The sector is not sustainable. Revenues constitute 1% of the sector's expenses. • Limited number of personnel with higher education in the area of GRSUs • There is no collection route plan • Lack of Records on the number of infractions and fines applied by the Municipal Council relating to waste management in the Municipality • There is no routine maintenance plan and records of equipment maintenance • Lack of knowledge on the part of the Municipality about the capacity of the dump, resulting in the lack of a dump use plan and deactivation plan/goals

Forces	Weaknesses
	trash cans
Opportunities	**Threats**
• Few areas with access problems for waste collection vehicles. • Recent legislation on landfills, which provides general guidelines for the implementation and operation of landfills and dumps • Existence of a market for recycling and reusing waste • Existing potential little explored in the recycling sector • Availability of space in Vila da Manhiça to allocate to landfills and recycling centers or other infrastructure for Solid waste management	• Data relating to public health is not monitored by the Municipal Council. Resulting in a lack of understanding of the correlation of waste management services vs impacts on public health. (lack of consideration of these indicators in the assessment of the impacts of urban solid waste management in the Municipality and in the development of the intervention strategy (ie priorities in terms of collection, distribution of containers, elimination of places where waste is deposited on the ground) • Lack of knowledge about demand in terms of recyclable waste • Lack of separation at the source of recyclable waste generation

9. Strategy for Solid Waste Management

9.1 Institutional and Organizational Development

The institutional reorganization of the sector aims to adapt the organizational structure to the needs of the services, including transversal aspects such as supervision and monitoring. The proposed organizational structure aims to respond to the following needs of the Municipality:

- Definition of a clear structure including intermediate hierarchy levels to avoid all sector activities being the sole responsibility of the Head of Sector, in particular:
    - Distribution of tasks among technical staff (planning, daily supervision/monitoring of collection, sweeping, trash can);
    - Integration of drivers of relevant means (tractors and container trucks) within the MSRM sector;
    - Creation of heads of operational teams (drivers for collection, sweepers for sweeping groups, head of inspection brigades, etc.);
- Clear definition of the responsibilities/tasks of each position/position, including operational workers (this activity can be carried out independently of the organizational chart review)
- Expansion of the Inspection/Civic Education team, responsible for ensuring the implementation of the provisions of the Municipal Posture (with support from the Municipal Police), as well as collecting revenue from the cleaning fee;

The Error! Reference source not found. presents a proposal for the organization chart for the Health Sector with a focus on GIRSU. This structure constitutes a preliminary proposal and may be revised, upon assessment of availability in terms of financial resources and priorities of the Municipal Council in terms of staff hiring.

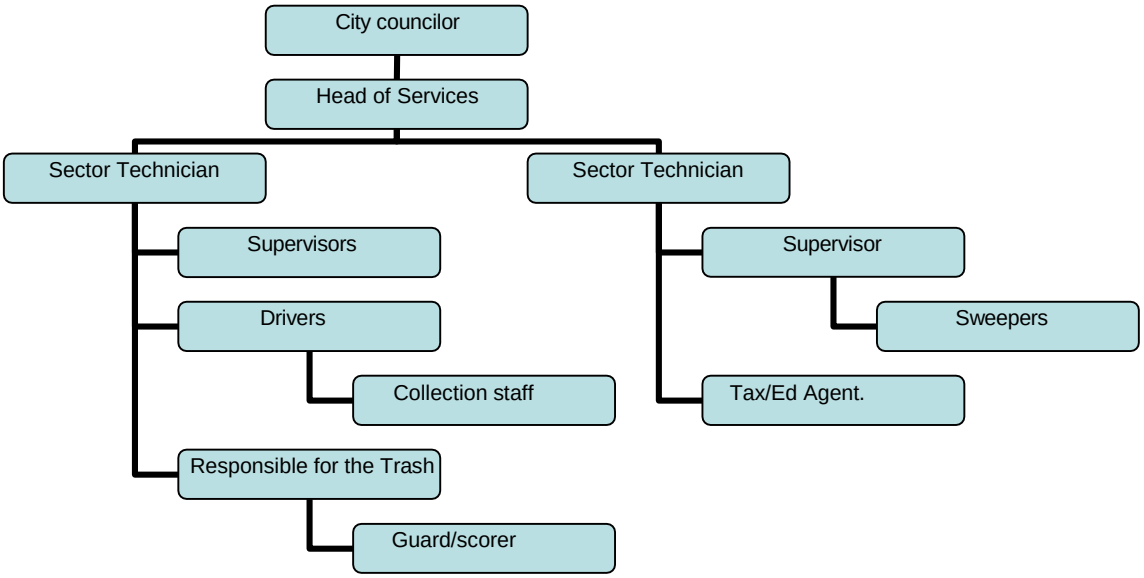

Figure 12: Proposal to review the organization chart for GIRSU

The above proposal, although defined, requires a detailed analysis of the staffing situation before its implementation. This analysis must include contractual legal aspects, availability of resources (for salary payments) and the sustainability of the sector itself, as well as a clear definition of responsibilities and functions for each proposed position. It is then proposed that the following actions be carried out:

1. Appointment of intermediate management positions in accordance with the approved organizational chart and staffing table;
2. Definition of the institutional organizational chart, with clear tasks for the different positions and approval by the Municipal Assembly.

9.2 Urban solid waste collection options

The definition of the most appropriate systems for collecting and transporting MSW in the municipality depends on several factors, the proposal presented was based on several physical, economic and social factors, in particular:

- Urban context and availability of access roads;
- Type of waste generated;

- Desired quality of service (greater proximity of service to citizens vs. communal solutions). For example, a door-to-door service corresponds to a high quality of service (personalized service, little effort on the part of producers), but is also expensive in time and financial resources, while communal containers offer a lower quality (producers must move to dump their RS) but it also allows for more efficient collection
- Costs associated with each system (per ton removed);
- Flexibility (specialized equipment has less flexibility);
- Availability of parts and equipment maintenance capacity.

The table below summarizes the proposed means of collection and transport.

Table 21: Proposed RSU collection and transportation options

AREAS	SOLUTIONS/OPTIONS
urbanized center	*System 1* - In places with 6m3 containers - System: Collection in 6m3 communal containers - Equipment: container truck (On streets with adequate access) *System 2* - Residential urban area with good access - Whistle or fixed stop (door-to-door collection) -Equipment: Tractor / truck
Suburbanwith difficult access	*System 2* - System: Whistle or fixed stop (door-to-door collection) - Equipment: Tractor / truck
Suburbanwith access	*System 1* - In locations with containers - System: Collection in 6m3 communal containers

AREAS	SOLUTIONS/OPTIONS
	- Equipment: container truck (on streets with adequate access)
Rural	*System* - Placement of containers, properly distributed, taking into account the concentration and number of homes and distances - collection in small containers (in a first phase) Equipment: -tractor / truck (for collection in places with small containers - Container carriers for collection from sites with 6m3 containers Improve the current system (no collection, RS “treated” at home) in these areas through effective awareness raising about good RS treatment practices at the production site (not burning plastics, etc.).
Businesses and Institutions	- System: Small individual containers (110 liters max.) purchased by the private party and placed in front of the business/institution. Door-to-door collection - Equipment: Truck / tractors
Markets	*System 1* - At points with containers - System: Collection in 6m3 communal containers - Equipment: container truck
Street cleaning	Wheelbarrows adapted for sweeping along with small equipment (broom, rake and “garbage tongs”) Setting clear daily sweep targets per worker (distance)

9.2.1 Container System

The collection system in 6 m3 communal containers consists of collection points with large containers, placed at regular intervals (150 to 500 m), taking into account the concentration of residences, and preferably on street corners.

The door-to-door collection system for small containers for the commercial sector, institutions and services, consists of the regular collection of containers previously placed at an agreed time/day along the road with

commercial institutions. Containers must be of a size and shape that allow easy loading by the collection vehicle (max. 110 liters). Since these do not remain permanently in public space, these containers, acquired by producers of solid waste from commercial activities, may be different models from public containers.

9.2.2 Whistle system or fixed stop (door-to-door collection)

The fixed stop/whistle system consists of a containerless collection system, also called door-to-door collection. In this system, the collection vehicle parks in pre-established locations and days/times, and notifies residents with a whistle/megaphone so that they can bring their RS and deposit them directly into the vehicle. This system requires less workforce as it is the residents who transport their RS to the vehicle.

The implementation of a door-to-door selective collection system, for the collection of already segregated recyclable waste, will be fundamental for the implementation of the Project to install and operate a Recyclable Collection and Transfer Center in Vila da Manhiça. This will allow better control and imposition of waste segregation practices by residents. This PGIRSUs includes in Annex 4, a Door-to-Door Selective Collection Plan for Recyclables.

9.2.3 Street cleaning system

The system for cleaning the streets is made up of adapted vans, made up of drums that allow the transport of large quantities of material removed from the roads, as well as small specialized equipment: “grabbing tongs” to collect waste (plastic, paper, cans, etc.), rakes for collecting leaves, and brooms for removing sand (in the case of paved roads). This system allows the separation at source of waste from other materials (sand, leaves) in the road cleaning process, a key step for reduction and reuse.

9.2.4 Collection and transport system optimization strategies

In addition to the technical solutions proposed regarding collection equipment and systems (vehicles, containers), it is necessary to implement measures aimed at optimizing the means and systems. These measures are essentially activity management measures, operational measures that aim to reduce operation time (waste loading), reduce distances during waste transport as well as optimize fleet times.

Table 22: Collection and transport system optimization strategy

Reduced RS loading time	**Reduction of distances for RS transport**
• Avoid collecting RS on the floor • Avoid collecting sand • Prioritize the use of containers with storage capacity compatible with the means of collection and easy to load	• Defining fixed routes and ensuring their implementation • Harmonization of distances between container points (150-250m) • Use of main avenues • Maximum use of vehicle capacity
Management	**Optimization of fleet times**
• Continuous supervision and monitoring • Developing more comprehensive training programs • Information dissemination and information exchange • Guarantee of regular preventive maintenance of the means, with special emphasis on basic aspects (washing, lubrication, oil and filter changes, tires, etc.); • Regular recording and monitoring of fuel consumption.	• Preventative maintenance and records of breakdowns and repairs • Continuous fuel availability • Pre-established route plan • Implementation of shifts and schedules adapted for each collection (different times for collection of public containers, door-to-door in stores, etc.) and the reality of the City, taking into account people's customs and safety

9.2.4.1 Documentation and Records

It is important to maintain adequate documentation and records to ensure that waste management is carried out efficiently and safely, as well as complying with environmental regulations and other applicable laws.

Currently, the only waste management report prepared by the Municipal Council is the Data Collection Form on Urban Solid Waste Management (Annex 6). This form must be completed and submitted annually to the Ministry of the Environment. This sheet is comprehensive and covers the main aspects of urban solid waste management. It is recommended that the periodicity of filling it out increases to every six months, in order to provide the Municipality itself with a report on the stage and performance of the sector, and allow improvement actions to be identified to be implemented in the second half of the year.

There is a need for greater control of waste management operations, and to this end, it is necessary to maintain updated records on collection, status of equipment (containers) and an updated inventory of equipment and materials. The following records are therefore proposed, incorporated as an Annex to this PGIRSU:

- Daily record sheet for the collection of solid urban waste (Annex 7) – daily record
- Registration form in the Municipal Waste Bin (Annex 8) – daily record
- Collection point inspection record (Annex 9) – monthly record
- Equipment inventories (Model provided in Annex 10) – monthly record.

By maintaining adequate records and documentation, you can ensure that waste management is carried out efficiently and safely, in addition to complying with environmental regulations and other applicable laws.

9.3 Calculations of theoretical productivity and sizing of different collection systems

9.3.1 Containers

As demonstrated in Chapter 7, effective collection depends on the means available for depositing waste prior to its collection for final disposal.

The table below (Table 23) presents the calculations of the number of containers that are needed for the projected MSW production for the next 5 years. As can be seen, the current number of containers available in Vila da Manhiça exceeds needs. Therefore, acquisitions of containers in the next 5 years are not recommended, but rather actions to maintain containers and review their distribution, taking into account the gradual growth of some neighborhoods.

Table 23: Calculations of the number of containers needed

PGIRSU Implementation Phases	Year	Projection of generated MSW volumes (ton)	Number of containers (6m3) necessary	Available containers
Current	2022	37	17	29
Phase 1	2023	38	17	29
	2024	39	18	29
Level 2	2025	40	19	29
	2026	41	19	29
	2027	43	20	29

It is important to highlight that the collection capacity not only depends on the availability of the means necessary for its temporary disposal by residents, but also on the availability of collection and transport vehicles and their respective productivity.

9.3.2 Dimensioning of the proposed collection system

Table 24: Dimensioning of the proposed means

PGIRSU Implementation Phases	Year	Projectionthe volume of MSW generated (ton/day)	Total volume generated (ton/year)	Total available containers	Vehicles (containers)	Schedule (proposed shift)	capacityand container daily rate at the. container	Days weekdays (proposals)	capable of collecting MSW (ton/day)	Annual collection capacity	Vehicles	Schedule (proposed shift)	Weekdays (proposed)	Productivity by day (ton/day)	capacity annual collection (ton/year)	Annual capacity collection (ton/year)	% coverage ofCM collection services
					Collection system in 6m3 containers using the container truck						Door-to-door system (whistle or fixed stop) with the use of 2 tractors and 1 truck (6ton) + tractor (Sonalika - repaired)						
Current scenario																	
Phase 1	2023	38	13786	29	2 container doors	8am	16	6	35.2	11013	Door-to-door collection system (whistle) using 2 tractors and 1 truck (6ton)	8am	3	4.1	641	11654	**85%**
	2024	39	14200	29	2 container doors	8am	16	6	35.2	11013	Door-to-door collection system (whistle) using 2 tractors and 1 truck (6ton) + tractor (Sonalika - repaired)	8am	3	6.1	954	11967	**84%**
Level 2	2025	40	14626	29	2 container doors	8am	16	6	35.2	11013	Door-to-door collection system (whistle) using 2 tractors and 1 truck (6ton) + tractor (Sonalika - repaired)	8am	3	6.1	954	11967	**82%**
	2026	41	15064	29	2 container doors	8am	16	6	35.2	11013	Door-to-door collection system (whistle) with the use of 2 tractors and 1 truck (6ton) + tractor (Sonalika - repaired)	8am	4	6.1	1272	12285	**82%**
	2027	43	15516	29	2 container doors	8am	16	6	35.2	11013	Door-to-door collection system (whistle) with the use of 2 tractors and 1 truck (6ton) + tractor (Sonalika - repaired)	8am	5	6.1	1590	12603	**81%**

Service coverage reduces as resources are maintained and population numbers increase. The above coverage proposal was made based on the global objective of maintaining coverage above 80%. Although there will be a reduction in terms of service coverage in the coming years, this will be mitigated through the introduction of a means of collection in 2024. A tractor was thus considered, assuming that the current tractor that is broken can be repaired . On the other hand, the choice to increase the collection of the door-to-door system was made with the aim of increasing the door-to-door collection of recyclable waste so that in the future, it can be sent to the Recyclable Collection and Transfer Center to be built in Vila da Manhiça. Other measures proposed to minimize the reduction in service coverage resulting from population growth is the gradual increase in the frequency of door-to-door collection, increasing to 4 times a week in 2026 and 5 times in 2027.

Other measures could be implemented to increase coverage, such as increasing container truck collection shifts, or increasing one more weekday. However, taking into account the great challenge of the financial sustainability of the sector, it is recommended that any increase in services must be preceded by a careful analysis of the financial impact for the Municipal Council with a view to implementing a balanced management of services (cost benefit).

The system proposed in Table 24 above will require a set of actions by the Municipal Council. These were proposed for a phased implementation to allow their financing to be guaranteed. On the other hand, a phased approach allows monitoring the effectiveness of implemented measures and applying optimization and remediation actions, before proceeding with the implementation of new measures that require new investments.

Below (Table 25) the main actions to be carried out to implement the proposed systems in the different implementation phases of the current PGIRSU are summarized.

Table 25: Actions to implement the proposed collection systems

PGIRSU implementation phase	Year	Actions
Phase 1	2023	• Optimized use of collection means • Management measures
	2024	• Addition of a collection means to support the door-to-door collection system • Management measures
Level 2	2025	• Management measures
	2026	• Acquisition of 6 containers • Increase in the number of collection days (+1) to 4 days through door-to-door collection door
	2027	• Increase in the number of collection days (+1) passing for 5 days through door-to-door collection

9.4 Table of advantages and disadvantages of collection systems and equipment

The decision on collection methods must be based on local characteristics, since, in addition to the financial component, there are other criteria that must be taken into account. And based on these, some collection methods or systems may offer more advantages and others disadvantages. Table 26 below presents the key characteristics of each type of system proposed with the purpose of providing a framework for analyzing their advantages and disadvantages.

Table 26: Key features of the proposed collection systems

Description	**Containers communal**	**Door to door (Whistle)**	**Door to door (Fixed stop)**
Collaboration of the residents at the transport inbins/garbage bags	Yes	Yes	Yes
Collaboration of the residents when emptying rubbish bins	Yes	Optional	No
Need in scheduled services	No	Optional	Yes
Access in collectors to waste	Very high	None	High
Average team size (excluding driver)	2 to 4	1 to 2	1 to 4
Complaints regarding the invasion	No	No	No
Service level	Low	Enough	Good
Cost in collection per dwelling	Low	Average	High
Potential appreciation inwaste due to segregation	Low	Medium-high	High
Collection time	More reduced	Average	Longer

9.5 Final deposition system proposal including operation

The RSUs have their final destination in the main Municipal dump, Balucuane dump, although there is a second dump to assist in the disposal of solid waste. The location of the main municipal dump appears to be appropriate and safe, with its delimitation and surveillance lacking.

The conditions of the auxiliary bin are considered inadequate due to the following factors:

- Located immediately upstream of a cultivation zone (less than 100m away)
- Very close to residences (less than 100m away)

Therefore, it is recommended to close this dump and identify an alternative location.

During the diagnostic phase of the preparation of the current PGIRSU, the potential of the current dump (main dump) to apply for a sanitary landfill was assessed, taking into account the rules and principles for converting open dumps into controlled landfills defined in the Ministerial Diploma at the. 31/2018 which approves the Directive for the construction, operation and closure of landfills.

During the visit to the dump, no serious conditions were identified with the naked eye that would make a possible conversion of the open dump to a controlled landfill unfeasible. However, a detailed analysis of the dumpster's condition is recommended to determine whether it meets the requirements of a controlled landfill, especially with regard to the dumpster's useful life. Such an assessment must be carried out as part of a study conducted by experts in the field.

According to Ministerial Diploma 31/2018, to convert a dumpster into a landfill, the following actions must be planned:

- Daily coverage of deposited waste
- Fence construction
- Control of entry and exit of people and vehicles
- Construction of drainages to prevent the accumulation of rainwater
- Construction of embankments and planting of vegetation
- Aquifer monitoring
- Protective tree cover
- Future use will follow the closure of the controlled landfill.

If the studies determine the unfeasibility of a possible conversion of the current main dump into a controlled landfill. It will be necessary to identify candidate locations for the implementation of a new landfill. The process to be followed must follow the steps proposed in Table 27, below.

Table 27: Proposed stages of the landfill implementation process

Phases	Main aspects
Landfill categorization	- Classification and estimation of waste to be deposited - Comparative selection of possible locations eliminating unsuitable areas
Site selection	- Detailed investigation of possible locations (surface and groundwater, soils, etc.) with confirmation of the appropriate location - Completion of the Matrix of “criteria for identifying candidate locations” (Annex A, Ministerial Diploma no. 31/2018) - Consultation with MTA
Viability study	- Conceptual design of the landfill, including organizational aspects and cost estimation
EIA Process	- Instruction of the Process to the MTA - Project Categorization by MTA - Environmental Impact Assessment Process
Executive project	- Deposition cells - Sealing the land (can be carried out with a tree curtain using native plants); - Base waterproofing system (if the soil is not suitable) and leachate collection - Support infrastructures (guardhouse, administrative area, etc.) - Weighbridge - Drainage of water out of the landfill (avoid and minimize rainwater coming into contact with waste) - Assessment of biogas production potential and respective capture and treatment system - Final coverage
Operation	- Waste acceptance procedures - On-site security - Responsible person (on-site pointer) - Weighing (weighing) and registration of entries

Phases	Main aspects
	- Medium compaction (0.6 – 0.8t/m3) - Regular waste coverage - Burn ban
Monitoring	- Data logging - Leachate monitoring (observations of effluents and surface water to react in the event of pollution)

Since a potential process of converting a dump into a landfill or implementing a new landfill can last for a long period, taking into account the legal licensing requirements to be met, the guarantee of financing and the time required for preparation technical documents, it is necessary to implement actions aimed at improving the conditions of the current dump site and its operation. Therefore, the following actions are recommended:

- Detailed analysis of the environmental aspects of the main dump (depth to the water table)
- Definition of basic procedures for waste disposal, compaction, and regular waste coverage (operation plan) for the current dump
- Preparation of the land (removal of vegetation, improvement of internal access, excavation of cells, etc.) and marking of the boundaries of the land with a tree curtain using native plants;
- Allocation of personnel to indicate disposal sites and monitor/register entries.

Regarding the deposition system, the relatively flat topography of the terrain allows for either a depression (Figure 12) or above-ground deposition system. It will be necessary to analyze the depth of the water table to decide on the maximum excavation depth.

This system may be composed of cells or trenches. This system will allow rapid disposal of MSW by collection vehicles, as well as limiting the need for intervention by the backhoe loader (a few days per month / frequency to be defined).

In addition to the cells for deposition, it will be important that the design also includes an area for reserving soil for covering, as well as an area for deposition of RS Verdes in the first phase, and eventually recyclables.

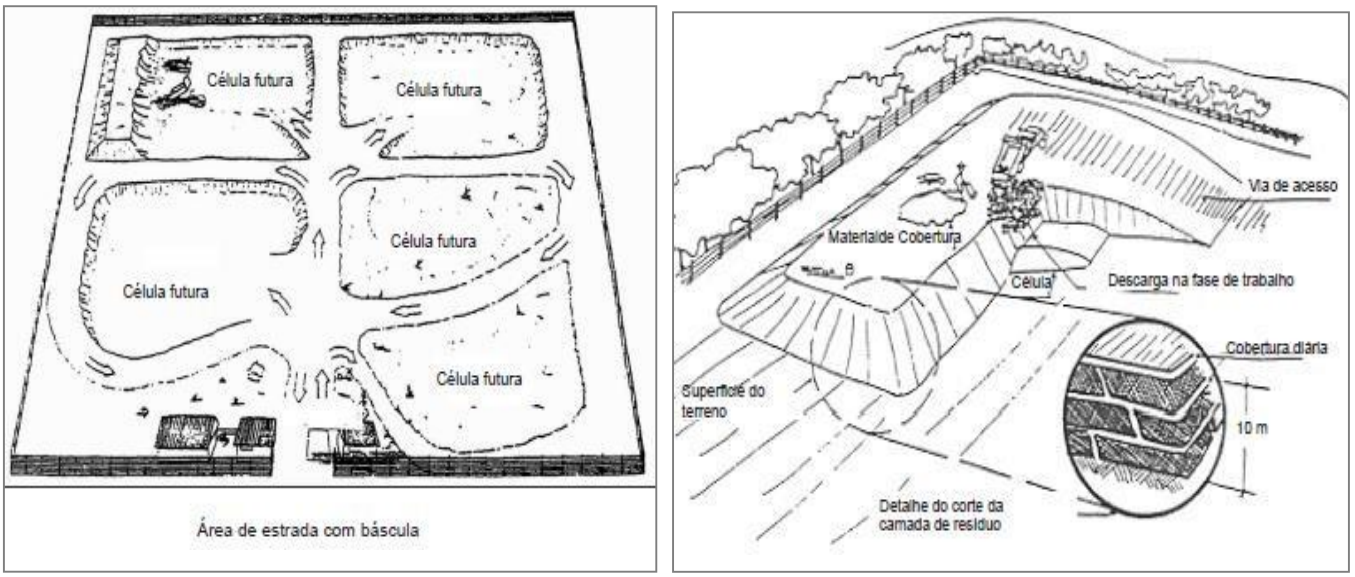

Figure 13: Landfill/dump organization schemes and disposal options[5]

9.6 Proposal for inclusive valorization initiatives

The valorization of MSW is a process through which solid waste that would be eliminated or deposited in landfills or landfills returns to the production chain, through added value. Waste recovery through recycling and reuse of waste produced has the following benefits:

- Reduction of volumes of solid waste generated

[5] *Source: Technical Directive for the implementation and Operation of Sanitary Landfills in Mozambique (2010)*

- Reduction in demand in terms of collection and transport services by the Municipal Council and as a consequence reduction in RSU management costs
- Reduction in the volume of waste sent to dumpsters or landfills
- Potential for generating income through waste recovery (the case of collectors)
- Reduction in carbon emissions
- Reduction in demand for natural resources as raw materials
- Change in population awareness about the use of waste as a resource.

At the moment, there is no formalized waste recovery system. Selective collection is practiced by some collectors who essentially collect glass, plastic and cardboard for later sale to manufacturers who request this type of material.

Waste recovery requires a set of actions from segregation, engagement with actors who may be interested in these initiatives, mobilization of funds, among others. Some actions are recommended here that aim to leverage the recovery sector within the Municipality of Vila da Manhiça, namely:

- Promote waste segregation, initially placing emphasis on the selective collection of waste generated by commercial and industrial units and instructing this group of generators to segregate waste at source and identify opportunities for reuse or recycling
- Identification of recycling projects (eg waste composting, creation of a transfer and recycling center) and potential partners

- Encourage the reuse of leftover organic products from markets for animal feed. Joint initiative with associations of farmers and livestock breeders,
- Carry out awareness campaigns within communities to raise awareness and educate about waste segregation, recycling, reuse and other topics.
- Create procedures at the dump for access to collectors (eg access given only to collectors registered with the Municipal Council)
- Identification of manufacturers interested in purchasing recyclable waste and carrying out a market study, based on potential demand, potential supply, income (prices) and potential involvement of other actors (greater number of collectors, commercial entities, industries and others) .
- Training of collectors.

It is believed that the installation of the Recyclables Collection and Transfer Center will significantly boost the recyclables market not only in the Municipality of Vila da Manhiça, but also in the region. Annex 5 presents a proposal for the Terms of Reference for the preparation of Feasibility Studies (environmental, technical and financial) and Executive Design for the Recyclable Collection and Transfer Center

The implementation of a Recyclable Collection and Transfer Center can only be viable if selective collection of recyclable waste is guaranteed. To this end, it is proposed to implement door-to-door selective collection for the collection of recyclable waste (see Annex 4).

9.7 Environmental Education and Awareness

Environmental education and awareness are key components of an effective solid waste management strategy. Therefore, it is recommended that actions be promoted by the Municipal Council with the aim of raising awareness among residents about the importance of adequate solid waste management and how each individual can contribute to a brighter future.

sustainable. The environmental education and awareness strategy starts with the implementation of the following measures:

- Awareness campaigns: through the organization of regular campaigns to raise awareness among the population about the importance of adequate solid waste management, including recycling, composting and the appropriate final disposal of waste.
- School education programs: including solid waste management in schools, to teach children about the importance of environmentally sound waste management.
- Community training: provision of training to the community on the importance of proper solid waste management and how each individual can contribute.
- Partnerships with local organizations: creating partnerships with local organizations, such as NGOs and businesses, to help promote environmental awareness and solid waste management.

Awareness-raising actions must include raising awareness among municipalities about changes to the tariff structure regarding GRSU.

9.8 Financial planning

The analysis of the financial sustainability of the sector shows a practically insignificant contribution (1%) to the revenue from the waste fee charged by the Municipal Council. Therefore, demanding the evaluation of other alternative waste fee collection systems.

Taking into account the current situation, it is unquestionable that the plan will not be able to provide financial management solutions that could help bring the municipality closer to sustainability in the RSU management sector in the next 5 years. The objective is to propose sustainable strategies that contribute to a gradual improvement of the financial framework of GRUs in the Municipality.

To this end, a detailed analysis was made of the costs of the proposed system (reference to Section 8.3) and the sector's revenue potential (see Table 28).

The full system cost calculation is based on the following assumptions:

- Total annual volumes to be potentially collected, taking into account the proposed means (see Systems Sizing in Section 8.3);
- The estimated cost per ton (1200 Mt), essentially referring to the costs of maintaining equipment, purchasing fuel, purchasing lubricants, salaries and allowances for staff in the sector.
- Forecast of additional costs (called contingency) estimated at 15% of expenses. These costs will cover expenses for extraordinary repairs, purchase of materials for street cleaning, personal protection materials (for collection and street cleaning staff), training and awareness campaigns, supervision activities (fuel for vehicles), including hiring new staff to address the proposed review of the sector's organizational structure.

Table 28: Estimates of the costs of the proposed systems

PGIRSU Implementation Phases	Year	Acquisition of equipment	Capacityannual collection (ton/year)	Operational costcollection estimate - MZN	Contingency(15% of operating costs)	Total MSRM expenses
Phase 1	2023	0	11654	13,984,800	2,097,720	**16,082,520**
	2024	0	11967	14,360,400	2,154,060	**16,514,460**
Level 2	2025	0	11967	14,360,400	2,154,060	**16,514,460**
	2026	0	12285	14,742,000	2,211,300	**16,953,300**
	2027	0	12603	15,123,600	2,268,540	**17,392,140**

To analyze the revenue potential, current rates were considered and several scenarios were developed that foresee an increase in current rates and the adoption of alternative charging systems (through EDM and

during licensing of commercial activities). Resulting in the proposal framed in the following Table (Table 29).

Table 29: Tariff structure for each scenario

	Scenario 1 (Current)	Scenario 2	Scenario 3	Billing method
Domestic tariff (M)	20 Direct billing by CMVM	20 Chargethrough EDM (25%)	50 Chargethrough EDM (25%)	• Scenario 1, systemcurrent billing • Charged (scenarios 2 and 3) by EDM with 25% commission
Commercial tariff (Mt)	30	50	100	• Charge direct paid in 6 in 6months at the commercial license fee (or alternative frequency to be proposed by the Advice Municipal)
Industrial Tariff (Mt)	30	1000	2000	• Billed every 6 months or annually

The garbage fee is currently charged directly by the Municipal Council along with the sanitation fee. According to information obtained from the Health sector of the Municipal Council, the total number of current taxpayers (in 2022) is 1587 of which 1483 pay a fee of 20 meticais and the remaining 104, a fee of 30 meticais. In this case, it is assumed that a potential increase in the number of taxpayers would depend on several factors, including the ability and willingness to pay of the citizens themselves. Making it difficult to project an increase in taxpayers over the next 5 years. Thus, a 20% annual increase in the number of taxpayers was conservatively assumed, trusting the efforts of the Municipal Council in this regard.

The estimated number of taxpayers presented in Table 30, below, considered, in addition to the factors mentioned above, the following assumptions:

- Potential number of domestic taxpayers, with reference to population projection, assuming 60% EDM collection coverage.
- Potential number of industrial and commercial taxpayers, using 2019 data as a reference base, applying an annual growth of 10%
- A charge rate in favor of EDM of 25%.
- The financial analysis did not consider the contribution of industries, predicting a marginal contribution from this group due to the very small number.

Table 30: Potential number of taxpayers

Year	Contributeints (charge direct)	Population	Number total number of families	EDM billing %	Numberpotential taxpayers (charge EDM)	Potentialtaxpayer number commercials
2023	1904	68,672	13,734	60	8,241	1032
2024	2285	70,733	14,147	60	8,488	1135
2025	2742	72,854	14,571	60	8,743	1249
2026	3290	75,040	15,008	60	9,005	1374
2027	3949	77,291	15,458	60	9,275	1511

The tables below present the revenue calculations for each proposed scenario, by consumer category, namely domestic and commercial, taking into account the assumptions presented.

Table 31: Scenarios (1-3) of revenues from domestic consumers

Year	Number of direct contributors	Potential number of contributors domestic	Scene 1	Scenario 2 (raised by EDM) Mt/year	Scenario 2 (raised for CM) MT/year	Scenario 3 (charged by EDM) Mt/year	Scenario 3 (raised for CM) MT/year
2023	1904	13,734	457,056	1,977,763	1,483,322	4,944,408	3,708,306
2024	2285	14,147	548,467	2,037,096	1,527,822	5,092,740	3,819,555
2025	2742	14,571	658,161	2,098,209	1,573,657	5,245,523	3,934,142
2026	3291	15,008	789,793	2,161,155	1,620,866	5,402,888	4,052,166
2027	3949	15,458	947,751	2,225,990	1,669,492	5,564,975	4,173,731

Table 32: Scenarios (1-3) of revenue from commercial consumers

Year	Numberpotential of commercial contributors	Scene 1	Scenario 2	Scenario 3
2023	1,032	371,520	619,200	1,238,400
2024	1,135	408,672	681,120	1,362,240
2025	1,249	449,539	749,232	1,498,464
2026	1,374	494,493	824,155	1,648,310
2027	1,511	543,942	906,571	1,813,141

Below, the results of the analysis of the 3 scenarios developed and the level of coverage of expenses resulting from each scenario are presented, using the potential revenues calculated from the Waste Tax as a source of investment.

Table 33: Recipe Scenarios (1-3)

Year	Annual expenses	Revenues Scene 1	% roof	Revenues Scenario 2	% roof	Revenues Scenario 3	% roof
2023	16,082,520	**828,576**	**5**	2,102,522	13	4,946,706	31
2024	16,514,460	**957,139**	**6**	2,208,942	13	5,181,795	31
2025	16,514,460	1,107,700	7	**2,322,889**	**14**	5,432,606	33
2026	16,953,300	1,284,286	8	**2,445,022**	**14**	5,700,477	34
2027	17,392,140	1,491,694	9	2,576,063	15	**5,986,873**	**34**

As shown in the table of results from the analysis of the three scenarios considered, the current tariff scenario presents a maximum potential for

coverage of 10% at the end of 5 years, if there is an annual increase in direct contributors of 20%.

Scenarios 2 and 3 appear to be the most advantageous, however, they require a change in the strategy and collection system, moving to EDM. Additional efforts involve negotiations and user awareness, especially regarding increases in domestic and commercial tariffs. For this last group, small traders who produce waste are considered the most critical, taking into account the potential for low income. To minimize this impact, a different rate could be studied depending on the potential for waste generation. Therefore, the difference in rates, based on the number of users in the different categories, could create an economic balance, and potentially bring closer the total revenue estimates calculated for scenario 3 presented in Table 31, above. However, this alternative requires an in-depth study, with the sector of economic activities and markets in order to assess the feasibility of implementing differentiated rates for traders.

For each year, the scenario proposed in the current PGIRSU is highlighted in Table 32. Briefly, the following is recommended:

- For the year 2023:
    - The implementation of scenario 1 (direct collection of the domestic tariff of 20 mt and commercial tariff of 30 mt)
    - Maintain the current tariff structure
    - Start engaging with EDM to evaluate a possible partnership for the inclusion of the waste tariff in the energy tariff for users of Vila da Manhiça. This engagement should result in a study of the indicative market, with projections of values raised in the coming years
    - Taking into account the constraints experienced by some Municipalities whose collection is made through EDM,

It is recommended that means of transparency be agreed with the Municipality in the collection process, providing records, projections and other data that allow for effective financial planning of the sector by the Municipality

- Update, in coordination with the sector responsible for economic activities, the inventories of commercial units and define strategies for charging waste fees by traders, for example charging the waste fee together with commercial activity license fees
- In coordination with the sanitation and water supply team, carry out actions to attract a greater number of taxpayers (target +20% annually).

- Year 2024:
  - Implementation of Scenario 1 (direct collection of the domestic tariff of 20 mt and commercial tariff of 30 mt)
  - Maintain the current tariff structure
  - Sign the agreement with EDM to start charging the waste fee with the energy fee
  - Implement information and awareness-raising actions for users about changes to the billing system
  - Start the process of reviewing waste rates for traders (from 30 mt to 50 mt) and industrial waste (from 30 mt to 1000 mt) and obtain approval from the Municipal Assembly
  - Interact with the main actors affected by the tariff change in the waste tax for commercial taxpayers, in order to inform and raise awareness.
- Year 2025:
  - Implementation of Scenario 2 (domestic tariff of 20 mt through EDM, commercial tariff of 50 mt)

- Year 2026:
    - Implementation of Scenario 2 (domestic tariff of 20 mt through EDM, commercial tariff of 50 mt and industrial tariff of 1000 mt)
    - Start the process of reviewing traders' waste fees (from 30 mt to 50 mt) and obtain approval from the Municipal Assembly
    - Start the process of reviewing the domestic tariff for 50 mt, commercial for 100 mt and industrial for 2000 and obtain approval from the Municipal Assembly
    - Awareness and information campaigns on the application of the new tariff structure covering domestic, commercial and industrial users
- Year 2027:
    - Implementation of Scenario 3 (domestic tariff of 50 mt, commercial tariff of 100 mt and industrial tariff of 2000 mt)

The rate review process must essentially follow the following steps:

1. Verification of taxpayer numbers for different categories and possible sub-categories/categories;
2. Engage with the National Association of Municipalities of Mozambique (ANAMM) to obtain guidance and share lessons learned from other municipalities with a view to identifying in advance potential challenges of changing the charging system
3. Preparation of detailed potential revenue scenarios;
4. Definition of values, including some public consultations;
5. Preliminary negotiations with EDM;
6. Approval of values by the Municipal Assembly;

7. Signing of the contract with EDM (including negotiation of the commission value, and obligations to provide justifications on the number of contributors by EDM, together with the monthly revenue).

In terms of the implementation strategy for the progressive increase in revenue, whenever possible, in the case of direct collection, priority should be given to taxpayers with greater willingness to pay (higher brackets), as they are fewer in number and will pay amounts higher, so a greater impact can be achieved with less effort.

The overall objective of the current PGIRSUs is to increase the level of coverage of expenses with GRUs revenues from 1% in the current scenario to 34% at the end of the 5 years of implementation of the current PGIRSU.

10. Objectives and Targets for GIRSUs in the Municipality of Vila da Manhiça

This section presents the objectives that the Municipality intends to achieve during the PGIRSU implementation period (2023- 2027, ie years 2023, 2024, 2025, 2026 and 2027).

The following objectives and goals result from the various stages of the process of preparing the current Integrated Urban Solid Waste Management Plan for the Municipality of Vila da Manhiça.

For the purposes of scheduling the actions, the goals were subdivided into two phases, the first lasting 2 years (2023-2024) and the second lasting 3 years (2025- 2026 - 2027), making up 5 years of implementation of the proposed Plan, assuming its implementation to begin in 2023.

Table 34:GIRSU objectives for the Municipality of Vila da Manhiça

Component6	Description of objectives/goals
	PHASE 1
1	***Organizational structure*** a. Intermediate managers defined and appointed b. Specific drivers for RS collection means integrated into the organization chart c. Defined profiles and tasks of all health sector personnel involved in GRSUs d. Training program on GRSUs, reviewed annually and comprehensive on the vertical scale of the organization chart (from drivers and sweepers to councilor level), and horizontally (covering staff from other councils) e. Definition of responsibilities for GRSUs by other councils and presentation of the proposal for their formalization f. Revision of the Municipal Council's Code of Posture to include additional measures (user responsibilities and prohibitions), new tariff structure. g. Approval of the Posture review by the Municipal Council

[6]*See Section 1.1 (FIGURE 1)*

Component6	Description of objectives/goals
two	***Operational actions*** a. Defining a collection route plan b. Implementation of records of collected waste (volumes) c. Implementation of a breakdown and maintenance log d. Repair of the damaged tractor and use of it for door-to-door collection e. Maintain an updated (monthly) inventory of equipment and materials (model provided in Annex 10) f. Regular inspections at collection points and monthly registration (Annex 9) g. Biannual update of the Data Collection Form on Urban Solid Waste Management in Municipalities (Annex 6) h. Completion of the Daily Register for the collection of RSUs (Appendix 7)
3	***Waste disposal*** a. Appointment of consultants to carry out: • detailed analysis of the dumpster's conditions to determine whether it meets the requirements of a controlled landfill, especially with regard to the dumpster's useful life. • Detailed analysis of the environmental aspects of the main dump (depth to the water table) b. Definition of basic procedures for waste disposal, compaction, and regular coverage of waste (operation plan) for the dump c. Preparation of the land (removal of vegetation, improvement of internal access, excavation of cells, etc.) and marking of the boundaries of the land with a tree curtain using native plants; d. Appointment of consultants to prepare an auxiliary dump closure plan.
4	***Waste recovery*** a. Competition for the preparation of Feasibility Studies (environmental, technical and financial) and Preparation of the Executive Project for the Recyclable Collection and Transfer Center. b. Appointment of the consulting company c. Tender for the construction phase of the Recyclable Collection and Transfer Center. d. Identification of priority locations to implement door-to-door selective collection to obtain recyclable waste e. Awareness raising and engagement actions with actors to promote the selective collection of waste by generators

Component6	Description of objectives/goals
	households (priority areas - pilot project) and by commercial and industrial units.
5	***Awareness*** Awareness raising, dissemination of information to residents on matters of segregation, waste recovery, good waste packaging practices, collection procedures by the municipality (door-to-door collection times, etc.) – 1 awareness campaign per quarter
6	***Financial management of the MSRM Sector*** a. Start engaging with EDM to evaluate a possible partnership to include the waste fee in the energy tariff for users of Vila da Manhiça. This engagement should result in a study of the indicative market, with projections of values raised in the following years b. Taking into account the constraints experienced by some Municipalities whose collection is made through EDM, it is recommended that means of transparency be agreed with the Municipality in the collection process, providing records, projections and other data that allow for financial planning of the sector by the Municipality c. In coordination with the sector responsible for economic activities, update the inventories of commercial units (including tourist ones) and define strategies for collecting waste fees from traders, for example charging the waste fee together with commercial activity fees d. In coordination with the sanitation and water supply team, carry out actions with a view to attracting a greater number of taxpayers (target +20% each year). e. Sign the agreement with EDM to start charging the waste fee with the payment of energy f. Implement information and awareness-raising actions for users about changes to the billing system g. Review of the tariff structure - waste rates for traders (from 30 mt to 50 mt) and industrial waste (from 30 mt to 1000 mt) and obtain approval from the Municipal Assembly h. Interact with the main actors affected by the tariff change in the waste tax, in order to inform and raise awareness.
LEVEL 2	
1	***Organizational structure:*** • Reinforcement of the waste management team, including appointing the team to work in the waste bin.

Component6	Description of objectives/goals
	• GIRSU training program defined for each profile
two	***Operational measures:*** • Progressive increase in door-to-door collection days from 3 to 5 times a week • Implemented and optimized route plan • Maintain an updated (monthly) inventory of equipment and materials (model provided in Annex 10) • Regular inspections at collection points and monthly registration (Annex 9) • Biannual update of the Data Collection Form on Urban Solid Waste Management in Municipalities (Annex 6) • Completion of the Daily Register for the collection of RSUs (Appendix 7) • Daily completion of the record in the Municipal Waste Bin (Annex 8)
3	***Waste disposal:*** • Appointment of consultants to prepare the project to convert the current municipal waste bin to landfill. If this is not viable, it is recommended to identify a candidate site for the future landfill and prepare Environmental Studies and Engineering Projects for the new landfill. • Start activities to close the auxiliary waste bin. • Allocation of personnel to indicate disposal sites and monitor/register entries.
4	***Waste recovery*** • Construction of the Recyclables Collection and Transfer Center • Implementation of selective waste collection (door-to-door collection) and registration of quantities of recyclables collected monthly
5	***Awareness*** Awareness raising, dissemination of information to residents on matters of segregation, waste recovery, good waste packaging practices, collection procedures by the municipality (door-to-door collection times, etc.) – 1 awareness campaign per quarter
6	***Financial management of the GRSUs Sector*** • In 2026, implementation of Scenario 2 (domestic tariff of 20 mt through EDM, commercial tariff of 50 mt)

Component6	Description of objectives/goals
	• Review of traders' waste fees (from 30 mt to 50 mt) and obtain approval from the Municipal Assembly • Review of the domestic tariff for 50 mt, commercial for 100 mt and industrial for 2000 and obtain approval from the Municipal Assembly • Awareness and information campaigns on the application of the new tariff structure covering domestic, commercial and industrial users • In 2027, implementation of Scenario 3 (domestic tariff of 50 mt, commercial tariff of 100 mt and industrial tariff of 2000 mt)

11. Monitoring Indicators and Goals

The table below illustrates the monitoring indicators and goals to be achieved during the Plan's implementation period.

Table 35: Monitoring indicators and goals (2023 – 2027)

At the.	Indicator	Definition and measurement methodology	Target 2023	Target 2024	Target 2025	Target 2026	Target 2028
			Organizational structure				
	Review of the organization chart health and reinforcement sector of the team	Organic structure of the council	Revised organizational chart	Managers intermediate nominated	Recruitment plan for reinforcement of the team approved	Hiring in one reinforcement team	Hiring a team reinforcement
	Definition of profiles and tasks all staff	Human resources records	Description of tasks for O guys involved at GRSUs	Formalization of tasks	Records in tasks It is Team informed about the your tasks	Task records and Team informed about your tasks	Records in tasks It is Team informed about the your tasks
	Training program in waste management materials for personnel involved in GRSUs	Human resources records and the Construction Council, Urbanization and Energy	Program in training elaborated and formalized	Program in training revised (annually) It is implemented	Program in training revised (annually) It is implemented	Program in training revised (annually) It is implemented	Program in training revised (annually) It is implemented
	Posture code review municipal (section referring to healthiness)	Approval for Assembly the Municipal	Group in work established for review posture code	Review and approval of posture code	Revised posture code and widespread	Code in posture implemented	Code in posture implemented
			Operational actions				
	Defining a route plan waste collection	File documentary from the Council from the Construction, Urbanization and Energy	Route plan drawn up and widespread	Revised route plan (if necessary) and disseminated	Revised route plan (if necessary) and disseminated	Revised route plan and optimized (if necessary)	Revised route plan and optimized (if necessary)
	Regular records of waste collected (estimated volumes)	• Documentary archive of the Construction, Urbanization and Energy Council; • Registration Form in the Municipal Waste Bin (Annex 8);	• Data Collection Form on Urban Solid Waste Management us Municipalities (Annex 6) – **1 completed form**	• Data Collection Form on Urban Solid Waste Management us Municipalities (Annex 6) 1 **completed form**	• Data Collection Form on Urban Solid Waste Management in Municipalities (Annex 6) 1 form **completed**	• Data Collection Form on Urban Solid Waste Management in Municipalities (Annex 6) **1 completed form**	• Data Collection Form on Urban Solid Waste Management in Municipalities (Annex 6) 1 form **completed**

		• Daily Record Sheet for the collection of RSUs (Annex 7); • Data Collection Form	• Daily Record Sheet for the collection of RSUs (Annex 7) – **Complete records**	• Daily Record Sheet for the collection of RSUs (Annex 7) – **Complete records**	• Daily Record Sheet for the collection of RSUs (Annex 7) – Records	• Form in Registration in the Municipal Waste Bin (Annex 8); - **Complete records**	• Municipal Waste Bin Registration Form (Annex 8) - - Records

At the.	Indicator	Definition and measurement methodology	Target 2023	Target 2024	Target 2025	Target 2026	Target 2028
		About Urban Solid Waste Management in Municipalities (Annex 6)	**3 months**	**6 months**	**full 9 months**	**3 months** • Daily Log Sheet for Collection of RSUs (Appendix 7) – Complete 9 Month Records	**full 6 months** • Daily Log Sheet for Collection of RSUs (Appendix 7) – Complete 9 Month Records
	Maintain an updated inventory (monthly) of waste collection materials and equipment	• Equipment inventories (Annex 10) • Collection point inspection record (Annex 9)	• Inventories in equipment (Annex 10) – Records for 3 months • Collection point inspection record (Annex *) – 3 month records	• Inventories in equipment (Annex 10) – 6-month records • Collection point inspection record (Annex 9) – 6-month records	• Inventories in equipment (Annex 10) – 9 month records • Collection point inspection record (Annex 9) – 9 month records	• Inventories in equipment (Annex 10) – 12-month records • Collection point inspection record (Annex 9) – **120-month records**	• Inventories in equipment (Annex 10) – 12-month records • Collection point inspection record (Annex 9) – 12-month records
	Repair of the damaged Tractor and use of it for door-to-door collection.	Equipment inspection	• Approval of repair	• Tractor repair • Tractor ino perating in the second half of the year	• Tractor in operation for door-to-door collection	• Tractor in operation for door-to-door collection	• Tractor in operation for door-to-door collection
	Progressive increase in door-to-door collection days from 3 to 5 times.	• At	• At	• At	• At	• Increase of 1 day in door-to-door collection. Going from 3 to 4 in January	• Increase of 1 day in door-to-door collection. Going from 4 to 5 in January
Waste disposal							
	Detailed analysis of the condition of the main municipal dump	Budget of the Council for Construction, Urbanization and Energy; Council's activity plan and activity report	• Budget for hiring in approved consultants.	• Hired consultants to carry out The detailed analysis ofcurrent conditions of	• Analysis report shared with the Municipality and approved	at	at

At the.	Indicator	Definition and measurement methodology	Target 2023	Target 2024	Target 2025	Target 2026	Target 2028
		responsible for GRSUs.		municipal dump			
	Definition of basic procedures for waste disposal, compaction, and regular waste coverage (operation plan) for the current dump	Documentary analysis of the Health Section	• Definition in basic procedures for disposing of waste in the bin	• Implementation of waste management actions	• Implementation ofwaste management actions	• Implementationwaste management actions	• Implementation ofwaste management actions
	Preparation of the land (removal of vegetation, excavation of cells, etc.) and marking of the boundaries of the land with a tree curtain using native plants	Visual inspection of the bin	• Plan and include in the budget to theinterventions to be carried out in the waste bin	• Implement progressively to theplanned actions on the ground	• Implement progressively theactions planned On the ground	• To implementprogressively planned actions on the ground	• Implement progressively theactions planned On the ground
	Allocation of personnel to indicate disposal sites and monitor/register entries	Recruitment plan, Organic structure of the Health Department, Human resources records	at	at	• Define the profile, and include it in the flat recruitment	• Process inrecruitment for hiring	• Contracted and active personnel.
	Preparation of the project to convert the current municipal waste bin to landfill. If this is not viable, it is recommended to identify a candidate site for the future landfill and prepare Environmental Studies and Engineering Projects for the new landfill.	Budget of the Construction, Urbanization and Energy Council; Activity plan and activity report of the Council responsible for GRSUs.	at	at	at	• Budget for hiring in approved consultants	• Contracting of the Consultant • Start of activity
	Closing from the auxiliary trash can.	Registration of documents from the Construction, Urbanization and Energy Council. Activity plan and report	at	• Budget for hiring in approved consultants.	• Contracting of the consultant	• Flat in Approved closure	• Implementation of the Plan closure(minimum 50% of goals)
Waste recovery							

At the.	Indicator	Definition and measurement methodology	Target 2023	Target 2024	Target 2025	Target 2026	Target 2028
	Recyclables Collection and Transfer Center Project.	City Council Budgets Reports and activity plans from the Construction, Urbanization and Energy council	• Budget for hiring in approved consultants	• Competition and appointment of the consultancy company for the preparation of thefeasibility studies and executive project	• Feasibility studies and Project executive submitted and approved	• Contest an d hiring of construction contractor of the unit	• Start of construction of the unit.
	Door-to-door selective collection to obtain recyclable waste	Daily Record Sheet for the collection of RSUs (Annex 7)	• Identify locatio ns priority fori mplement door-to-door selective collection	• Actions in awareness It is engagements with actors to promote selective waste collection • Start of selective door-to-door collection (pilot phase)	• Collection selectiveport-a-port (pilot phase)	Door-to-door selective collection (pilot phase)	Door-to-door selective collection (pilot phase))
	Awareness and training						
	Awareness raising, dissemination of information to residents on matters of segregation, waste recovery, good waste packaging practices, collection procedures by the municipality (door-to-door collection times, etc.)	Records of Sector of healthiness Health sector activity plan	two campaigns awareness	4 campaigns in awareness (1 per quarter)	4 campaigns in awareness (1 per quarter)	4 campaigns in awareness (1 per quarter)	4 campaigns in awareness (1 per quarter)
	Financial management of the GRSUs Sector						
	In coordination with the sanitation It iswater supply, carry out actions aimed at raising	Records of consumer numbers and sector revenues	Increase in 20% incompared to last year	Increase in 20% incompared to last year	20% increase compared to last year	Increase in 20% incompared to last year	20% increase compared to last year

At the.	Indicator	Definition and measurement methodology	Target 2023	Target 2024	Target 2025	Target 2026	Target 2028
	in bigger number intaxpayers (target +20%).						
	Transition to a waste fee collection system through EDM	Activity plan; Proposal to the Municipal Assembly	• Approval fro m theMunicipal Assembly and the President of the Municipal Council of the change in the charging system	• Negotiations with EDM and signing of the agreement with EDM • Actions in raising awareness of users about the change	• Implementation fro m thebilling through EDM	• Implementation of billing through EDM	• Implementation fro m thebilling through EDM
	In coordination with the sector responsible for economic activities, update the inventories of commercial units (including tourism) and define strategies for collecting waste fees from traders	Activity plan Inventory of economic activities Recipe records	• Inventories of economic activities updated • Billing strategy proposal approved by city Council • Implementation ininformative and awareness-raising actions for commercial taxpayers about the new method ibilling and • awareness of the need in pay the fees	• Implementation of new billing methods for commercial users • Implementation ininformative and awareness-raising actions for commercial taxpayers about the new method ibilling and • awareness of the need in pay the fees	• Implementation of new billing methods for commercial users • Implementation ini nformative and awareness-raising actions on the need to pay fees	• Implementation of new billing methods for commercial users • Implementation of information and awareness-raising actions on the need to pay fees	• Implementation of new billing methods for commercial users • Implementation ini nformative and awareness-raising actions on the need in pay the fees
	Review of the tariff structure - waste rates for traders (from 30 mt to 50 mt) and industrial waste (from 30 mt to 1000 mt) and obtain approval from the Municipal Assembly	Posture Code Revenue Records	• implementation of scenario 1 (direct collection of the domestic tariff of 20 mt and commercial tariff of 30 mt)	• Implementation of Scenario 1 (direct collection of the domestic tariff of 20 mt and commercial tariff of 30 mt) • review of waste fees of the	• Implementation of Scenario 2 (domestic tariff of 20 mt through EDM, commercial tariff of 50 mt)	• Implementation of Scenario 2 (domestic tariff of 20 mt through EDM, commercial tariff of 50 mt and industrial tariff of 1000 mt) • waste fee review process	• Implementation of Scenario 3 (domestic tariff of 50 mt, commercial of 100 mt and industrial of 2000 mt)

At the.	Indicator	Definition and measurement methodology	Target 2023	Target 2024	Target 2025	Target 2026	Target 2028
				merchants (from 30 mt to 50 mt) and industrial (from 30 mt to 1000 mt) and obtain approval from the Municipal Assembly • Interact with the affected actors with the alteration tariff from the waste fee for commercial taxpayers in order to inform them and sensitize them		of traders (from 30mt to 50mt) and obtain approval from the Municipal Assembly • process of reviewing the domestic tariff for 50 mt, commercial for 100 mt and industrial for 2000 and obtaining approval from the Municipal Assembly • Campaigns in awareness It is information on the application of the new tariff structure covering yo u domestic, commercial users an d industrial	

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Annex 1 – List of Main Actors and Engagement Plan

At the.	Actors	Characteristics	How are they affected by the Problem	Activities forconsider of interest	Type of engagement	Minimum frequency
1	Members of the Municipal Assembly	city Council	Municipal solid waste management services	Approval of the municipal stance, approval of annual plans, approval of budgets	Meetings with the municipal assembly and other extraordinary meetings	Semiannuallyand in accordance with the internal work program of the Municipal Council
two	City Council councilors	city Council	Municipal solid waste management services	Municipal waste management services, preparation of annual plans, engagement with external actors, waste management initiatives and projects waste, annual reports.	Internal activities of the Municipal Council	Monthly and in accordance with the Municipal Council's internal work program
3	Unlicensed private operators	Private sector	Responsible for collecting, transporting and disposing of waste	Collection, transportation and disposal of waste, licensing, payment of fees and records	Meetings to raise awareness about good practices, licensing and waste an d waste in Records	Semiannually
4	Collectors	Local community	Waste recovery	Awareness raising, segregation of waste in the bin,	Awareness raising and data sharing	Semiannually
5	FIPAG	Public company	Supply of water;	Data and information sharing	Information exchange and synergies	Semiannually
6	AIAS	Public company	Synergies with sanitation projects and initiatives	Data and information sharing	Information exchange and synergies	Semiannually
7	Ilovo (Açucar da Maragra)	Private company	Large waste generator and operator of the waste	Waste generation and waste disposal	Awareness raising and data sharing (referring to data management)	Quarterly

generated

				waste)		
8	Neighborhood Chiefs	Local structure	Interface with citizens at neighborhood level;	Raising awareness of populations at neighborhood level, environmental education.	Regular meetings to raise awareness, exchange information and synergies	Quarterly
9	Administration Municipal markets	Advice Municipal	Cleaning services of the markets, environmental education of sellers	cleaning services markets, awareness and salesperson education	Work meetings (council internals Municipal)	Monthly (minimum) and according to the program inner work of the Council Municipal

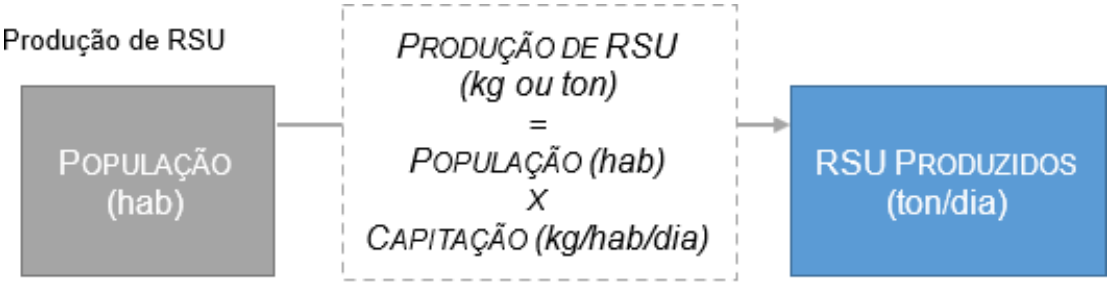
Annex 2 - Support Matrix for Baseline Information Collection

Theme	Description	Possiblesource/responsible for information
1. General context	1.1. Geographical situation - City map (neighborhoods, roadsmain, etc.)	PlanningU r b a n
	1.2. Situation of urban development (distribution of expansion areas, urban and suburban areas, access roads byneighborhood, rural areas, etc.)	PlanningU r b a n
	1.3. Basic urban services (light, water, etc.)	PlanningU r b a n
	1.4. Socio-economic situation (main commercial activities,industrial, etc.)	Urban Planning /Economic Activities;Industry and Commerce Directorate
2. OrganizationInstitutional	2.1. CM/GD general organizational chart	CouncilInstitutional
	2.2. General organization chart of the sector	MSW/Resource ManagementHumans
	2.3. Distribution of GRSU personnel by area, numbers and function: drivers, removalists, waste disposal personnel, inspectors, etc	MSW/Resource ManagementHumans
	2.3.1. Level of training of existing staff	MSW/Resource ManagementHumans
		RSU / Council ManagementInstitutional
	2.4. Existing institutional development plan10	
3. Equipment	3.1. List of available equipment (brand, model, condition,collection capacity, etc.)	MSW/Workshop Management
	3.2. Maintenance statusof existing equipment	MSW/Workshop Management
	3.3. Plan for purchasing additional equipment / major repairs	MSW Management / Workshops /Acquisitions
4. Aspectscool	4.1. Regulations and other existing legal instruments(posture, etc.)	RSU / Council ManagementInstitutional
	4.2. Information on the application of regulations and attitudes (number of infractions and fines applied, etc.)	RSU Management / Council ofFinance
5. Quantityand composition of MSW	5.1. Population - Census data by neighborhood (includingprevious 1997, 2007)	PlanningU r b a n
		INE
	5.2. Commercial Sector – Number of commercial establishments, number ofworkers, etc.	Directorate of Industry and Commerce
	5.3. Tourism (number of tourists per month, number of resortstourist)	Tourism Directorate
	5.4. Per capita production (for the different production areas,urban, suburban, rural domestic MSW, businesses, etc.)	Survey
	5.5.Density and composition of RS	Survey
	6.1. Collection: Description of the system by area/neighborhoods	MSW Management
	6.1.1. List of neighborhoods covered or not and frequency ofcollection	MSW Management
	6.1.2. Type of disposal system (container, silo, waste on the floor,etc.)	MSW Management
	6.1.3. Number and location of collection points (containers /silos/etc.)	MSW Management

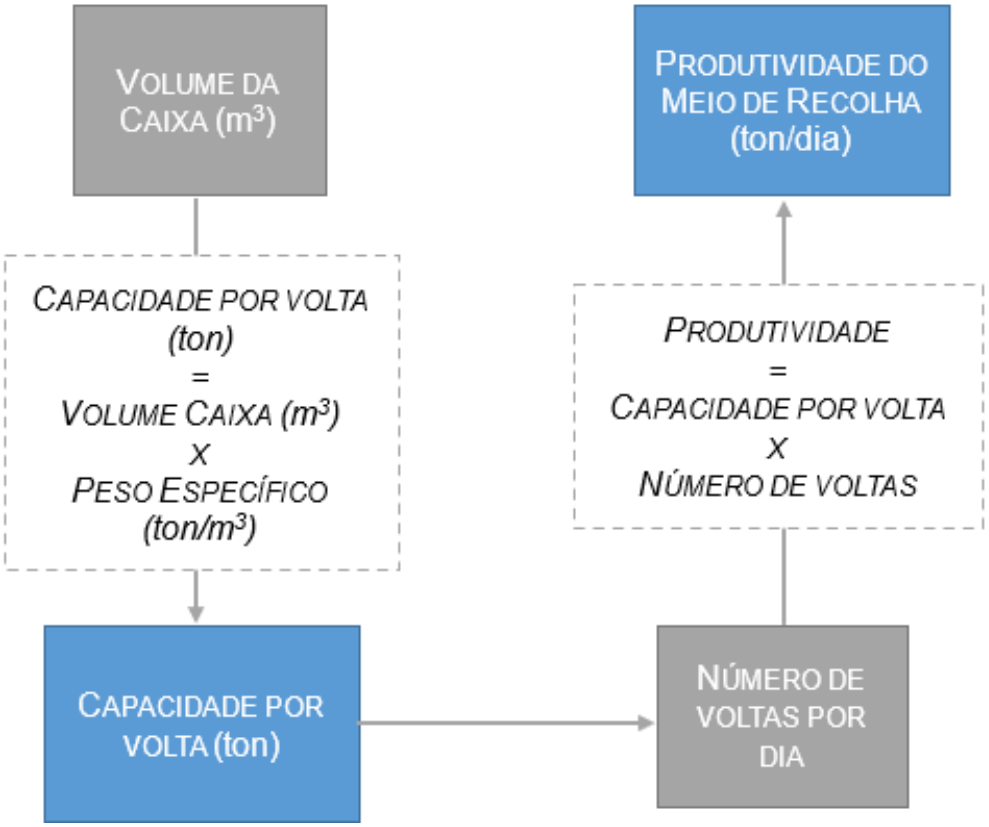
Theme	Description	Possiblesource/responsible for information
6. Systemcurrent GIRSU	6.1.4. Vehicles used	MSW Management
	6.1.5. Existing routes	MSW Management
	6.1.6. Records of work per vehicle (collection time,transport to waste bin, number of laps, etc.)	MSW Management
	6.2. Existence of informal garbage bins (location)	MSW Management
	6.3. Final disposal - mapping of bin(s)	MSW Management
	6.4. Final deposit - amounts deposited (number of vehicles,volume, weight)	MSW Management
	6.5. Recycling - Local experiences	RSU / Council ManagementInstitutional
7. Finance	7.1. Existing fee system (garbage fee): tiers, amount ofEDM commission, etc.	RSU Management / Finance
	7.1.1. Details on the number of taxpayers per category (general,commercial, etc.)	RSU Management / Finance
	7.2. Value of sector revenue	RSU Management / Finance
	7.3. Value of sector expenses	RSU Management / Finance
	7.4. External funding or donations	RSU Management / Finance
8. Othersaspects	8.1. Existing memos	RSU / Council ManagementInstitutional
	8.2. List of actors in the sector (NGOs, environmental clubs, sectorprivate, etc.)	RSU / Council ManagementInstitutional
	8.3. Existing studies	RSU / Council ManagementInstitutional

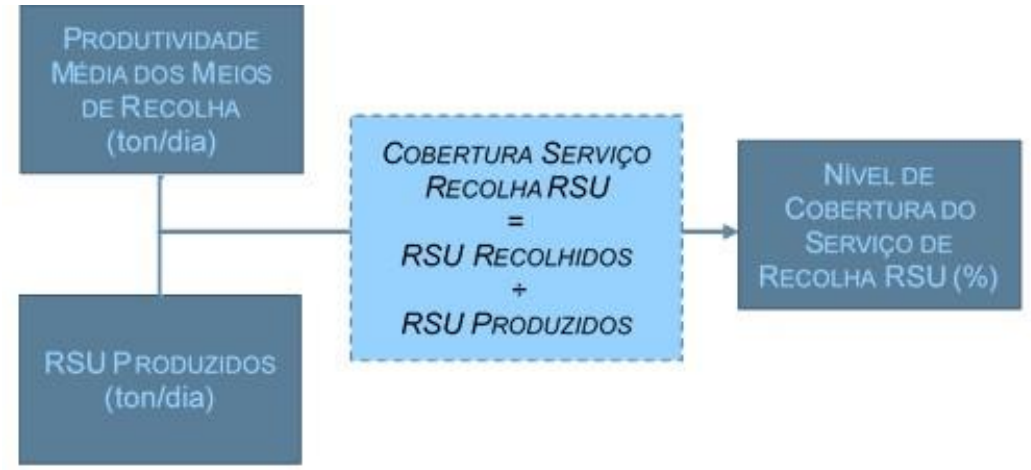
Annex 3 – Sequence of Calculations

Produção de RSU



Produtividade do meio de recolha de RSU





Custos médios diários

Custos unitários

Annex 4 –

Assessment of the Current Door-to-Door Collection System and Future Potential

Door-to-Door Selective Collection Plan

PART A - ASSESSMENT OF THE CURRENT DOOR-TO-DOOR COLLECTION SYSTEM AND FUTURE POTENTIAL

The fixed stop/whistle system consists of a containerless collection system, also called door-to-door collection. In this system, the collection vehicle parks in pre-established locations and days/times, and notifies residents with a whistle/megaphone so that they can bring their Solid Waste and deposit it directly into the vehicle. This system requires less workforce as it is the residents who transport their RS to the vehicle. This system is a fundamental piece in the context of multi-material recycling, when it is applied to the selective collection of RU, and it is usual to process it on pre-defined days and times.

The door-to-door collection system has the advantage of being an easily accessible disposal system, as users do not have to travel to leave recyclables at a collection point, resulting in better participation results. This also favors greater collection of separated waste and collected material, with lower contamination rates. Its application, however, has management costs that can be higher, compared to the proximity container system, resulting from greater operational costs, with collection teams and with regard to vehicle maintenance, because it enhances the its physical wear and tear. Furthermore, in terms of awareness, it presents great demands on explaining the process for the correct separation of the material.

Table 1 below presents the key characteristics of each type of door-to-door collection system, thus providing a table of the main advantages and disadvantages of each system.

Table 36: Key characteristics of door-to-door collection systems

Description	**Door to door (Whistle)**	**Door to door(Fixed stop)**
Collaboration of the residents at the transport inbins/garbage bags	Yes	Yes
Residents' collaboration in emptying rubbish bins	Optional	No
Need for scheduled services	Optional	Yes
Access of collectors to waste	None	High
Average team size (excluding driver)	1 to 2	1 to 4
Complaints regarding the invasion	No	No
Service level	Enough	Good
Collection cost per household	Average	High
Potential appreciation in waste due segregation	Medium-high	High
Collection time	Average	Longer

Currently the main waste collection system carried out in the Manhiça Municipal Council is collection in containers. The fixed-stop door-to-door collection is carried out in some neighborhoods with the highest incidence in the Ribangua Neighborhood, where approximately 4500 people live (data from the 2017 census) and in the Tsa-tsé Neighborhood with around 3000 inhabitants.

The means used for door-to-door collection are the dump truck and the tractor. The second tractor, currently broken down, is also intended for door-to-door collection. The two operational means, namely the tractor and the dump truck, have a total collection capacity of approximately 4 tons per day.

In the Recycling and reuse component, the municipal dumps in operation, with a greater incidence in the Balucuane Dumpster, house a small number of informal people who selectively collect solid waste. However, the quantities and the market where these wastes are destined and sold are unknown. The action points are

Variables of this are the containers spread throughout the municipality as well as in the Trash.

The municipality does not have a system for separating and reusing different types of waste, although it has identified a space close to the dump to accommodate the future Recyclable Collection and Transfer Center.

However, there is a high untapped potential for waste recovery in Vila da Manhiça, as can be seen from the volumes of recyclable waste produced in the Municipality. Table 1 below presents the composition of recyclable urban waste generated in Vila da Manhiça, aggregating a total of 30% of the total volume of waste. Of these, plastic and metal cardboard stand out.

The presents typical composition of solid waste by waste category.

Table 37: Composition of urban solid waste7

Waste categories	Composition in percentage (%)
Plastic	11.26
Glass	1.8
Paper card	8.5
Metal	8.56
Total	**30%**

According to the data above, taking into account the estimated annual production of approximately 37 tons/day, are produced annually in the Municipality
3.3 tons of plastic, 2.4 tons of cardboard and 2.4 tons of metal per day. Offering high potential for the installation of a recyclable collection center for commercialization purposes on the national and international market, such as in South Africa.

The implementation of a door-to-door selective collection system, for the collection of already segregated recyclable waste, will be fundamental for the implementation of the Project to install and operate a Recyclable Collection and Transfer Center in Vila da Manhiça. Because it will better

[7] *Reference characterization campaign carried out in Manhiça (2019)*

control and imposition of waste segregation practices by citizens. This PGIRSUs includes in Annex 4, a Door-to-Door Selective Collection Plan for Recyclables.

The table below summarizes the proposal contained in this Integrated Urban Solid Waste Management Plan regarding the adoption of the door-to-door collection system in Vila da Manhiça over the next 5 years.

Table 38: Proposed RSU collection and transportation options

AREAS	SOLUTIONS/OPTIONS
urbanized center	*System 2* - Residential urban area with good access - Whistle or fixed stop (door-to-door collection) -Equipment: Tractor / truck
Suburbanwith difficult access	*System 2* - System: Whistle or fixed stop (door-to-door collection) - Equipment: Tractor / truck
Businesses and Institutions	- System: Small individual containers (110 liters max.) purchased by the private party and placed in front of the business/institution. Door-to-door collection - Equipment: Truck / tractors

The implementation of a door-to-door collection system must be accompanied by a continuous assessment of the following factors:

- Urban context and availability of access roads;
- Type of waste generated;
- Costs associated with each system (per ton removed);
- Flexibility (equipment specialized present less flexibility);

Parts availability and equipment serviceability

PART B - DOOR-TO-DOOR SELECTIVE COLLECTION PLAN (OF RECYCLABLES)

Introduction

The current door-to-door selective collection plan provides guidelines for collecting recyclable waste from homes in the Municipality. The main objective is to guarantee selective collection of recyclable waste to be sent to the recyclable market.

Coverage area definition criteria

The health sector must define the geographical area to be covered by door-to-door collection. The selection must be made based on a pre-evaluation of the following aspects:

- Areas with high potential for generating recyclable products such as plastic, glass, paper and cardboard
- Prioritize urban areas, where the population's level of education is higher, facilitating understanding of the objectives and benefits of waste segregation
- Proximity to the collection and transfer center for recyclables.

Before the areas covered are defined, the residents of these areas must be duly engaged by the Municipal Council in order to inform them about the collection program, train them in matters of waste segregation and obtain sensitivities and contributions for improvement.

Collection schedule

The collection program must be registered and shared with the populations covered. The program must be updated monthly and must include the following information:

- Areas covered (nº. of houses)
- Engaged vehicles
- Week days
- Time
- Name of drivers and personnel involved in door-to-door collection.

The planning of the collection routes and program must be done to ensure that the collection is carried out at the same time and on the same days in the same area. For example, Thursdays from 10am – 1200 in Bairro da Wenela. This planning will allow residents to prepare in advance to have waste separated and properly packaged for delivery at the time of collection and include this activity in their daily street routines.

Types of waste

The list of recyclable waste to be collected must be defined based on market demand. Currently, the greatest demand is concentrated in plastic waste, paper/cardboard, glass and metal. Since the selective collection will be for supply to the future Recyclable Collection and Transfer Center, it is recommended that the types of waste be defined based on the list of waste to be handled in that unit.

During the collection process, unsorted waste, ie non-recyclable, will also be collected. Methods for identifying this waste must be identified to be sent to the dump. Methods may include packaging in specific bags and using ribbons for identification.

Collection logistics

The vehicles to be used for selective collection are tractors and trucks. Other materials to be purchased and made available for collection include:

- Bags for reserve packaging. However, it is proposed that residents be held responsible for packaging waste in plastic bags.
- Safety equipment for workers involved in selective collection

Final disposal of waste

The destination of waste must be determined based on the final market. It is assumed that a large part of the recyclable waste will be absorbed by the recyclable collection and transfer center (to be installed in the future). However, it is recommended that a pilot program for collecting recyclable waste be implemented, even before the installation of the future factory. This phase will serve to train the population, monitor the quantities of recyclable waste to size the recycling unit and implement corrective measures and improve the door-to-door collection system. It is therefore expected that at this stage, recyclable waste will be sent to the municipal waste bin.

Employee training

Workers to be involved in the recyclable waste collection process must be properly trained in the following aspects:

- Types of recyclable waste
- Packaging methods (plastics, bags, etc.)
- Health and safety risks when handling waste
- Appropriate rules and ways of interacting with residents during waste collection
- Operational process (routes, areas covered, forms of packaging in vehicles, destination, etc.).

Communication with the community

The communities to be affected by the door-to-door collection program must be duly engaged to:

- Raise awareness about the objectives of selective collection and its positive impacts
- Train them on the rules to be followed during separation, with regard to types of waste, packaging methods in plastic bags, waste that is not acceptable for recycling, etc.
- Inform them about the waste collection programwaste (vehicles, schedules, municipal employees involved and means of identifying personnel (badges and uniforms).

Taking into account that door-to-door collection requires some type of direct interaction with residents, it is recommended that a telephone line be opened to receive complaints and contributions for improvements from the population.

The segregation and selective collection of waste is a new practice in the Municipality of Vila da Manhiça and in the rest of the country. Therefore, it is recommended that comprehensive awareness campaigns be carried out at neighborhood level and extended to some groups such as traders and students (in schools). These campaigns can be through meetings and also by distributing posters at strategic points in Vila da Manhiça.

Waste segregation and packaging

Door-to-door collection will only be effective if correct segregation of recyclable waste and correct packaging by residents is guaranteed. It is imperative to disseminate information on the rules for segregation and packaging of recyclable waste.

Examples of images to be used in informative material

Types of recyclable waste

Recyclable waste groups

Recommended below are some measures to be observed during the segregation and packaging of waste by citizens:

- Non-recyclable material should not be mixed with recyclable material
- Cardboard boxes to be discarded must be dismantled, if there are a large quantity, they must be made into a bundle and tied and taken to the external shelter intended for common recyclable waste.

- Different types of recyclable materials cannot be mixed.
- The bags to be used for packaging must be strong enough to prevent them from breaking during handling and transportation.

Record

A file must be maintained with activity records. The Registry must include updated documentation with the following information:

- Records of the collection operation, for each vehicle:
    - Houses covered,
    - Collection days
    - Routes
    - Time
    - Waste destination
- Volume of recyclable waste collected. This data can be obtained from the receiver (recyclable collection and transfer center)
- Record of non-conformities. Non-conformities can be raised by residents at the time of collection, by drivers and collection helpers and by the recipient of recyclable waste.

Annex 5 –

Part A - Detailed Plan for the Implementation of the Recyclable Collection and Transfer Center

Part B - Criteria and Guidelines for the Design and Installation of the Recyclable Collection and Transfer Center

Part C - 5. Licenses and Authorizations, Role and Responsibilities

Part D – Main Risks and Measures

PART A - Detailed Plan for the Implementation of the Recyclable Collection and Transfer Center

In recent years, the Municipality of Vila da Manhiça has seen growth in its population and an increase in population density in the urban center. This growth is accompanied by an increase in waste generation in the Municipality. The municipality generates approximately 13,000 tons of solid waste annually, of which a significant portion is made up of recyclable waste, such as plastic, cardboard and glass.

The Vila da Manhiça Municipal Council intends to implement a Project for the collection and transfer of recyclable waste in Vila da Manhiça. To this end, the Municipality identified a location for the installation of the unit, close to the Municipal Waste Bin.

This plan describes the steps to be followed with a view to implementing a Recyclable Collection and Transfer Center.

MAIN ACTIVITIES

The implementation of a Recyclable Collection and Transfer Center first requires determining the viability of the Project from an environmental, technical and financial point of view and the preparation of the Executive Engineering Project to be subsequently delivered to the contractor for the center's construction work.

The studies aimed at preparing the Project to implement the Recyclables Collection and Transfer Center have the following objectives:

- Quantify the generation of recyclable waste in the Municipality
- Carry out a market study in the region
- Determine the volume of investment required for the implementation and operation of the landfill
- Assess the environmental and technical compatibility of the location identified for the installation of the unit.
- Map the licensing requirements for the implementation of the Factory
- Assess the financial sustainability of the business.

I. Activity 1: Economic viability and market analysis:

The economic viability of the Project must be preceded by a detailed analysis of the potential for production of recyclable solid waste generated in the Municipality, to subsequently support the analysis of the feasibility of implementing the Project, determining the sizing of the infrastructure

(installed capacity) and the resources required for its installation and operation.

The survey must be carried out based on waste collection records complemented by field surveys and a solid waste characterization study in the Municipality.

An assessment of the demand for recycling services in the region must be made, as well as an analysis of competition and market trends.

II. Activity 2: Analysis of financial viability:

To analyze the financial viability of the Project, economic indicators such as Net Present Value (NPV), Internal Rate of Return (IRR) and Payback must be used. To determine such indices, it is necessary to determine the initial investment, operational courses, revenues and expenses to later determine whether or not the project is economically viable.

The study must include:

- Market analysis (suppliers and buyers, prices)
- Revenue projections
- Projection of costs, expenses and investments
- Assessment of economic analysis indicators such as Net Present Value (NPV), Payback[8].

A financial model must be included that allows a prediction of financial results over time.

III. Activity 3: Analysis of environmental aspects:

The environmental assessment will consist of the following:

- An analysis of the suitability of the location identified for the implementation of the Project and other alternative locations indicated by the Municipal Council. This analysis must be based on an analysis of environmental and social multi-criteria, such as the following:
    - Location accessibility conditions
    - Compatibility with land uses and territorial planning
    - Environmental sensitivities (biodiversity, soils, topography, watercourses).
- Assessment of the potential environmental impacts of the Project

[8] *To analyze the economic viability of the RCC Recycling Plant, economic engineering indicators were used, such as Net Present Value (NPV), Internal Rate of Return (IRR) and Payback. To determine these indices, it is necessary to determine the initial investment, cash inflows and outflows to later determine the option of accepting or rejecting the project.*

- Preparation of an Environmental Management Plan for the construction and operation phases of the unit.
- Based on the determination of the installed capacity, the selected location, the sizing of the infrastructure, the categorization of the activity for environmental licensing purposes must be evaluated.

IV. Activity 4: Technical feasibility analysis and Executive Project:

A detailed assessment must be made of the infrastructure, technologies and equipment necessary for the operation of the proposed installation, including its efficiency, capacity and costs. Furthermore, an analysis must be made of the project execution time, the human resources required and the steps involved in implementation.

As part of the technical assessment, the processing steps and equipment and units to be installed (eg sieving, crushing and compression units) must be determined and described.

During this phase, field surveys and technical studies are expected to be carried out to support the preparation of the Executive Project, including (but not limited to):

- Geotechnical surveys
- Topographic surveys
- Mapping (using GIS systems)

At this stage, the following documentation must be developed:

- Technical Feasibility Report
- Executive Project Documentation, including:
    - Design/dimensional notes & templates,
    - Autocad plans and profiles
    - Detailed profiles
    - Descriptive memory
    - Architectural drawings
    - Quantity maps

An operation and maintenance manual for the enterprise must also be prepared.

<u>DOCUMENTS TO BE PRODUCED</u>

- Diagnostic report, comprising the following:

  - Characterization of recyclable solid waste and production projections
  - Recyclables market conditions
  - Identification of the main actors in the management of recyclable waste
  - SWOT analysis (Strengths, Opportunities, Weaknesses and Threats) taking into account the implementation of the Project.
- Proposed site validation report, based on the results of the assessment of environmental aspects
- Environmental Feasibility Study
- Environmental Management Plan
- Financial feasibility study report, including a cost analysis (CAPEX and OPEX)
- Technical Feasibility Study Report
- Executive project of the unit infrastructure, including descriptive parts, drawings and maps of quantities. The executive project must comply with all requirements necessary to obtain the construction license. The Executive Project must include a budget for the construction of the project and the Terms of Reference for contracting the contract for the construction phase.
- Operation and maintenance manual for the future enterprise.

SKILLS NEEDED FOR O DEVELOPMENT OF THEENGINEERING STUDIES AND PROJECT

Below It ispresented one list of specialties needed fordevelop the proposed studies, namely:

- Civil engineering and project management
- Solid Waste Management / recycling and recovery
- Mechanical Engineering
- Environment
- Geotechnics
- CAD
- GIS

PART B - Criteria and Guidelines for the Design and Installation of the Recyclables Collection and Transfer Center

Objectives

The guidelines and criteria for Design and installation of the Recyclable Collection and Transfer Center proposed here meet the following objectives:

- Create a safe and easily accessible waste handling space
- Develop a project taking into account environmental protection aspects through appropriate environmental management, from the implementation phase to the operation phase.
- Define criteria for continuous evaluation of Project performance
- Provide suggestions and formulas for calculating space capacity
- Provide criteria for selecting a suitable location for the center
- Create spaces for efficient management of recyclable waste, sufficient areas for waste handling and minimizing contamination from collection and loading
- Ensure there is sufficient space for collection vehicles to access areas
- Identification of the main risks associated with the development of similar projects.

Facilities Layout

The design of the Project will fundamentally depend on the availability in terms of space and the characteristics and capacity of the Recyclables Collection and Transfer Center. Its capacity can only be determined after carrying out the necessary feasibility and project design studies.

The Collection Center must consist of at least the following areas:

- Pre-processing storage area designated as temporary storage facility

- Sorting and weighing area
- Processing area
- Temporary storage area after sorting (before distribution to the final market)
- Washrooms
- Office for administrative activities
- Cup
- Entry cancellation
- Circulation area for waste transport vehicles

As a reference, a temporary storage facility designed considering aesthetics and functionality is proposed (see Figure 1). Its roof has an elliptical shape so that water drains behind the structure, where the drainage is located, and was designed to have natural ventilation. The proposed installation is 2.2 m. It is covered in a matte double-walled polycarbonate sheet. The design of the cover can be changed to comply with common standards taking into account market supply. Its gate is located in the center of the storage room and is 1 meter long. The proposal is based on similar projects for volumes similar to those produced annually in the Municipality of Manhiça. However, during the feasibility study phase the specifications must be reviewed.

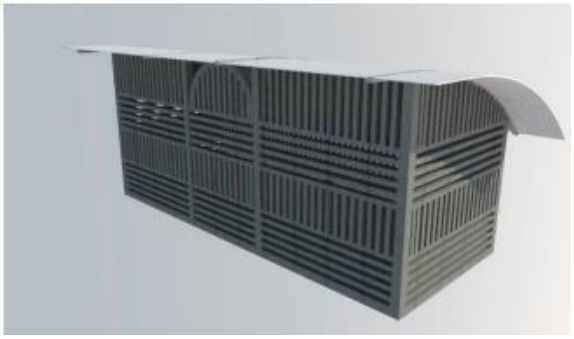


Figure 1: Conceptual project proposal for temporary storage facility after sorting and treatment

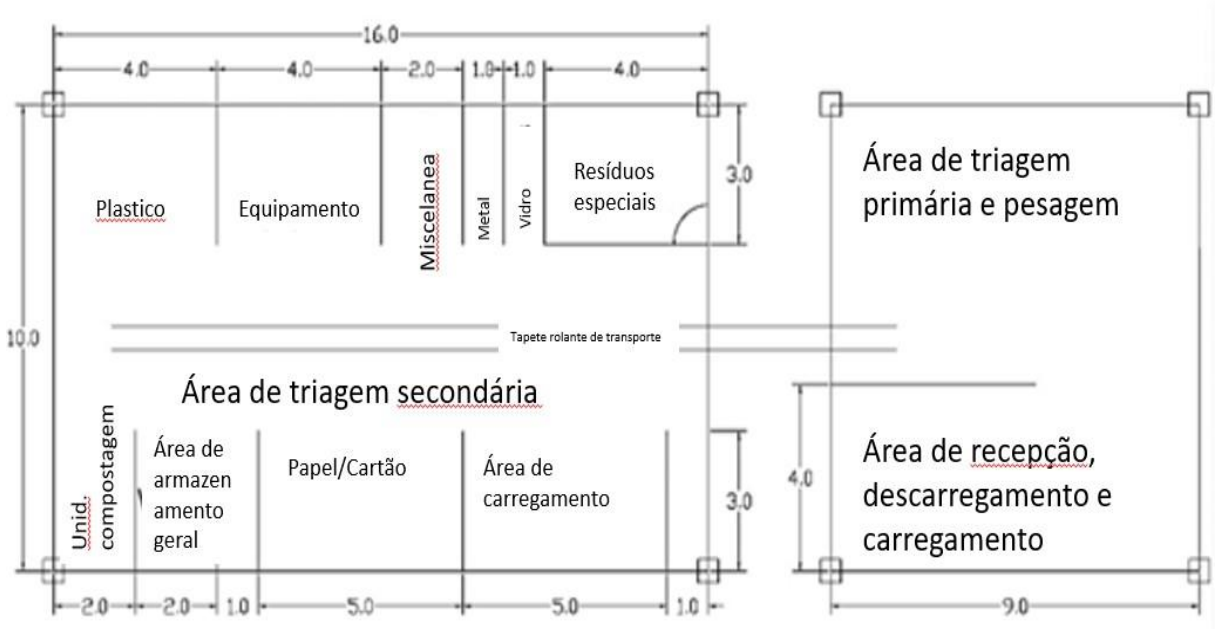


Figure 2: Proposed layout of the main building of the recyclable waste collection and transfer facility

Figure 2 shows the proposed layout, which accounts for waste classification, allocating more space for plastic and paper waste. Furthermore, a composting unit was considered in the layout, since there is still biodegradable waste that is recovered.

Primary waste sorting must begin with the discharge of waste into Building 1 (primary sorting and weighing area) before the waste can be separated by a classifier. Subsequently, the sorted waste is transferred to Building 2 (secondary sorting) by a conveyor. A conveyor system (conveyor belt) is equipment that allows the transfer of materials.

Equipment

The main equipment planned includes, but is not limited to, the following:

- Compactor (recycling baler) – see figure xx
- Forklift
- Crusher
- 6m containers[3]

- Conveyor belt for transferring waste from Building 1 to Building 2

Figure 3: Compactor (recycling baler)

Figure 4: Forklift

Figure 5: Crusher

Budget

The indicative costs calculated for the implementation of the Project are proposed in Table 4 below:

Table 4: Budget

Item. at the	Activity	Cost (MT)
1	Technical, Financial and Environmental feasibility studies	15,000,000.00
two	Executive Project	6,000,000.00
3	Infrastructure construction	28,000,000.00
4	Equipment and consumable materials	15,000,000.00
5	Contingencies	5,000,000.00
Total (exc. Fees)		**69,000,000.00**

The costs below are indicative and have been calculated taking into account current construction costs for the proposed infrastructure and market costs for equipment and materials. However, the above costs must be confirmed within the scope of Technical, Financial and Environmental Feasibility Studies.

PART C - Licenses and Authorizations, Role and Responsibilities

The main licenses foreseen for the implementation of the waste collection and transfer center are the following:

Table 1: Licenses It isauthorizations needed The construction It isimplementation of the enterprise

Licenses	Responsible for issuing the License
Installation environmental license (for the construction phase)	Provincial Environmental Services (SPA)
Environmental operating license	Provincial Environmental Services (SPA)
Right to Use and Benefit from Land (to be obtained for thecontractor) - Municipality	Vila da Manhiça Municipal Council
Marketing license	Single Service Counter (BAÚ)
Cleaning License	Single Service Counter (BAÚ)
License in transport inrecyclable waste	Vila da Manhiça Municipal Council
Construction License	Vila da Manhiça Municipal Council
Exporter certificate, in case of export of the final product	Ministry of Industry and Commerce through BAÚ

PART D: Main risks and measures

The table below presents the main risks to be managed during the construction and operation phase of a recyclable collection and transfer center.

Table 1: Risks and management measures during the construction phase of the project

Risk	Management measures
Road/aviation accidents (run overs, crashes, collisions between vehicles, rollover)	▪ Hire certified drivers and equipment operators with proven experience. ▪ Set maximum speed limit. ▪ Establish frequent traffic safety awareness programs
Occurrence of work accidents (burns, ablation, falls, posture problems, bruises, muscle strains, etc.)	▪ Flammable substances must be kept in a place protected from heat and any source of ignition, in areas with restricted access and with signs prohibiting smoking. ▪ Do not use sharp tools to probe underground electrical cables. ▪ Training and training at different levels on the handling of dangerous substances, equipment and materials must be guaranteed. ▪ Whenever possible, training on providing first aid and identifying the person responsible for providing first aid should be carried out. ▪ Implementation of a code of conduct (prohibition of the use or consumption of alcohol, drugs or other substances, illegal actions, irresponsible behavior and lack of care in the workplace). ▪ Workers must have personal protective equipment (PPE) appropriate to their activities and the main associated risks. ▪ Workers must be trained to properly maintain PPE, cleaning dirty ones and replacing damaged ones (the employer must assign). ▪ Ensure the organization of materials or equipment so that they do not present risks to the worker. ▪ Arrangement of materials and equipment in an orderly manner. ▪ There should be no people under suspended loads.

Risk	Management measures
	▪ Ensure the availability of combat equipment to fire in strategic areas.
Exposure to intense noise	▪ Training and awareness programs about the risks arising from prolonged noise. ▪ Acquisition of equipment with low noise levels whenever possible. ▪ Distribute protective equipment appropriate to the risk. ▪ Ensure supervision.
Exposure to dangerous substances	▪ The use of chemical products should be avoided without proper monitoring/training by specialists. ▪ If necessary for their use, the safety of deliveries of dangerous substances, storage, transport, use and disposal must be controlled. ▪ Ensure the supply of PPE suitable for the task and the product to be handled. ▪ Train handlers on the chemical product safety data sheet that presents precautions and rules for transportation, storage, and actions to be taken in case of accident, etc.

Table 2: Risks and management measures during the operation phase of the project

Scratchs	Measurements
Contamination of solo during O packaging w aste	• Design handling and storage facilities with an impermeable floor with double containment

Mixing hazardous waste with non-hazardous recyclables	• Provision of a waste separation site after entry • Implementation of a color code by the generator (eg bags identified with colored ribbons for each type) and within installation in containers/containers

Scratchs	Measurements
	storage
Risks of incidents resulting in injuries due to exposure and contact of waste by part ofneighboring communities	• Construction of a fence • Access control (entrances and exits
Risks of occupational incidents during handling waste	• Flammable substances must be kept in a place protected from heat and any source of ignition, in areas with restricted access and with signs prohibiting smoking. • Do not use sharp tools to probe underground electrical cables. • Training and training at different levels on the handling of dangerous substances, equipment and materials must be guaranteed. • Whenever possible, training on providing first aid and identifying the person responsible for providing first aid should be carried out. • Implementation of a code of conduct (prohibition of the use or consumption of alcohol, drugs or other substances, illegal actions, irresponsible behavior and lack of care in the workplace). • Workers must have personal protective equipment (PPE)

Scratchs	Measurements
	appropriate to its activities and the main associated risks. • Workers must be trained to properly maintain PPE, cleaning dirty ones and replacing damaged ones (the employer must assign). • Ensure the organization of materials or equipment so that they do not present risks to the worker. • Arrangement of materials and equipment in an orderly manner. • There should be no people under suspended loads. • Ensure the availability of fire-fighting equipment in strategic areas.
Risks of accidents involving solid waste transport vehicles	• Placing in signaling at the enclosure of installation • Setting speed limits inside and outside the facility • Training It is awareness aboutdefensive driving •
Noise caused by equipment (foo tcompressors, conveyor belts, etc.)	• Training and awareness programs about the risks arising from prolonged noise. • Acquisition of equipment with basses

Scratchs	Measurements
	noise levels whenever possible. • To distribute equipment in protectionappropriate for the risk. • Ensure supervision.

Annex 6 – Data Collection Form on Urban Solid Waste Management in Municipalities

REPUBLIC OF MOZAMBIQUE
MINISTRY OF LAND, ENVIRONMENT AND RURAL DEVELOPMENT
NATIONAL ENVIRONMENT DIRECTORATE

Data Collection Form on Urban Solid Waste Management in Municipalities

(Month xx – Month yy of Year zz)

Maputo, Month xx of Year xx

Data Collection Form on Urban Solid Waste Management in Municipalities

I Section – General data

1) Name of Municipality: Vila da Manhiça Municipal Council
2) Contact of the technician responsible for filling out the form:

Full name:

Function :

Email:

Telephone:

Address:

General data about the Municipality

3) Indicate the names of the neighborhoods and their population:

4) What are the main economic activities carried out in the Municipality?

☐ Agriculture
☐ Fishing
☐ Industry
☐ Business
☐ Tourism
☐ Others (mention)_____

II Section – Organizational structure, legal and financial aspects

5) Indicate the name of the Council responsible for the Urban Solid Waste Management area and the name of the Councilor:

6) Indicate the name of the Department responsible for the Urban Waste Management area and the name of the Director:

7) Indicate the name of the Service responsible for the Urban Solid Waste Management area and the name of the Head of Service:

8) Indicate the number of personnel belonging to the Urban Solid Waste Management area:

Number of decision-makers (Councillor, Directors, Chiefs):

Number of technical personnel:

Number of administrative staff (secretaries, servants, etc.): Total

number of staff:

9) With reference to the personnel who belong to the Urban Solid Waste Management area, indicate how many are permanent and how many are occasional:

Number of effective staff:

Number of possible personnel:

10) Indicate the number of employees who belong to the Urban Solid Waste Management area by level of education:

11)

School level	Number of employees
Higher level	
Middle level	
Basic level	
Elementary level	
No schooling	
Total	

12) Does the Municipality have a training plan for staff in the Urban Solid Waste Management sector?

☐ Yes☐No

13) Does the Municipality provide medical and medication assistance to personnel in the Urban Solid Waste Management sector?

☐ Yes☐No

14) Does the Municipality have partners that work in the area of Urban Solid Waste Management?

☐ Yes☐No

15) If yes, indicate the name of the Municipality's partner organization, the area of activity and the period of execution of the project.

	Name of the project	**Name from the partner**	**Areas of action**	**Period in execution of the project**
Project$_1$				
Project$_{two}$				
Project$_3$				
Project$_4$				
Project$_5$				

16) Does the Municipality have a civic education plan in the area of Urban Solid Waste Management?

☐ Yes ☐No

17) How is civic education carried out?

☐ Radio☐Television
☐ Newspapers☐Megaphone
☐ Door to door☐Speeches
☐ Others:Practical Exercises

18) In what year was the Code of Municipal Posture?

19) Is there a regulation or strategic document for the management of Urban Solid Waste?

☐ Yes ☐NoIf yes, mention:

20) Exist one flat in Management in Urban solid waste?

☐ Yes ☐ XNo

20) With reference to the Urban Solid Waste Management plan, indicate the date of approval, the year of the last update and the name of the entity/project that prepared it:

	Approval	**Update**	**Entity/Project**
	0	0	0

21) They exist tax employees specifically in the Urban Solid Waste Management sector?

☐ Yes ☐No

22) If yes, indicate the number:

23) Summarize the financial situation of the Urban Solid Waste Management sector, with reference toannual dataof the previous fiscal year (January-December):

Annual Revenues	**Meticais**
Amount collected through collection of garbage fees	
Amount collected resulting from special collection service	
Amount collected by depositing in the trash/landfill	
Amount collected by fines	
Others (Mention)	
Total revenue	
Annual Expenses	**Meticais**
Personnel – Salary and allowances	
Fuels and lubricants	
Vehicle maintenance	
Acquisition of cleaning and personal protective equipment	
Acquisition of means of transport	
Acquisition of materials for packaging	
Expenses for hiring the collection/cleaning service	
Civic education campaigns and training in the area of waste urban solids	
Others (Mention)	
Total Expenses	
	Meticais
Total budget allocated by the municipality to the urban solid waste management sector	

24) With reference to the garbage fee, indicate what percentage of the total fee is charged monthly by Electricidade de Moçambique:

Value in percentage_

25) Is there a differentiation in the waste rate?

☐ Yes ☐No

26) If not, indicate the monthly fee amount charged_____

27) If yes, indicate the monthly fee amount to be paid by family, commercial and industrial unit: Other

fees (indicate the type of fee and amount charged):

III Section – Characterization, collection, treatment and disposal ofUrban solid waste

28) Is waste management in the Municipality carried out by an autonomous service?

☐ Yes ☐No

If Yes, indicate O name from the company what render O service autonomous

_____

29) Already Were studies or campaigns carried out to weigh and characterize waste in the Municipality?

☐ Yes ☐No

30) Is there information regarding the study or weighing campaign?

☐ Yes ☐No

31) If yes, fill in the table below:

Waste categories	Composition in percentage (%)
Organic material	
Plastic	
Glass	
Paper card	
Metal	
Fabric/Rubber	
Others	

Total	

32) How many neighborhoods are covered by collection services?

Number of neighborhoods covered:

33) How many solid waste storage points are there in the municipality? Number of solid waste storage points:

34) Indicate the daily amount of urban solid waste produced in the Municipality:

Type of municipal solid waste	Production per day (ton/day)	Production per day (%)
Household waste		
Commercial waste		
Market and holiday waste		
Green waste		
Construction Waste		
Sweep Residue		
Total RSU		
RS equated to urban		
Uncontaminated RS Hospitals		
RS Non-hazardous industrial		
Other non-hazardous waste		
Total		

35) Indicate the type and number of containers available for storing solid waste:

Container type	Quantities
Small containers (100-220 liters)	
1.1 m3 containers	
3 m3 containers	
6 m3 containers	
9m3 containers	
12 m3 containers	
Fixed trailers	
Silos	
Others (specify)	
Total containers	

36) Is there a defined and duly approved collection plan?

☐ Yes ☐No

37) Indicate the frequency of collection of Urban Solid Waste per week:

☐ 1 time
☐ 2 times
☐ More than 3 times

38) Is there Solid Waste collection in difficult-to-access neighborhoods?

☐ Yes ☐No

39) Which Are the following means used for collection in difficult-to-access neighborhoods?

☐ Tchovas
☐ Hand truck
☐ Animal traction
☐ Others (mention): Tractor, Truck

40) Who Do you collect urban solid waste in difficult-to-reach neighborhoods?
☐ County
☐ Associations
☐ Microenterprises
☐ Others (mention)_____

41) Is selective collection carried out in the Municipality?
☐ Yes, carried out by the Municipality
☐ Yes, carried out by associations
☐ Yes, carried out by private companies
☐ Yes, carried out by others (mention)_____
☐ No

42) What types of waste are selectively collected?

☐ Paper
☐ Plastic
☐ Glass
☐ Metal
☐ Others (mention)_____

43) Indicate how many tonnes per month of waste are treated using the following methods:

Type of treatment	Ton/month
Recycling	
Composting	
Others	

Total	

44) Where does the final disposal of waste take place?

☐ Landfill
☐ Controlled landfill
☐ Bin

45) For each final disposal site, provide the following information:

	Area (Ha)	**Amount in wastedeposited (ton/day)**	**Operation start date**
Landfill			
Controlled landfill			
Bin			

46) For each final disposal site in the Municipality, provide the following information, marking the applicable options:

	Seal	**Currently operational**	**Have a closure plan**
Landfill			
Controlled landfill			
Bin			

47) Indicate the year of closure of the following

locations: Recycle Bin:

Controlled landfill_____

Landfill_____

48) Is there a waste sorting center in the Municipality?

☐ Yes ☐No

49) Exist land identified for the construction of a sanitary or controlled landfill?

☐ Yes☐No

50) If yes, indicate the studies that were carried out for the construction of the

landfill: Study 1:_____

Study 2:_____

51) Are there private companies involved in Urban Solid Waste Management operations?

☐ YesXNo

52) If yes, indicate the number and area of activity by type of entity involved in MSRM operations:

	Number	**Area of activity**
Private company		
Association		
Cooperative		

53) To the Are private companies operating in the area of Urban Solid Waste Management licensed?

☐ Yes☐No

54) If Yes, who licensed to the companies?
_____

55) Are there informal scavenging phenomena, whether on the streets or in trash cans?

☐ Yes☐No

IV Section – Materials, Equipment and infrastructure

56) Indicate the quantities of materials used in collection and sweeping:

Type of Materials	**Amount**
Gloves	
Uniforms	
Caps	
Boots	
Masks	
Brooms	
Hoes	
Shovels	
Wheelbarrows	
Scythes	
Forks	
Rakes	
Others	
Total	

57) Indicate the number of vehicles available for the collection of Urban Solid Waste:

Vehicle type	Available Potential		Paralysed		Year of manufacture of vehicles	Capacity (m3)	Total vehicles
	In circulation	Under repair	Broken	No recovery			
Compactor							
Skip loader							
Roll on - Roll off							
Tippers							
Open box							
Tractor							
Shovel Loader							
Bulldozer							
Others							
Total							

58) Indicate how many vehicles are owned by the Municipality, how many are owned by operators and how many are rented:

Vehicle type	**Municipal Property**	**Private Operator Ownership**	**Rented**
Compactor			
Skip loader			
Roll on - Roll off			
Tippers			
Open box			
Tractor			
Loader			
Bulldozer			
Others			
Total			

59) Does the solid waste sector have its own infrastructure?

☐ Yes ☐No

60) If yes, what type of infrastructure does it have?

☐ car park

☐ Fuel filling station
☐ Workshop
☐ Others (mention)_____

61) Additional relevant information about the sector?
Training of employees every 3 months within 1 year, distribution of fresh milk daily, increase of working material

Filled by: The person responsible for the waste sector:

Date

Annex 7 – Daily Record Sheet for the Collection of Urban Solid Waste

Municipal Council/District Government of:	**Month year:**
Registration:	**Brand/Type:**
Box volume* (m^3):	**Load capacity** (ton):**

* Box volume (m^3) = *Height x Width x Length;*
***Load capacity = Volume x Specific Weight*

Day	**Number of laps**							**Driver signature**	**Observations (indicate incidents, reason for non-availability, etc.)**
	1	**two**	**3**	**4**	**5**	**6**	**7**		
1									
two									
3									
4									
5									
6									
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TOTAL (laps/month):							**AVERAGE (laps/day):**		
							AVERAGE (m^3/day):		
							AVERAGE (ton/day)		

Annex 8 – Registration Form in the Municipal Waste Bin/Landfill

Bin keeper's signature:_____ Date:___/___/_____

Arrival time	Vehicle identification					Origin of Waste	Estimated compositio n[1]	Volume[two]			
	Entity responsible for transport	Driver's name	Registration	Type[3]	Driver's signature			1/4	1/2	3/4	full

Grades

1) . First the waste in greater quantities, for example: green waste, rubble, urban waste…etc.

Types of waste		
1. Greens (branches, leaves, garden cuttings | , etc.)	2. Urban (cans, plastics, glass)	3. Industrial
4. Stones and construction debris		5. Scraps	
6. Equipment waste. electrical and electronic	s (computers, TV, radios…etc.)		

two) . Volume transported by the vehicle by visual inspection (or indication by the driver in the case of a compactor truck)

3). Vehicle type identification

1. Large truck (7 to 12 tons)	2. Medium van (up to 4 tons)	3. Small van (up to 1 ton)	4. Compactor Truck
5. Container ship			

Received by:	Receipt date:			
_____	// _____			
Head of services/sector				

Annex 9 – Collection Point Inspection Record

Type

A: Silo on the floor

B: Whole drum (200 liters)

C: Drum cut in half (100 liters) D:

Container (_____liters)

E: Point on the

floor F: Bags

G: Other (indicate:_____)

state conservation

B:G o o d

F:Bored/Broken

Survey date (day(s)/month/year) (_____/_____/_____)

No.	Type	Neighborhood	Location (indicate landmarks or important information)	conservation state

Annex 10 – Equipment Inventory Model

				Municipal Council of Vila de Boane						
Responsible Council							**Councilor's name**			
Name of the person responsible							**Signature**			
Review date										
At the.	**Year of Acquisition**	**Type**	**Brand**	**Model**	**At the. Chassis**	**No.Engine**	**Power/Capacity**	**No. Tires**	**Current Status (date)**	**Type of Breakdown**

Annex 10 – Attendance List for the Public Consultation Meeting of the Vila da Manhiça Integrated Solid Waste Management Plan (02.06.2023) and Photographic Images of the Meeting

RESTAURANTE E BAR COSTA RICA E SALAO DE EVENTOS
RELACAO NORMAL DOS PARTICIPANTES DO SEMINARIO

SOBRE

Duracao do Seminario ..... / ..... / ..... a ..... / ..... / .....

N°	Nome Completo	Presencas 1°	2°	3°	4°	5°	6°	Proveniencia	Contacto	Assinatura	Obrigacoes
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RESTAURANTE BAR E SALAO DE EVENTOS COSTA RICA
NUIT. 300 259 510

RESTAURANTE E BAR COSTA RICA E SALAO DE EVENTOS
RELACAO NORMAL DOS PARTICIPANTES DO SEMINARIO

SOBRE

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RESTAURANTE E BAR COSTA RICA E SALAO DE EVENTOS
RELACAO NORMAL DOS PARTICIPANTES DO SEMINARIO

SOBRE

54	Vicente	Rachide							A. Ldo Mondlane	848923627		
55	Guilherme	Muaule							A.M.V.M	846034969		
56	Armando	Muiacega							Chifuntatuine	840179429		
57	Albertino	Carlos Rafael							Aeródromo	842869438	[signature]	
58	Abilio	Xerinda							Galaus	852931773		
59	Anledio	Florentino Chiau							Ribuungua	840409970		
60	Alexandre	Alberto Manhiça							Baluguane	846719422		
61	Sebastião	Serafim Bece							Bafucuana	848349659		
62	Celestino	Nhantumbo							Wenela	842307981		
63	Carlote	José Mahoarela							Mitilene	845775603		
64	Idalina	Armando Cheiane							M-central	848160269		
65	Tiambo	James Pedro							SDEJT-Manh	865004545		
66	Lizi	Alberto Sumbe							Manhiça Sede	844633763	Secretária	
67	Felecidade	Ngubo							Manhiça-Sede		Líder	
68	Alberto	Chichava								879912997		
69									Nhamadri			
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RESTAURANTE E BAR COSTA RICA E SALAO DE EVENTOS
RELACAO NORMAL DOS PARTICIPANTES DO SEMINARIO

02.06.2023
Local Manhiça

SOBRE Reunião de Auscultação Pública do PGIRSU Manhiça

Duracao do Seminario ..../......................../................,a................../................../..................

N°	Nome Completo	Presencas 1°	2°	3°	4°	5°	6°	Proveniencia	Contacto	Assinatura	Obrigacoes
1.	Tercia da Sagrada							CAVM	875537150	[signature]	
2	Leonor Ana Banda Lisboa							CAVM	844033290	[signature]	
3	Catarina dos Olavos							CAVM	867151080	[signature]	
4	Albertina Tomule							CAVM	874184789	[signature]	
5	José Baptista Manu							CMVM	845326685	[signature]	
6	Julita Tobias M. Cossa							A.MVM	844961079	[signature]	
7	Simão J. Cutsele							Loc. Maciana	844751352	[signature]	
8	Domingos Nhoungo							AMVM	878764811	[signature]	
10	Justino Zita							Chungana	840439644	[signature]	
11	Leonor António							Pheyngana	847443143	[signature]	
12	Alfredo Mamuguele							Mulembja	871194331	[signature]	
13	Felisiano Rachide							Cimento	846730532	[signature]	
14	Marta R. Nhantumbo							Maciana	857402923	[signature]	
15	[illegible]							Wenela	844091837	[signature]	
16	Marta da Nea Mbebe							M. Central	844166641	[signature]	
17	Helena Ezequiel Chochane							C. Tladeule	845000071	[signature]	
18	Isabel A. Muchanga							C. Madeule	844329352	[signature]	
19	Constantino [illegible]							Nhafutane	845478895	[signature]	
20	Germano Matusse							Ribjene	844793309	[signature]	
21	João Sicane Dimande							Mitilene	845855400	[signature]	
22	Angelo Samissone Cossa							Bofi	842377008	Cossa	
23	Marina Arminda							Cambeve	844940310		
24	Rui Ernesto Hoinuane							Bambene	844022414	[signature]	
25											

RESTAURANTE BAR E SALÃO DE EVENTOS COSTA RICA
NUIT 300 259 510