INTEGRATED SOLID WASTE MANAGEMENT PLAN URBAN (PGIRSU) - VILA BOANE AUTARCHY

BOANE VILLAGE MUNICIPAL COUNCIL

Final version

Prepared by:

SOLARIS
Soluções & Serviços

Datasheet

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Responsible for Preparation:	Solaris Soluções & Serviços Lda
Authors:	Iris Viviana Dimene Hermenegildo Ali Américo
Review and Approval	Vila de Boane Municipal Council
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Glossary

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 de Boane.

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 de Boane 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
AL	Local Authorities
AIA	Environmental Impact Assessment
AM	city Council
ANAMM	National Association of Municipalities of Mozambique
ANE	National Highway Administration
CFM	Mozambique Railways
CMVB	Vila de Boane 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
LOL	Solid Waste

Acronym	Meaning
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

1. Introduction

The rapid urbanization of the Municipality of Vila de Boane, combined with the economic development of the Municipality, is accompanied by challenges in the management of urban solid waste, due to the increasing increase in waste generation, as well as the diversification of waste generated, making integrated waste management crucial. urban solid waste more effective and sustainable.

The PGRSU constitutes 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 strengthening of political commitment, participation and collaboration of the main public, private and civil society actors (citizens, companies, non-governmental organizations and other interested parties) to guide efficient and effective waste management practices in the Municipality.

The current PGIRSU responds to the requirements established in 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 Urban Solid Waste Management Plan for the Municipality of Vila de Boane is presented.

This document constitutes the update of the Urban Solid Waste Integrated Management Plan (2020-2025) prepared by the Municipal Council of

Boane Village. The current PGIRSU of the Municipality of Boane is valid for a period of five years (2023-2027).

1.1 PGIRSU objectives

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:

- Carry out a review of the Integrated Urban Solid Waste Management Plan of the Municipality of Boane (2020-2025);
- Align the PGIRSU of the Municipality of Boane with the guidelines, strategies, goals and programs currently defined in the regulations;
- Develop tools to facilitate the Municipality 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 PGIRSU implementation.

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]

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);

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

- 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 providing services for waste management operations, and v) Expenses with studies and other costs were analyzed. .

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 de Boane 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, 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 Boane 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 Preparation Working Group of the Municipality of Boane

At the.	Name	Institution	Department /
1	Alberto Refo	CMVB	Head of the Dept. County
two	Filipe Ricardo Bila	CMVB	Councilor Health
3	Gerson Elias Xerinda	CMVB	Head of Health Services
4	Olívio Joaquim Macuacua	CMVB	Urbanization Council
5	Simon Zonguene	CMVB	Human Resources Council
6	Vaz Victor Massinga	CMVB	Infrastructure Council
7	Jerónimo Joao Mazuze	CMVB	Council Economic Activities
8	Antonio Salvador	CMVB	Department of Finance
9	Casimiro Bonifácio Chongo	Civil society	Representative of the Central Market Commission
10	Fernando Augusto	Non-Governmental Organization – Ukula Association	Representative of the Ukula Association
11	Francisco Maquintane	CMVB	Private operator

The working group identified other actors and interested parties with regard to different areas of domain and interest in urban solid waste management. A list of actors and interested parties was thus compiled, as well as proposed levels of engagement and frequency. This list and engagement proposal is included in Annex 1 of this Plan. It must be regularly updated by the Municipal Council to allow new actors and interested parties to be duly identified, registered and consequently engaged on the Municipality's urban solid waste management issues.

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 bibliographic data collection 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/working groups, Municipal managers with the aim of collecting general and specific information about GRSU. Similarly, a questionnaire was prepared for external actors, including private operators operating in the Vila de Boane Municipal Authority.

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 of public institutions and services.

b) 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 developed and shared with the Municipal Council and working group (Annex 2).

3. Public Hearing

A public consultation meeting on the Integrated Urban Solid Waste Management Plan of the Municipality was held on June 8, 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 de Boane. 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, prepared by the team of consultants with the support of the work team formed by the Municipal Council and other actors, under the coordination of the team from the National Directorate of the Environment (DINAB), from 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, under the leadership of the Councilor responsible for Health. The meeting had 53 participants, 20 women and 23 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 Annex 11. The same annex presents some photographed images.

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.
- The need to outsource waste collection services
- The need for awareness campaigns
- The need to monitor compliance with the Plan's objectives and disseminate

During the meeting, additional data was provided that considerably changed the results of the Report, these mainly include the number of containers and collection frequency. The current document was revised considering the update provided during the public consultation meeting.

4. General Context and Administrative Division

The Municipality of Vila de Boane, headquarters of the district of the same name, is located on the left bank of the Umbeluzi River. The Village of Boane is located in the South of the Province of Maputo and Southwest of the City of Maputo between latitude 26˚ 02´ 36" South and Longitude 32˚ 19´ 36" East, presenting the following geographical limits: North the Administrative Post of Matola-Rio, through the towns of Xitevele and Macombe, to the South by the Movene and Umbeluzi rivers, to the East by the Umbeluzi river and the town of Beluluane and to the West by the Movene river.

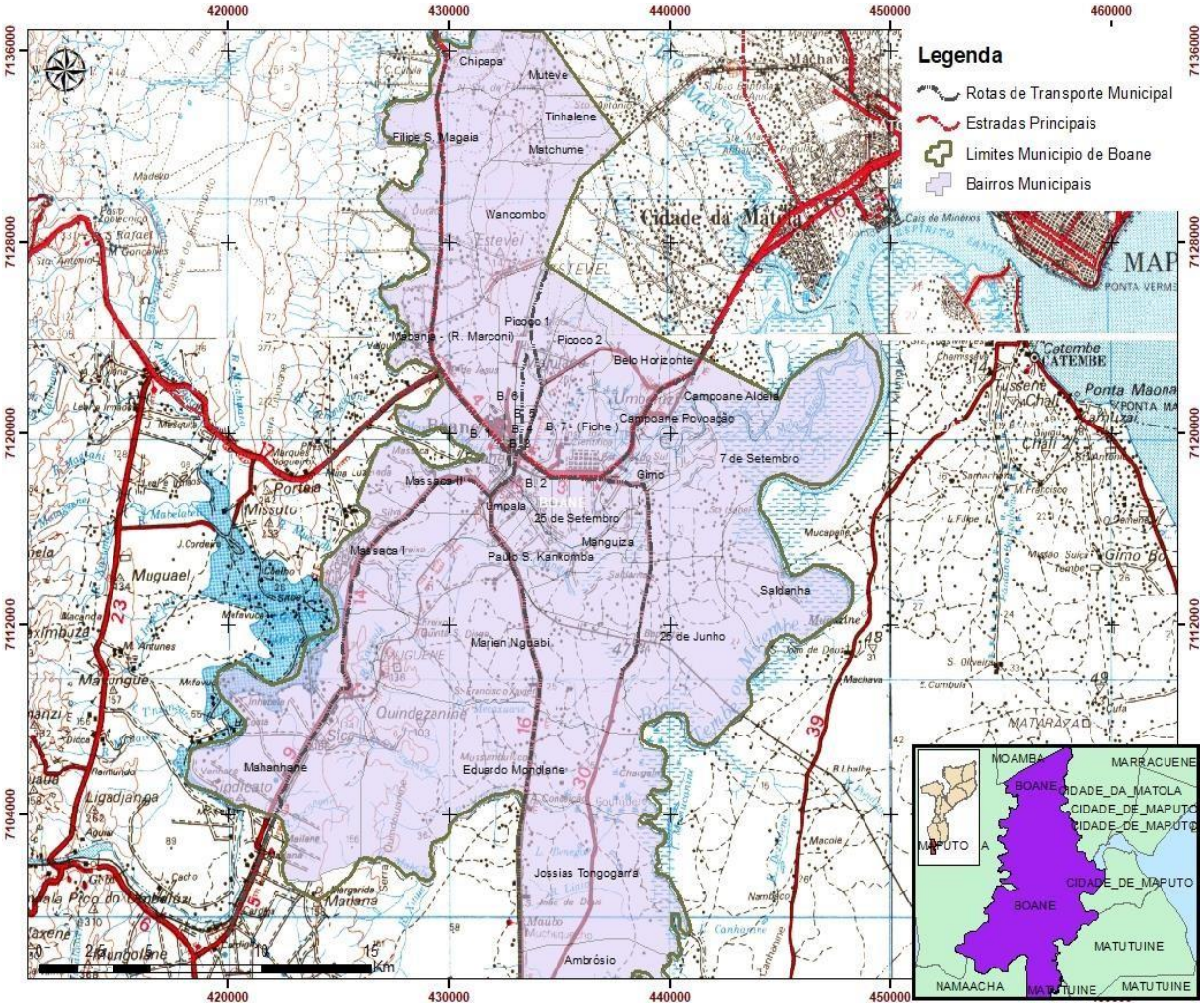

Figure 2– Geographical setting of Vila de Boane

According to its Administrative division, Vila de Boane is structured into Neighborhoods, Localities, Towns and Villages. The Localities are part of Neighborhoods,

Towns and Villages. Thus, the Municipality of Boane has 33 Neighborhoods integrated into two Localities, namely the localities of Gueguegue and Eduardo Mondlane.

According to reports during the basic data collection phase, it was found that there is a growing demand for housing in Vila de Boane, which results in changes in land use in agricultural areas or uninhabited areas with vegetation cover. , housing areas, portraying a growing trend of urban expansion in this village (see**Figure 3**). This urban growth naturally accompanies the increase in waste generation and the creation of new waste production centers.

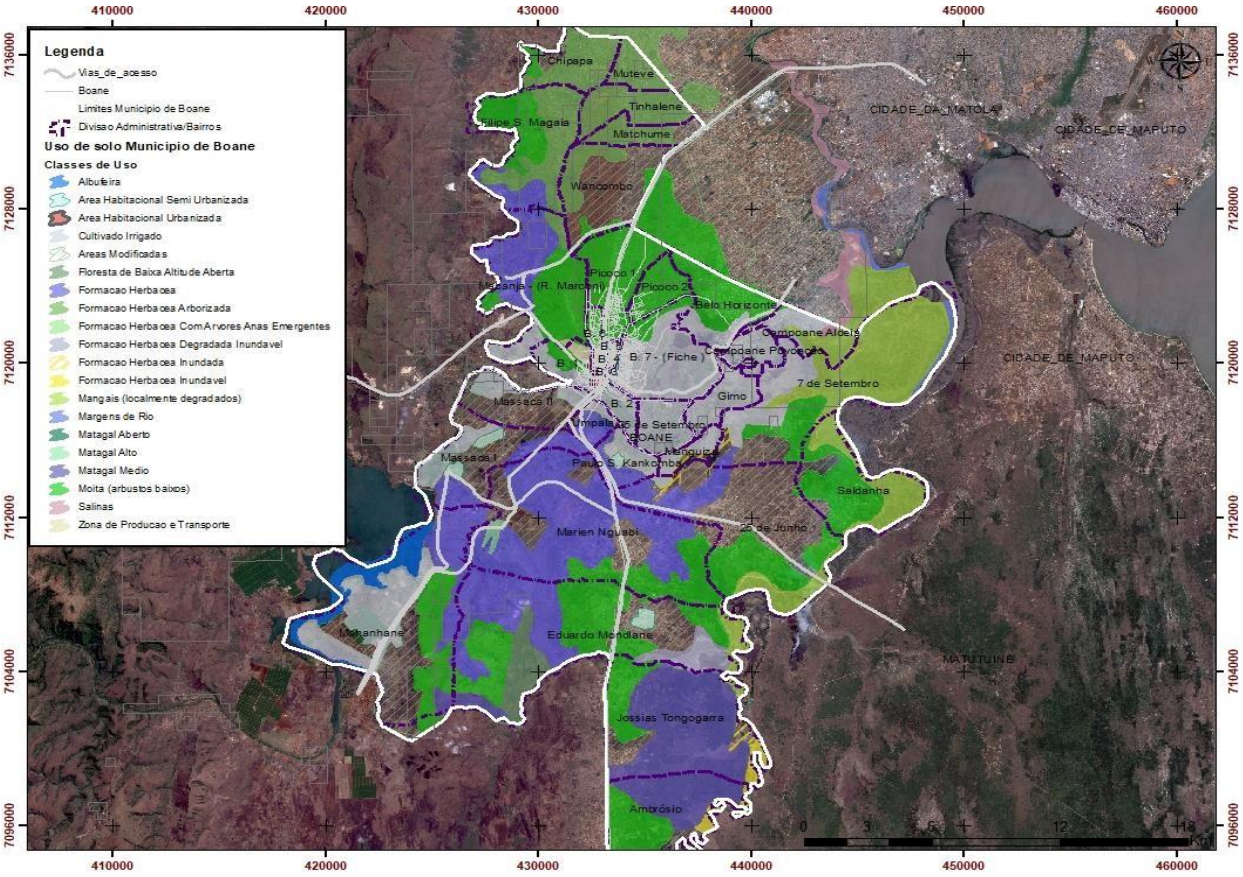

Figure 3– Current land use in the Municipality of Boane

Throughout the neighborhoods of Paulo Samuel Khamkomba, main village, Eduardo Mondlane and Massaca I and II, modified areas predominate, corresponding to areas of expanding housing/urban construction and so-called semi-urban/suburban housing areas. Therefore, rapid urbanization, the growth of

neighborhoods without any basic services, notable internal migration flows are factors that contribute to this expansion, challenging the public administration to face new realities, particularly new MSWM strategies. In parallel to this, Boane, due to its edaphic-climatic condition, has soils with agricultural and livestock potential that are exploited by a vast private and family agricultural fabric, highlighting cultivated fields, herbaceous and wooded formations and small bushes throughout the Marien Ngoabi Neighborhoods, 25 de Junho and Jossias Tongongarra.

5. Municipal Characterization

The town of Boane is recognized for its great agricultural potential and is a hub for attracting investment in the province of Maputo, and is the second gateway from abroad, either from Swaziland with the entrances to Namaacha and Goba or from South Africa with entrances in Ressano Garcia and Ponta de Ouro.

5.1 Demographic description

According to the official census of 20072, the Municipality of Vila de Boane had a total population of 76,139 spread across its 34 neighborhoods (**Table 2**). Currently, with a surface area of 597 km2, the Municipality is home to a population of 114,546 according to the 2017 census (INE, 2017).

Table 2: Administrative Division of the Municipality of Vila de Boane

Administrative Post	**Location**	**Towns/Villages/Neighborhoods**
Municipality of Vila de Boane	Gueguegue	Neighborhoods: 1,2,3,4,5,6,7 and Belo Horizonte; Villages: Picoco1, Picoco2, Mukhombo, Tinhalene, Muteve, Matchume, Rádio Marcone, Chipapa, Campoane, Filipe.S. Magaia; Villages: 25 de Setembro and Campoane.
	SubTotal 1	20
	Eduardo Mondlane	Villages: Eduardo Mondlane, Marien Ngoaby, 25 de Junho, Jossias Tongogarra, 7 de Setembro, Ambrosio, Gimo, Saldanha, Umpala, Manguiza and Mahanhana; Villages: Massaca I, Massaca II and Paulo.S.Kamkomba
	SubTotal 2	14

The following table 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 (2023-2027) and a broader horizon until 2030 The projections were calculated based on the Maputo Province's average population growth rate of 3%. A**Figure 4** demonstrates population growth during the reference period.

Table 3: Population Projection of the Municipality of Vila de Boane

Year	Number of inhabitants
2017 (INE)	**114546**
2018	117982
2019	121522
2020	125168
2021	128923
2022	**132790**
2023	**136774**
2024	**140877**
2025	**145103**
2026	**149457**
2027	**153940**
2028	158558
2029	163315
2030	168215

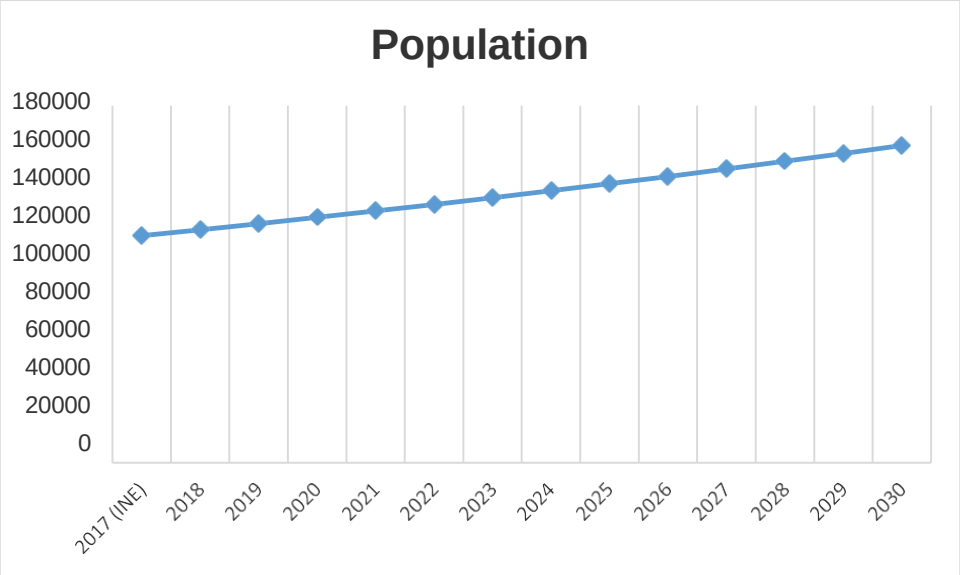

Figure 4: Projection of demographic growth in the Municipality of Vila de Boane

The table below provides population data by neighborhood and occupation areas, based on data provided by the Vila de Boane Municipal Council.

Table 4: Population data by neighborhood and occupation areas[3]

At the.	Location	Neighborhood	Pop/2021	Area (Km2)
1	Eduardo Mondlane	Eduardo Mondlane	3926	63.15
two	Gueguegue	tineene	2064	9.39
3	Gueguegue	Matchume	1500	5.75
4	Gueguegue	Filipe S. Magaia	2371	23.98
5	Gueguegue	Mabanja - (R. Marconi)	3739	27.29
6	Gueguegue	Wancombo	6394	19.07
7	Gueguegue	Picoco 2	2078	5.61
8	Gueguegue	Belo Horizonte	3001	12.51
9	Gueguegue	Campoane Village	8485	7.52
10	Gueguegue	Campoane Povoação	4698	4.63
11	Gueguegue	B. 7 - (File)	3793	18.53

[3]*Data provided by the Municipal Council of Vila de Boane*

At the.	Location	Neighborhood	Pop/2021	Area (Km2)
12	Gueguegue	B.1	4944	5.44
13	Eduardo Mondlane	Massaca II	3282	11.90
14	Eduardo Mondlane	Umpala	12848	3.58
15	Eduardo Mondlane	Gimo	2157	6.78
16	Eduardo Mondlane	September 7th	2486	46.65
17	Gueguegue	September 25th	3514	6.55
18	Eduardo Mondlane	Hose	370	3.58
19	Eduardo Mondlane	Paulo S. Kankomba	4040	6.19
20	Eduardo Mondlane	Massaca I	6389	19.46
21	Eduardo Mondlane	Mahanhane	4502	56.26
22	Eduardo Mondlane	Saldanha	1435	20.33
23	Eduardo Mondlane	June 25th	3514	45.47
24	Eduardo Mondlane	Marien Nguabi	6565	58.80
25	Eduardo Mondlane	Ambrosio	3213	26.93
26	Eduardo Mondlane	Jossias Tongogarra	4287	38.46
27	Gueguegue	Chipapa	2120	10.32
28	Gueguegue	Muted	2740	4.52
29	Gueguegue	B.3	2828	0.26
30	Gueguegue	B.6	8548	2.10
31	Gueguegue	B.4	3391	0.44
32	Gueguegue	B.5	2106	0.60
33	Gueguegue	B.2	3913	3.68
34	Gueguegue	Picoco 1	2860	13.65

Population growth throughout the Municipality is notable, according to projection data, population distribution and expansion tends to be concentrated in semi-urban or suburban areas of medium density (**Figure 6**). Data

vector files (Shapfiles) belonging to the Health Council point to two deactivated dumps, namely: Old dump located in Bairro Massaca 1 and Dump in the District Government mediation, specifically in Bairro Gimo.

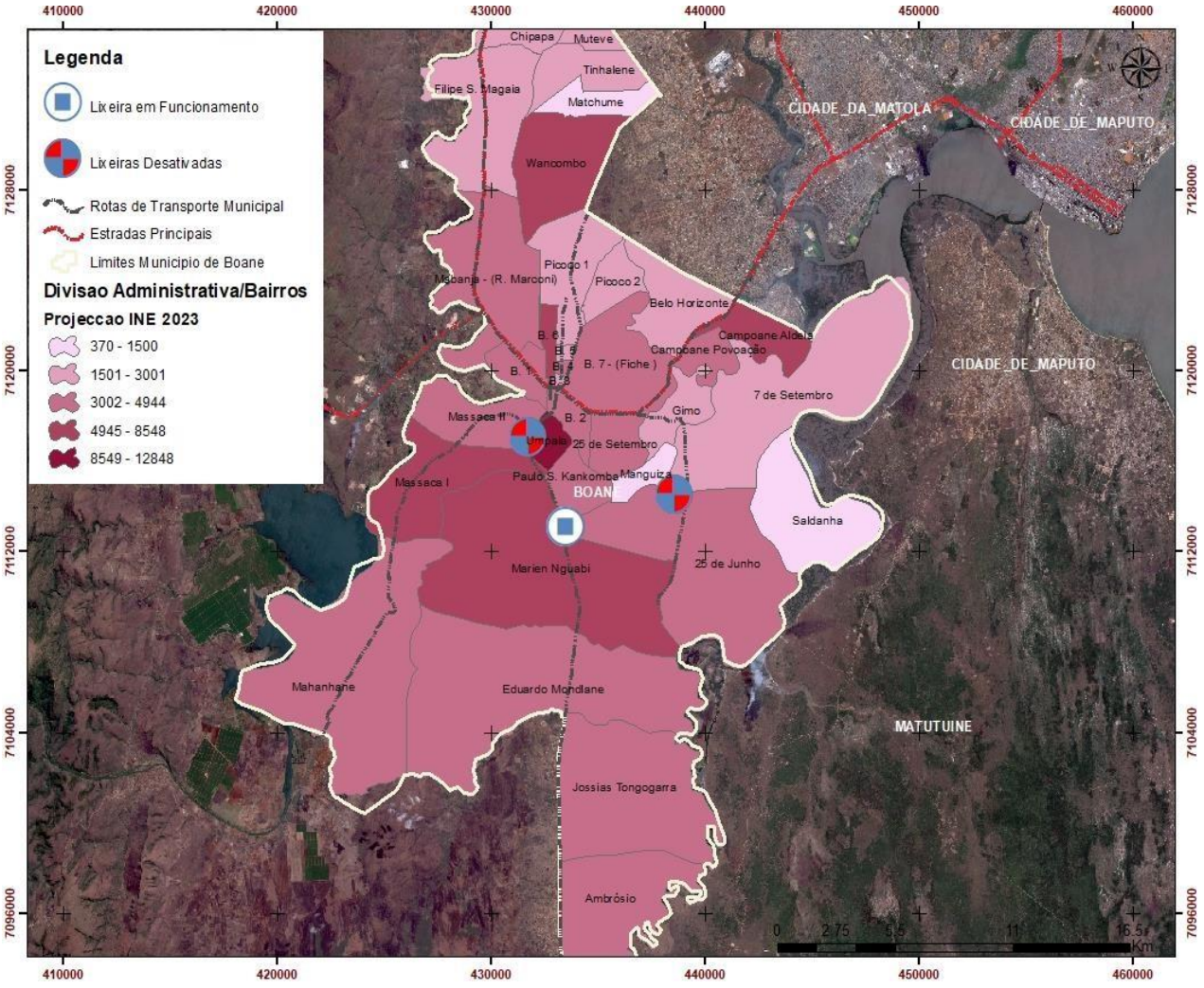

Figure 5: Population growth by municipal neighborhoods and allocation of MSW disposal sites

5.2 Urban description

The Municipality of Vila de Boane comprises areas with very different urbanization and land use characteristics. 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 3 main categories (see**Table 5)**.

Table 5: Urban Categories of the Municipality of Vila de Boane

Urban category	Road network	Land use and coverage
urbanized center	Main (EN2)-Main trunk / Road Stem	Residential / services
Suburban medium density	Trunk and secondary roads	Residential/informal commerce
Low-density suburban and rural	Third/secondary	Cultivation areas/villages

Source: ANE

The map on**Figure 6** Below, it presents the classification of neighborhoods in the different urban categories.

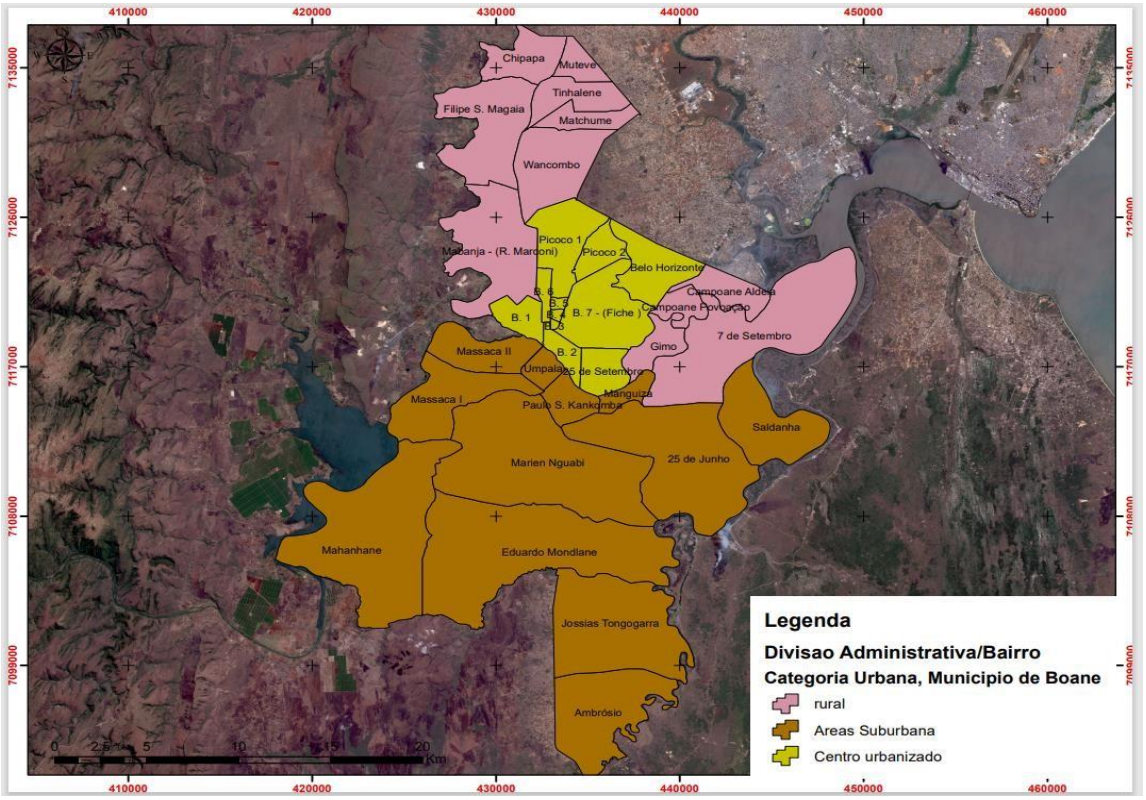

Figure 6: Urban Categories in the Municipality of Vila de Boane

According to the National Road Administration (ANE), national roads are classified into 3 categories, namely: main/primary, secondary and tertiary roads. According to the urban categorization defined in the**Table 5** above, main, secondary and tertiary roads are identified in the municipality, clarify that this classification is only applied to the road system

national. For urban roads, the classification is based on 3 categories, namely Main Trunk, Trunk and Secondary (**Figure 7**).

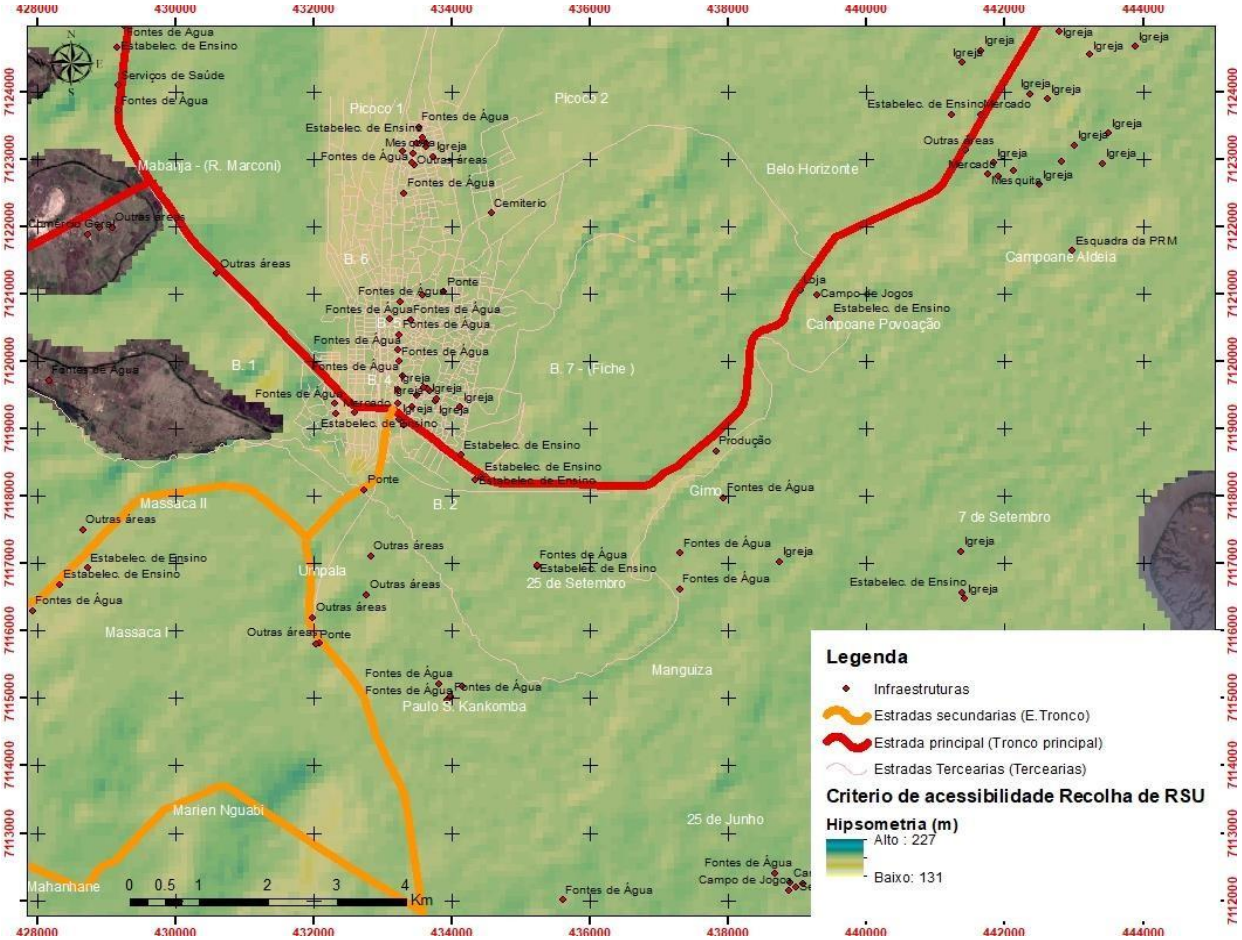

Figure 7: Access in the Neighborhoods of the Municipality of Boane

In the Municipality, the road network is classified as main (9%), secondary (3%) and tertiary (88%). The primary network is made up of the EN1 and EN200 that cross the town of Boane. Of the 9% of main roads, only 8% are paved. This basically corresponds to EN200 Moamba-Boane-Ponta de Ouro and Goba-Boane-Matola (PEU, 2019).

The secondary network connects the interior of the town to the urban center. These roads are not paved, that is, they are graded. The tertiary road network makes up the bulk of the roads. These connect neighborhoods to each other and to the urban center. Of these roads, only 1% are paved and the remaining 87% are unpaved and difficult to access for motorized vehicles, particularly during the season.

rainy. As a corollary of the city's structure, most motorized traffic occurs basically on primary roads (PEU, 2019).

In Boane, the largest volume of urban traffic (aggregated to all modes of transport) occurs along the EN200 and EN2. On the EN200, the highest traffic is recorded on the section between the town of Vila de Boane towards the city of Matola. On Estrada Nacional 2 (EN2), the highest traffic is recorded on the section between Bairro Umpala and the main town of Boane.

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 two (EN2), commonly known as Avenida de Namaacha. The streets within the neighborhoods, most of which are not paved but made of dirt, offer access conditions for MSW removal vehicles, with free spaces for placing containers. The urbanized center corresponds to almost 70% of the cement neighborhood and corresponds to neighborhoods 1 to 7 and the Belo Horizonte neighborhood.

Figure 8: Urbanized center of the Municipality of Boane

5.2.2 Medium-density suburban areas

Suburban areas are made up of well-organized formal and informal settlement zones with a high population and housing density4, and some access is particularly difficult or restricted in some neighborhoods.

Suburban areas of medium to rural density correspond mainly to parts of the neighborhoods 25 de Setembro, Picoco, Massaca 1 and 2, Marein Nguambi, Eduardo Mondlane, Campoane Aldeia.

Figure 9: Medium density suburban center of the Municipality of Boane

5.2.3 Low-density suburban to 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 neighborhoods of Rádio Marconi, Muteve,

[4]No reference values are presented for housing density (in inhabitants/km^{two}) for this case, the density being defined through the key conditions for GRSU (access, open spaces, etc.)

Umpala and a part of Campoane Povoação. Rural areas represent a large part of the surface of the municipality of Boane.

In these areas the population density is very low. These are the entire neighborhoods of Matchume, Tinhalene, Wacombo, Fulie Samuel Magaia, Chipapa, 25 de Junho, Djimo, Ambrósio, Jossien, Tongogara, Manguiza, Paulo Samuel Kamkomba, Saldanha, Mahanhane, 7 de Setembro, a good part of the neighborhoods by Eduardo Mondlane, Marien Nguambi, Picoco and Campoane Povoação.

Figure 10: Rural area of the Municipality of Boane[5]

5.2.4 Summary of commercial activity

Around 70% of the population of Boane lives based on agriculture as their main source of subsistence. To obtain income, they dedicate themselves to the production of vegetables, fruits, production of fruit tree nurseries, breeding of small species of animals, as well as the development of micro-sized industries, such as shipyards for construction materials. (PEU,2019).

The distribution of commercial activities and services in the municipality is mainly concentrated in the central area of the city, in neighborhoods 1, 2 and 3 and on the outskirts

[5]*The green lines constitute the boundaries of the neighborhoods*

in the Massaca and Campoane Aldeia neighborhoods, but there are also markets in other neighborhoods with substantial dimensions that represent a potential waste producer (PGIRSU,2020).

Table xx below presents statistics on economic activities in the Municipality. (PGIRSU Boane, 2020).

Table 6: Commercial Activity Indicators[6]

Type of Institution	Number
Trades	
Shops and other points of sale (stalls, grocery stores, warehouses, hardware, etc.)	985
Provision of services (welding, hairdressing, tailoring, workshops, offices, etc.)	515
Hotels Restaurants and guesthouses	51
Industries	
diverse industry	32
Total Commerce and Industries	1586
Markets (8 markets)	
Total Mercados (Stands and Stalls)	674
Public and Private Institutions	
Schools	16
Hospitals and health centers	10
State Institutions (CMVB, District Services, etc.)	6
Total Institutions	2289

[6]*Data extracted from the PGIRSU of Vila de Boane prepared in 2020. The 2020 data (PGIRSU Boane. 2020) are considered as reference.*

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 Boane 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 will be 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 Boane prepares 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; Guarantee 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.

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 Urban Solid Waste Management Strategy 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 activities in the short, medium and long term for the different GIRSU components - 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; - It also prohibits the free distribution of plastic bags.

Legislation	Description
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 Resolution 9/87 of April 25th of the Council of Ministers, Vila de Boane was elevated to the category of Municipality in May 2013, classifying itself according to the same instrument, as a Category “D” City. This category corresponds to municipalities that play an important role in local development as small cities.

The administrative structure of the Municipality of Vila de Boane comprises:

a) Executive body

b) Technical and administrative bodies (territorial administrative units, technical and administrative services and collective consultations).

The Municipality’s executive bodies comprise:

a) The President of the Municipal Council

b) The Municipal Council (councillors and others).

The Municipality of Vila de Boane is territorially organized into two localities, these subdivided by 34 Municipal neighborhoods. Administrative localities are headed by Municipal Locality Chiefs, appointed by the President of the Municipal Council. Neighborhoods are managed by a Neighborhood Secretary, chosen by the respective population and recognized by the President of the Municipal Council.

The Technical and Administrative Services of the Municipality of Vila de Boane have the following composition:

a) Office of the President of the Municipal Council

b) Municipal Secretary

c) Secretary

d) Administrative Locations

e) Municipal Police

f) Acquisition Management and Execution Unit

g) Administration and Finance Council

h) Economic Activities Council

i) Markets and Fairs Council

j) Infrastructure Council

k) Urbanization and Environment Council

l) Transport, Communications and Traffic Council

m) Council for Health, Cemeteries, Gardens, Sports and Social Action

n) Municipal Sections

o) Municipal Transport Company of Boane.

6.2.1 Postures and regulations for GRSUs

In the proposed Municipal Code of Posture (not yet approved by the Municipal Assembly) the following points from chapter II (Hygiene and Health) can be highlighted:

- Prohibition of disposing of solid waste outside the places and standards provided for this purpose (Article 20);
- Application of a municipal tax to all residents to cover the costs of collecting and processing RS (Article 31);
- Competence of the Municipal Council services for the removal and treatment of domestic, industrial and commercial solid waste in general (Article 14.1);
- The producer is responsible for properly collecting and transporting the MSW produced (Article 22.3)
- Domestic RS must be packed in CM containers, users' own containers or plastic bags (Article 26.1);
- Obligation for commercial and industrial RS to be deposited in specific containers purchased and maintained by users (Article 20.1.e);

- Schedules for depositing domestic RS containers: Not yet defined by the Municipal Council, and collection by the CMVB is carried out from 6 am to 2 pm (article 26.);
- Fines ranging between 500 Mt and 5,000 Mt for infractions, depending on their degree of severity.

6.2.2 Strategic Aspects

Currently, a PGIRSU approved in 2020 by the Municipal Assembly is being implemented. An Operational Plan for Urban Solid Waste Management was also approved subsequent to the PGIRSU of 2020.

The Urban Structure Plan is under review and although this document, by its nature, does not focus on MSW aspects, it is of great relevance for the preparation and review of PGIRSU and for the management of waste collection services , having as one of the main foundations the definition of the management strategy for territorial planning criteria.

The following projects implemented in recent years were identified, with relevance to GRSU:

- The PROSIGRSU project (Project for the Reinforcement of the Integrated GRSU System), carried out by the MTA with the support of the LVIA organization, aimed to facilitate the systematization of information relating to GRSU in the Municipalities, in order to comply with the obligation to send annual information for the MTA. The project includes in particular capacity building activities for Municipalities in matters of MSRM and the implementation of an electronic information system, based on a form template for sending to the MTA (systematized information on quantities of RS, management processes - collection, transport, recovery and deposition -, human resources, finance, etc.);
- Restructuring of the RSULVIA management system financed by the European Union;
- Social Integration Network (RISC);

- Project carried out by WaterAid
- Projects implemented by the non-governmental organization Ukula[7]:
    - Lisima Lavu Bassissa Project, which means “importance of hygiene” (2016-2019)
    - Project "You with ours The neighborhoods” LVA),implemented in the period (consortium between 2018-2021

The projects implemented in partnership with the Ukula association involved the following activities:

- Acquisition of tractors for waste collection
- Training a local company in solid waste collection
- Primary waste collection in Neighborhoods 7, 2 and 1 using txovas and application of a collection rate of 100 Mt per month per family. The collection reached a peak of 1000 homes.

6.3 Institutional organization related to GRSUs

6.3.1 Responsibilities of Municipal Councils

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).

[7] *Association that operates in the area of environment and sanitation with a strong focus on vulnerable groups including women and children*

Legislation	Responsibility / Powers of the Municipal Council
Finance Law and PatrimonyMunicipal - Law no. 11/97 of May 31st	- 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.
Regulation on Urban Solid Waste Management (Decree no. 94/2014 of December 31st)	<u>Competencies (Article 5)</u> - 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). <u>Obligations (Articles 6, 8)</u> - 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).

Source: PGIRSU Boane, 2020

According to the CMVB's organic statute, the Municipal Solid Waste Management Section (which is part of the Health, Cemeteries, Gardens and Parks Council) is responsible for cleaning public roads and collecting MSW. This council is responsible for the following, with relevance to GRSU:

- Prepare and ensure the execution of the council's periodic and annual activity plans and budgets, as well as the preparation of the respective executive reports;
- Clean streets and public spaces, as well as remove solid waste;
- Participate in inspection and management operations of toxic products and waste;
- Manage vehicles, machines and other equipment in the Health Department;
- Produce periodic reports on compliance with the council's activity plan;
- Maintain the filing system and prepare maps of the effectiveness of staff assigned to the Council and send them to the Human Resources section.

This council, through the Cleaning, Water and Sanitation Section, has the following powers:

- Manage all cleaning material and equipment assigned to the section (Cleaning, Water and Sanitation),
- Ensure the cleanliness of the Village,
- Manage vehicles and other equipment,
- Survey the needs for protective material for cleaning staff and ensure sanitary conditions,
- Provide items and utensils necessary for cleaning activities,

- Coordinate and plan with the Workshops and Automobiles and Equipment Section the maintenance and repair of vehicles, engines and others and ensure their supervision,
- Ensure permanent and impeccable work of public cleaning, collection and transportation of solid waste, including that produced and accumulated in markets,
- Promote the production, commercialization and use of containers for packaging and collecting waste,
- Participate in the monitoring of public compliance with conservation and public hygiene standards and the observation of mandatory garbage disposal times,
- Manage and promote the maintenance of municipal waste bins,
- Participate in selection, classification and possible recycling or transformation of solid waste,
- Participate in the formulation of garbage fees,
- Carry out census and registration of users of waste collection services,
- Design and budget scrap and container removal programs on public roads, in collaboration with the Municipal Police and Inspection,
- Design, organize and promote periodic weeding, sweeping and landfilling or garbage removal campaigns by people in the respective blocks.

The sector currently has 28 workers, of which:

- 2 decision-makers (Councilman and Head of Services),
- 20 street sweepers,
- 2 tractor drivers,
- 2 container truck drivers,
- 1 dump truck driver

- 1 administrative.

The academic levels of the staff are detailed in the Table below.

Table 9: Education level of employees in the GRSU area

School level	Number of employees
Higher level	1
Middle level	two
Elementary level	25
Total	**28**

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

- The sector does not have any employee responsible for the technical aspect, and all work of this nature is under the responsibility of the Head of Services who accumulates responsibilities for all areas of the council, namely, health, cemeteries, gardens and parks, reporting to the Councilor of the area.
- There are no intermediate managers, at the level above the sweepers and drivers, there are the councilor and the head of services. Despite this, although it was a 2020 PGIRSU recommendation to review the organization chart and introduce intermediate managers.
- There are no inspectors specifically 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.
- According to data obtained during the diagnosis phase, the current hiring plan of the Council responsible for health care does not foresee an increase in staff, having already filled all the planned vacancies, which are only occupied by sweepers.
- The level of education, although low, mostly elementary, fits the organizational structure and staff. Since the

intervention, should be in the review of the council's organizational chart and hiring of qualified technicians and introduction of intermediate managers.

- The number of drivers is equivalent to the number of means. Introducing a risk of collection means being paralyzed in the event of unavailability for extraordinary reasons.

The Municipality of Boane, despite not having a training plan, has carried out awareness-raising actions and regularly engaged the main actors (licensed and unlicensed private operators, garbage collectors, local structures, market committees) to discuss issues related to solid waste management.

Although the council responsible for health care assumes primary responsibility for the management of MSW in the Municipality, it is important to highlight that efficient management of MSW requires joint efforts and coordination between the various sectors in the Municipality, taking into account the different areas of intervention of each sector and role. , fundamentally, in the solid waste management services provided by the Municipal Council. A**Table 10**, presents a summary of the competencies of each sector/council relevant to the management of urban solid waste.

Table 10: Competencies of Councils and Sections of the Boane Municipal Council and their Responsibilities in GRSU

Sector/Council/Section ão/Local structures	General Skills	Skills relevant to GRSU
Municipal Police	• Ensure the implementation of decisions by municipal bodies and authorities, • Monitor and ensure compliance with Municipal Regulations, Regulations and other laws in force • Application of fines	• Imposition of regulation internal It is posturesrelated to solid waste management • Application of fines for non-compliance with the stance regarding GRSU
Localities and Municipal Neighborhoods	• Mobilize the population to actively participate in the search for solutions to community problems • Conduct regular civic education programs • Listen and analyze complaints and complaints from citizens • Promote public meetings with communities, to collect suggestions to improve municipal services and carry out civic education • Collect taxes and fees in force in the Municipality	• Organization of awareness campaigns on solid waste management measures • Register and transmit complaints and grievances from citizens to the Municipal Council • Disseminate at the level of practical communities imposed by PGIRSU, Municipal Posture and other normative documents
Administration and Finance Council (Human Resources Section)	• Administrative management of human resources and ensuring their professional technical development • Promote the training and qualification of human resources • Organize competition processes for admission	• Development and formalization of training plans including training in GRSUs subjects • Review of the organization chart of the health area

Sector/Council/Section ão/Local structures	General Skills	Skills relevant to GRSU
	• Promotion of personnel, according to deliberations of the competent bodies of the municipality	• Contracting plans and implementation of these plans
Administration and Finance Council (Planning Accounting Section)	• Preparation of budgets for the Municipal Council • Carry out and control budget execution • Manage current expenditure funds and investment funds, ensuring their correct execution • Prepare monthly balance sheets and periodic financial reports • Prepare, on a monthly basis, local revenue accounts and funds received from the State and other institutions • Monitoring of organic units on the execution of the Activity Plan and Budget • Preparation of Balance Sheet Reports • Preparation of periodic, quarterly, semi-annual and annual reports • Preparation of activity plans and annual budgets • Coordinate and schedule the planning and review stages of the activity plan and budget and ensure compliance with established deadlines	• Preparation of health budgets for the GRSUs component • Control and documentation of expenditure in the healthcare sector • Monitoring of GRSU actions and goals that appear in the activity plans of the different councils • Support in the review of activity plans, ensuring the integration of GRSUs actions into the activity plans of the different councils and ensuring that they are properly budgeted • Support in the development of project proposals and programs related to GRSUs.

Sector/Council/Secção/Local structures	General Skills	Skills relevant to GRSU
	• Design proposals for specific economic, social and environmental development programs for the municipality's areas	
Administration and Finance Council (Revenue Section)	• Collect fixed and occasional revenues under the terms regulated by law, regulations and other municipal deliberations or decisions • Collect public and private service fees by the various sectors of the Municipal Council • Examine licensing application processes • Systematically update the register of licensing processes that giveentry into the Municipal Council • Propose decentralization of more services depending on user demand • Organize the user database • Ensure inter-institutional coordination, especially with public and private institutions in the area under its jurisdiction • Manage processes that enter the revenue unit and ensure compliance with legally established deadlines	• Support in the survey of potential users of GRSUs • Collection of fees associated with GRSUs • Maintain the user database • Define and implement joint collection strategies (ie license fee for commercial activity charged together with the garbage collection fee)
Administration Council and	• Ensure the updating of the Municipal Council's movable and immovable property register	• Maintain inventory of vehicles, materials and equipment used in sweeping and collecting MSW

Sector/Council/Section ão/Local structures	General Skills	Skills relevant to GRSU
Finance (Heritage Section)	• Carry out annual and periodic inventory and assessment of movable and immovable assets • Monitor price developments in the markets • Maintain stocks of materials necessary to ensure the continuous functioning of the Authority	• Support the health department in estimating costs and expenses associated with GRSUs
Economic Activities Council	• Ensure the registration of economic activities at the level of the Municipality • Systematize statistical data on economic activities • Ensure the dissemination and correct implementation of the Code of Posture by local economic operators • Participate in the inspection of commercial, industrial and tourist units to be licensed	• Maintain and share with the health department the register of economic activities • Identify synergies with the health department in order to alert about new processes, facilities and commercial, industrial and tourist units, disseminate requirements related to GRSUs to these operators.
Urbanization and Environment Council	• Supervise the presence and combat the use of risk areas • Control full compliance with the Municipality's Urban Structure Plan • Issue certificates and titles for land use and benefit • Monitor urban growth and the emergence of new infrastructure • Design environmental rehabilitation programs and guide their implementation	• Share data and information with the health section on territorial planning, expansion areas to allow priorities to be identified in the allocation of containers and the Municipal Council's MSW collection services • Monitor compliance with easements in landfills during the DUAT acquisition process until its implementation

Sector/Council/Section ão/Local structures	General Skills	Skills relevant to GRSU
	• Design environmental education and awareness programs at all levels • Promote the creation of environmental groups and associations • Promote the planning and execution of programs to evict protected areas, as well as their supervision to prevent new occupations in coordination with other specialized sectors • Coordinate environmental management actions with different institutions • Ensure environmental education and awareness programs	• Synergies with the health sector in the design and organization of environmental education and awareness programs
Infrastructure council	• Coordinate and monitor the maintenance, conservation and rehabilitation activities of all municipal council assets • Ensure the maintenance and repair of urban access roads • Promote and evaluate environmental impact studies on all enterprises whose activity may, in some way, constitute a potential danger to public health and the environmental quality of the Municipality • Carry out environmental monitoring and inspection, including the handling of toxic products and waste • Promote the development and implementation of environmental education programs	• Coordination with the activity sector during the prioritization of road repair and maintenance actions taking into account access for waste collection • Carrying out land regularization interventions in landfills • Synergies with the health sector in the design and organization of environmental education and awareness programs

Sector/Council/Sectionão/Local structures	General Skills	Skills relevant to GRSU
	• Train activists and sanitation centers in schools, markets, near water sources and in other convenient locations	
Council for Education, Culture, Youth, Sports and Social Action	• Promote cultural events such as shows and entertainment • Promotion of shows nationwide	• Coordinate extraordinary waste collection at major events and shows
Markets and Fairs Council	• Ensure the organization of markets and fairs • Creation and maintenance of the markets and fairs database • Ensure the maintenance, hygiene and conservation of markets • Ensure the full organization of markets and fairs	• Coordinate cleaning activities in markets with the health sector • Raise awareness among sellers about the need to comply with waste management measures in market areas
Transport, Communication and Traffic Council	• Assign routes to semi-collective passenger transporters • Participate in public road education promotion programs • Through the Auto and Equipment Workshop Section, plan and carry out regular maintenance of the Municipal Council's vehicles, machines and other equipment • Propose the shipment of equipment or its parts for repair in specialized stores	• Support the health sector in defining routes for waste collection vehicles • Develop and maintain a routine maintenance plan and keep records of routine and extraordinary repairs carried out on the means used in GRSUs

Sector/Council/Section ão/Local structures	General Skills	Skills relevant to GRSU
	• Prepare and distribute vehicle preventive maintenance instructions to their drivers and users • Keep a daily record of the work of each vehicle, tractor or other machinery and the mileage traveled • Supervise planning and compliance with fuel and lubricant consumption • Carry out periodic planning for the purchase and storage of parts, spare parts, tires and inner tubes for vehicles and tractors • Maintain an up-to-date record of the maintenance and operating costs of each vehicle or machine • Maintain a qualified and updated inventory of all vehicles or machines	• Supervise and plan fuel consumption and lubricant use in vehicles used to collect waste • Keep a record of maintenance costs and share with the healthcare sector to support budget preparation

6.4 General findings on the organizational framework for urban solid waste management

From the analysis of the relevant organizational and legal framework for urban waste management in the Municipality of Vila de Boane, the following was found:

- At this moment, the Municipal Police is the only body with the capacity to supervise compliance with the Municipal Posture and Internal Regulations. Validating its preponderant role in the management of urban solid waste, with regard to the imposition of internal regulations and attitudes and generation of revenue through the application of fines. However, according to data and information obtained, there is no significant involvement of the Municipal Police in the application of fines related to waste management.
- There is no exchange of information or sharing of records with the Council responsible for health issues regarding fines applied for non-compliances associated with solid waste management.
- During the verification of compliance with the goals established in the PGIRSU approved in 2020, it was found that many of the actions were not fulfilled. There were several reasons that resulted in this non-compliance, one of them being the lack of resources. It is also understood that the lack of accountability for actions, between the various councils, may imply that the implementation of the Plan's actions is under the sole responsibility of the Health Sector, belonging to the Health, Cemeteries, Gardens and Parks Council. Thus, failing to implement actions whose implementation, due to the nature of the powers assigned to each council, are not completely under the control of the Health Sector.

7. Current Characterization of GIRSU

7.1 Quantity and composition of RSUs

The main types of MSW in the Municipality of Boane are the following:

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

No MSW characterization studies have yet been carried out in the Municipality of Vila de Boane. However, for reference purposes, due to similarities in habits and Municipal profile, data from the characterization study carried out in the Municipality of Vila de Manhiça were used as a reference (**Table 11**). The choice of Manhiça as a reference for the characterization of waste in Vila de Boane was reinforced by findings in the field during the preparation of the current Plan, the following being described:

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

Table 11: Composition of urban solid waste[8]

Waste categories	Composition in percentage (%)
Organic material (inc. fines)	36.94
Plastic	11.26
Glass	1.8
Paper card	8.5
Metal	8.56
Fabric/Rubber	2.56
Others	2.25
Total	**100%**

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

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/inhabitants was therefore used to estimate the volumes of domestic solid waste generated in the Municipality of Vila de Boane. A**Table 12**, provides estimates of RSD volumes generated based on population growth projections using as a reference the average growth rate for Maputo Province of 3% extracted from the 2017 population census data 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. A**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	RSD volumes (kg)	REI and RSC (Kg)	Total volume of MSW (Kg/d)
2017 (INE)	**114546**	57273	5727.3	63000
2018	117982	58991	5899.1	64890
2019	121522	60761	6076.1	66837
2020	125168	62584	6258.4	68842
2021	128923	64461	6446.1	70907
2022	132790	66395	6639.5	73035
2023	136774	68387	6838.7	75226
2024	140877	70439	7043.9	77482
2025	145103	72552	7255.2	79807
2026	149457	74728	7472.8	82201
2027	153940	76970	7697.0	84667

Year	Population	RSD volumes (kg)	REI and RSC (Kg)	Total volume of MSW (Kg/d)
2028	158558	79279	7927.9	87207
2029	163315	81658	8165.8	89823
2030	168215	84107	8410.7	92518
2031	173261	86631	8663.1	95294
2032	178459	89229	8922.9	98152

Based on the estimates presented in the Table above, it is estimated that approximately 73 tons of Urban Solid Waste (MSW) are currently generated daily in the Municipality of Vila de Boane.

7.2 Equipment for collecting and transporting urban solid waste

The Municipal Council of Vila de Boane has its own resources to collect and transport waste from points of generation and/or disposal to the place of disposal in the bin. A**Table**13 Below is a list of the means and their main characteristics.

Table 13: Means of collecting and transporting RSUs from Boane CM

Features of the medium					
Kind of equipment	Truck - Containers	Door Truck -Containers	Dump Truck	Tractor with trailer (loading manual)	Tractor with trailer (loading manual)
Equipment,brand, model registration	Nissan	Tata	*confirm with municipality*	*confirm with municipality*	*confirm with municipality*
Status (active, broken, obsolete)	Operational	Operational	Operational	Operational	Operational
Year of Acquisition	2015	2020	2020	2014	2016
Breakdown period					

Type of breakdown					
Capacity	6m container^3	6m container^3	6 tons	3.2m^3	2 m^3
Description of use					
Use (collection, urban cleaning, disposal, regularization in the trash	Collection at "collection points" with containers for disposal in the bin	Collection at "collection points" with containers for disposal in bin	Door to door collection	Loadingmanual in waste disposal sites (including deposits informal)	Loadingmanual in waste disposal sites (including deposits informal)
Collection Zone	centerUrbanized and suburban middle density	centerurbanized and medium-sized suburban density	Neighborhood of Belo- Horizonte and Campoane	Neighborhoods, 6, Massage 1 and Massaca 2	Neighborhoods, 6, Massage 1 and Massaca 3
Final destination	Waste bin Paulo Samuel Kankhomba	Waste bin Paulo Samuel Kankhomba	Waste bin Paulo Samuel Kankhomba	Waste bin Paulo Samuel Kankhomba	Waste bin Paulo Samuel Kankhomba

The mechanized means listed above are the only ones that the Municipal Council of Vila de Boane has, it should be noted that one of the tractors supports the gardening sector in collecting branches and pruning trees. In addition to the means presented in the previous Table, the Municipality has a backhoe loader that serves as support in critical areas, especially after rainy events and in the regularization (leveling, waste confinement) of the landfill site. The backhoe belongs to the council that oversees the construction area, and if necessary, it is allocated to the MSW sector (PGIRSU Boane, 2020).

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. For this purpose, you have a contract with a service provider, which is activated in the event of a breakdown. The Municipal Council does not have a routine maintenance plan or records of equipment breakdowns and repairs.

7.3 Collection of RSUs

According to the CMVB's organic statute, the Municipal Solid Waste Management Section (which is part of the Health, Cemeteries, Gardens and Parks Council) is responsible for cleaning public roads and collecting MSW. Currently, the municipality of Vila de Boane has 26 communal 6m3 containers, distributed throughout the village to facilitate disposal by residents and collection by the municipality. In addition to the aforementioned communal containers, there are also 3 1100L plastic containers, allocated to some institutions.

Due to the deficit in terms of the number of containers, there are several MSW accumulation points on the ground in some neighborhoods of the Municipality (informal deposits). Six (6) collection points designated as informal were identified distributed throughout Neighborhoods 1, 6, Massaca 1 and Massaca 2. In terms of coverage, the collection services mainly cover the central area of the Village, made up of Neighborhoods 1,2 ,3,4,5,6,7, Campoane village, Campoane village, Belo Horizonte and Massaca, and you can check the collection points (with container) highlighted on the map of**Figure 11**, below. It is important to highlight that at the time of the field visit carried out by the Consultant responsible for preparing the current plan, the available containers were 19, with 10 containers having been acquired and 3 subsequently removed. Regarding markets, all are covered by the collection.

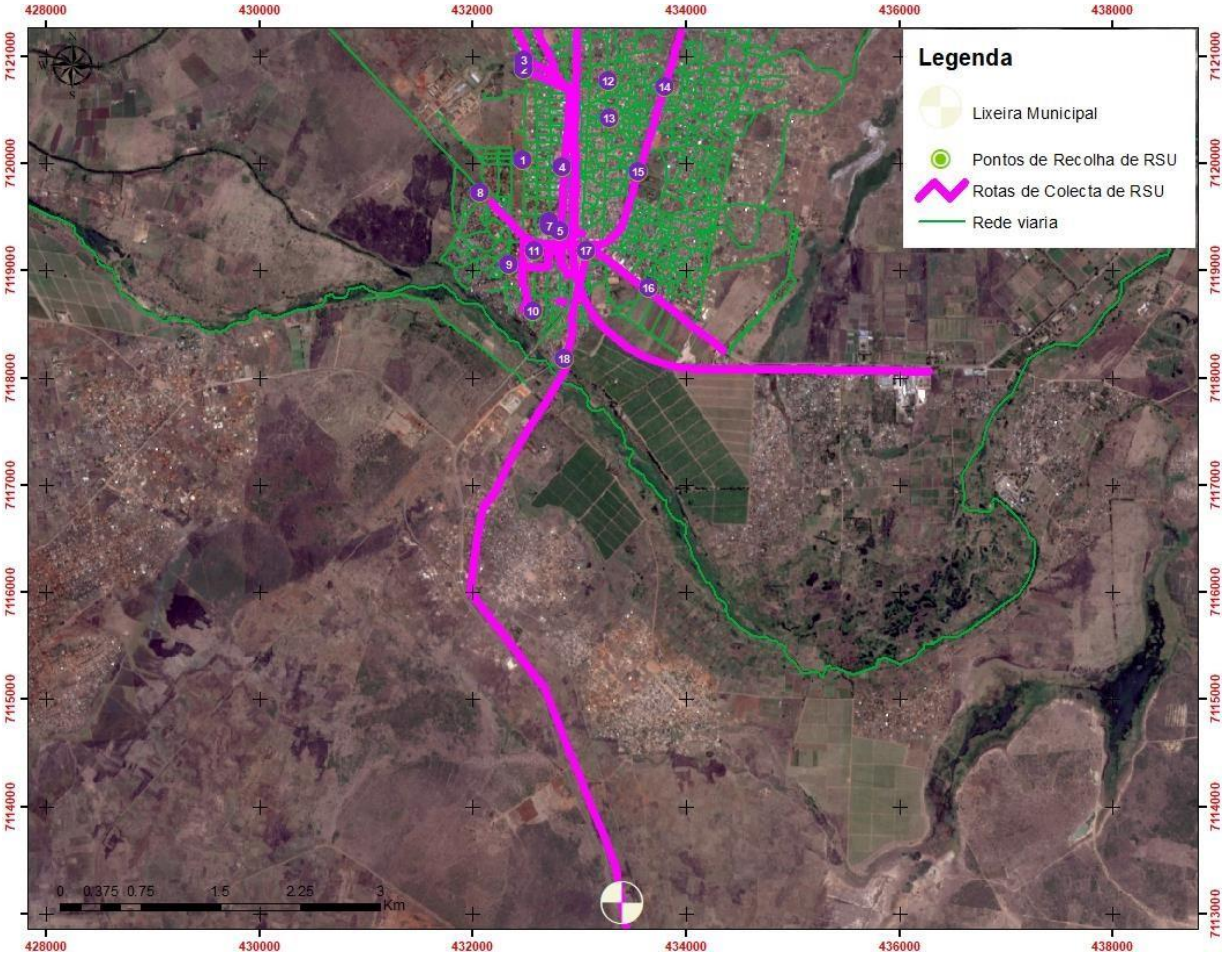

Figure 11: Distribution of communal containers and waste collection routes in Vila de Boane

The Municipality of Vila de Boane has a previously prepared Route Plan for the collection and transport of MSW, however, this is not implemented. The plan follows a certain schedule 5 times a week and the starting point for the collection of MSW is the urbanized center (cement city). In this case, it starts in Neighborhood 1, covering other nearby streets, followed by final disposal in the only functioning dumpster belonging to CMVB.

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

Table 14– Minimum time and distances traveled during MSW collection

#	Proximity order	Distance (m	Time (min)
1	18	3678	5.5
two	17	5099	7.6
3	9	5574	8.4
4	15	5731	8.6
5	8	6042	9.1
6	10	6128	9.2
7	16	6083	9.1
8	6	6344	9.5
9	4	6289	9.4
10	5	6385	9.6
11	7	6753	10.1
12	14	6811	10.2
13	3	6881	10.3
14	0	6987	10.5
15	12	7311	11.0
16	11	7658	11.5
17	13	7617	11.4
18	1	7826	11.7
19	two	7910	11.9

Door-to-door collection is carried out essentially in the neighborhoods of Belo-Horizando and Campoane using a dump truck. Door-to-door collection is also carried out by private operators who have their own equipment. It should be noted that these operators dispose of waste in the CMVB dump without assigned disposal fees and do not provide the Municipal Council with any type of data or reports on volumes deposited.

In general terms, primary collection is carried out by private operators. Five private urban solid waste management operators are licensed by the Municipal Council. And according to information obtained from the Municipal Council's health department team, there are unlicensed private operators in Vila de Boane who carry out their activities illegally. The Municipal Council, through the council responsible for

health, tried to engage informal workers to persuade them to acquire an operator's license, however, they have not yet done so.

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

Figure 12: Minimum distances between MSW collection points, Municipality of Boane

Throughout the Municipal village, the distribution of containers at some point follows a certain regularity in terms of allocation (minimum distance 100m). However, the disruption lies in the lack of replacement of damaged containers and the allocation of more in medium-density suburban/rural areas, according to the urbanization category.

The effective collection of MSW corresponds to operations that involve processes, equipment and treatment and/or final destination facilities.

7.4 Final Deposition of RSUs

The disposal of MSW is being carried out in an open dump, located in the Marien Nguambi neighborhood, at a distance of approximately 8 km from the center of the village and 22 km from the furthest point of Recolha (Campoane Aldeia). The dump covers an area of 3 hectares (PGIRSU Boane, 2020). This dump has been in operation since 2018 after the closure of the old dump in the Umpala neighborhood. The choice of location did not follow the evaluation process with the MTA to serve as a final disposal site, as specified in the Technical Directive for the Implementation and Operation of Sanitary Landfills in Mozambique.

There is no basic infrastructure at the dump, such as a guardhouse, gate, or fence. It does not have allocated guards or any other type of control. The internal space of the dump does not have any basic level of preparation (deposition spaces, access roads), the deposition of MSW is done inside a crater and in a not very organized way (it is not clearly divided into cells and is devoid of a system for surface water management). In rainy weather, access is quite slippery and the MSW is deposited at the top of the crater and is then “pushed” by the machine into the crater.

Other critical aspects related to the operational dump are associated with its location, being crossed by a high voltage line and next to the National road (**Figure 14**).

As seen in the map below (**Figure 13**), where the location of the dumpster in relation to the waste collection points is highlighted, it can be reached after traveling a minimum period of 5 km from the MSW collection points.

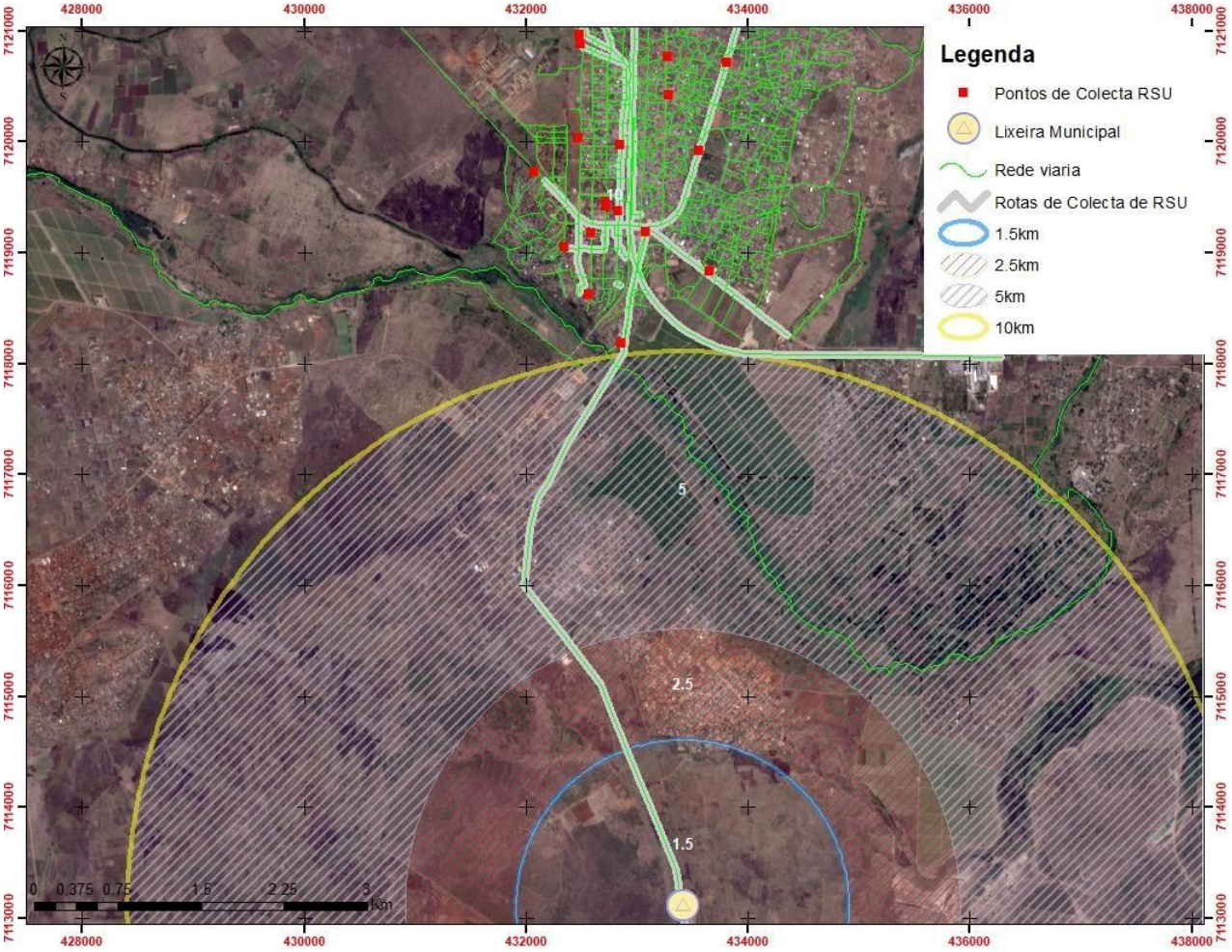

Figure 13: Minimum distances from the MSW deposition point, Municipality of Boane

Figure 14: Photos of the Paulo Samuel Kankhomba Trash

7.5 Urban Cleaning

In addition to collecting MSW, the Municipal Council also cleans roads and public spaces (sweeping), mainly covering the streets in the central area of the town.

The lack of adequate equipment for scanning, in particular for transporting the swept RS (adapted hand trucks, etc.), as well as the fact that some staff are a little older, result in low productivity. At the same time, it also results in an extreme and painful work effort, in the multiplication of small piles of RS to be collected (which end up becoming points of deposition by the population and traders).

7.6 Valorization of urban solid waste

The Municipal dump in operation covers a small number of collectors without associational ties who normally work selectively collecting MSW and sell it to the few micro-recycling companies in Maputo and intermediaries who then resell to beer production companies.

Figure 15: Selective separation at different MSW collection points

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.

7.7 Coverage of collection services and analysis of the Productivity of Waste Collection and Transport Means

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: Analysis of productivity of available MSW collection means and level of coverage of Boane CM collection services

	Medium 1 - Container Truck (1)	Medium 2 - Container Truck (2)	Dump Truck	Tractor 1	Tractor 2
Features of the medium					
Kind of equipment	Container Truck	Container Truck	Dump Truck	Tractor with trailer (manual loading)	Tractor with trailer (manual loading)
Equipment, brand, model registration	Nissan	Tata	*confirm with municipality*	*confirm with municipality*	*confirm with municipality*
Status (active, broken, obsolete)	Operational	Operational	Operational	Operational	Operational
Year of Acquisition	2015	2020	2020	2014	2016
Breakdown period					
Type of breakdown					
Capacity	6m3 container	6m3 container	6m3 container	3.2 m3	2 m3
Description of use					
Use (collection, urban cleaning, disposal, regularization in the trash	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	Manual loading at waste disposal sites (inc. informal)	Manual loading at waste disposal sites (including informal deposits)
Collection Zone	Urbanized and medium-density suburban center	Urbanized and medium-density suburban center	Belo-Horizonte and Campoane neighborhood	Neighborhoods, 6, Massaca 1 and Massaca 2	Neighborhoods, 6, Massaca 1 and Massaca 3
Final destination	Waste bin Paulo Samuel Kankhomba	Waste bin Paulo Samuel Kankhomba	Waste bin Paulo Samuel Kankhomba	Waste bin Paulo Samuel Kankhomba	Waste bin Paulo Samuel Kankhomba
Daily effort (distances, duration)					
Planned shift of operation	7:30am-3:30pm	7:30am-3:30pm	7:30am-3:30pm	7:30am-3:30pm	7:30am-3:30pm
Number of times per week	6	6	6	6	6
Number of trips to the trash can per day	8	5	1	1	1

average distance traveled per round trip (km)	14	14	14	14	14
Average distance between collection points (km)	0.5	0.5	0	1	1
Collection locations (informal and others) - applicable to tractors				10	10
Average volume collected at informal and other specific locations (kg)				200	200
Volume of Waste generated per family/household (kg) accumulated over two days - applicable to door-to-door collection			8		
Total number of residences			650		
Area occupied by each residence km			0.03		
Total distance traveled per day (km)	116	72.5	33.5	14	14
Average speeds (km/h)	40	40	40	35	35
Total travel time per day during transport (min) Subtotal 1	174	109	50	24	24
Average loading time at the collection point (min)	25	25	0.5	30	30
Average duration for container replacement (min)	15	15			
Average duration of deposition in the bin (min)	15	15			
Charging duration (C), unloading (D) and deposition (D) per location (min)	55	55	0.5	30	30
Total daily CDD duration (all locations) min - Subtotal	440	275	325	300	300
Total duration of operation (Subtotal 2)	614	384	375	324	324
Total hours worked per day (Subtotal 1 + Subtotal 2) - Hours	**10**	**6**	**6**	**5**	**5**
Working day	8	8	8	8	8

Overtime (-) worked and free hours after the operation (+) - assuming an 8H working day	-two	two	two	3	3
Collected volumes					
Medium Capacity / Box Volume (m3)	6	6	6	3.2	two
Number of containers handled per day	8	5			
Number of houses covered in door-to-door collection / number of locations by tractor			650	10	10
Average volumes produced per household (kg)/locations			8	200	200
Adopted average specific weight (ton/m3)	0.36	0.36			
Average % of loaded capacity	100	100			
Total volume of MSW collected (tons/day)	**17.3**	**10.8**	**5.2**	**2.0**	**2.0**
Guys					
No. of drivers	1	1	1	1	1
No. Of Helpers	two	two	two	two	two
Number of txova helpers	at	at	at	at	at
Total number of personnel	3	3	3	3	3
Productivity of the Environment					
Productivity - ton/hour	**1.69**	**1.69**	**0.83**	**0.37**	**0.37**

Productivity - kg/hour	**1688.60**	**1688.60**	**831.45**	**370.37**	**370.37**
Daily productivity 8H) - ton/day	**13.51**	**13.51**	**6.65**	**2.96**	**2.96**
Maximum volumes collected per day/half (m3)	**38**	**38**			
Maximum volumes collected per day (kg)			**6652**	**2963**	**2963**
Number of containers	**6**	**6**			
Maximum number of homes covered			**831**		
Collected (adjusted) volumes - no overtime					
Volume of MSW collected daily (adjusted) - ton/day	**13.51**	**10.8**	**5.2**	2.0	2.0
Number of collections weekly	**3**	**3**	3	3	3
Number of annual collections	313	313	313	313	313
Total volume collected annually (ton)	4226	3379	1627	626	626
Total volume collected annually by the Municipal Council (ton)	10483				
Estimated total volume of MSW generated (2022)	26645				
Collection service coverage (2022) (%)	**39.3**				

The lack of requirements for sharing data on volumes generated and the lack of control over volumes deposited in the operational dump make it difficult to assess the coverage of waste collection services by private operators.

However, during the preparation of the current PGIRSU, one of the private operators was interviewed, categorized by the Municipal Council as being one of the most active and which has been operating in the Municipality of Vila de Boane since 2017. It operates mainly in the neighborhoods of Campoane and Belo Horizonte, currently serving 2 tourist complexes and residences (inside and outside condominiums) in these locations. For door-to-door collection, it uses an open-top vehicle with a capacity of 3 tons. The operation is carried out with the support of 3 workers (driver and 2 helpers) who work a shift from 5am to 6pm. Collection is done 3 times a week (Monday, Wednesday and Friday). With an average of 2 trips to the trash can per day.

Based on the reports above, it is assumed that the operator collects and deposits an average of 2 tons in the bin per working day. Assuming that this volume is replicated by the 4 other licensed operators. A weekly collection by operators of approximately 30 tons is estimated, totaling 1560 tons per year by licensed private operators, resulting in an increase in the level of annual coverage of collection services in the Municipality of Boane in the order of 6%, thus increasing the annual coverage of collection services in the Municipality to approximately 46%.

The contribution of informal workers is indicative, as there is no precise data on this group of operators. It is known, however, that they operate vehicles such as low-tonnage trucks and motorbikes with trailers.

The low coverage of collection services provided by the Municipal Council is primarily associated with the following factors:

1. Low availability of communal containers to respond to the estimated daily generation volume. Currently there are 26 containers and according to calculations based on container capacities and specific weight, for the volume of MSW generated daily, they would be

35 containers are needed to guarantee the storage of MSW. Placing the Municipality in an initial condition of approximately 74% coverage based on container availability

2. Low availability of capable resources to guarantee the loading of 24 containers, taking into account the productivity of the container ships, which indicates that they have an accumulated daily capacity of 12 containers, assuming the normal working period (7:30 am- 3:30 pm).

3. 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 assumptions

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

Item	Value	Source / Justification
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 financial framework of GRSUs

As presented in Sect.6.3.1(**Table 10: Competencies of Councils and Sections of the Municipal Council of Boane and their Responsibilities at GRSU**) the Administration and Finance Council concentrates all responsibilities for the financial management of the Municipal Council, without the exception of Urban Solid Waste Management. However, a coordination relationship prevails with the Council for Health, Cemeteries, Gardens and Parks with regard to financial issues relating to GRSUs.

7.8.1 GRSU revenue structure

The Municipality has a waste collection fee system to finance GIRSU services. The fees were reviewed as part of the review of the Municipal Posture (not yet approved). Therefore, the rates in force are the rates approved in 2016.

The table below (**Table 17**) provides the framework of the current tariff structure for SURMs.

Table 17: GRSUs tariff structure

Tariff	Value/month (Mt)
Domestic	15
Commercial	45

Industrial	100

Next, the tariff proposal proposed in the revised Posture (not yet approved) is presented.

Table 18: Tariff structure for GRSUs proposed in the Revised Municipal Posture

Order no.	Producer categories	Monthly energy consumption	Monthly fee
Home Producers			
1.	Social tariff	Up to 100 kWh	15.00 MT
two.	Low consumption	Up to 200 kWh	45.00 MT
3.	Average consumption	201 – 500 kWh	60.00 MT
4.	High consumption	More than 500 kWh	80.00 MT
Non-home producers			
1.	Low consumption	Up to 100 kWh	45.00 MT
two.	Average consumption	Up to 200 kWh	80.00 MT
3.	High consumption	201 – 500 kWh	100.00 MT
Large Non-Domestic Producers			
1.	Daily production of urban solid waste up to 350kg or from 1000 liters to 1500 liters		2000.00MT
two.	Daily production of urban solid waste up to 200kg or from 500 liters to 1000 liters		1000.00MT
3.	Daily production of urban solid waste up to 150kg or from 375 liters to 500 liters		700.00MT
4.	Daily production of urban solid waste up to 100kg or from 250 liters to 375 liters		500.00MT
5.	Daily production of urban solid waste up to 25kg from 50 liters to 250 liters		250.00MT
6.	Daily production of urban solid waste up to 12.5 kg or from 25 liters to 50 liters		125.00MT
7.	Hospitals and Public Health Units		Exempt

The garbage fee is charged by EDM as provided for in the Memorandum of Understanding (MoU) signed between the Municipality and EDM. However, there are several constraints associated with this agreement between the two entities, including the following:

- High commission percentage (25%)
- Lack of transparency about the actual amounts charged
- Lack of information on the number of users charged. This aspect limits the financial planning of the MSRM sector.

- The MoU imposes limitations on decision-making by the Municipal Council on tariff reviews.

Currently, the sector's expenses are covered by the municipality's general budget and the Municipal Council's Investment Fund.

7.8.2 Record of income and expenses of GRSUs (2019-2021) and sustainability of the 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. A**Table**19 and the**Table 20** provide a summary of information provided by the City Council.

Table 19: Revenues from the MSW Sector (2019-2021)

Annual Revenues	2021	2020	2019	Average value
Amount collected through collection of garbage fees	2,710,000	0	0	903,333
Amount collected resulting from special collection service	77,814	0	0	25,938
Amount collected by depositing in the trash/landfill	3,997	85,500	45,500	44,999
Amount collected by fines	0	0	0	0
Others (Mention)	0	0	0	0
Total revenue	2,791,811	85,550	45,550	974,304

The numbers above show that the main source of revenue for the Municipality's MSW sector is the collection of garbage fees through EDM, taking the year 2021 as a reference.

Below are the average annual expenses based on expense records for the last 3 years (2019-2021).

Table 20: MSMS Sector Expenses (2019-2021)

Annual Expenses	**2021**	**2020**	**2019**	**Average of 3 years**
Guys – Wage It is subsidies	1,682,648.00	1,682,648.00Mt	1,442,648.00	1,602,648
Fuels It is lubricants	1,800,740.00	1,200,740.00	2,800,740.00	1,934,073
Vehicle maintenance	500,675.00	700,675.00	680,675.00	627,342
Acquisition of equipment cleaning and personal protection	400,322.00	400,322.00	400,322.00	400,322
Acquisition in meansi n transport	1,450,000.00Mt	3,850,000.00Mt	0	1,766,667
Acquisition of materials for the packaging	0	0	0	0
Hiring expenses of service collection/cleaning	0	0	0	0
Civic education and training campaigns in the area of solid waste urban	34,000.00	44,000.00	34,000.00	139,333
Others (Mention)	0	0	0	0
Total Expenses	6,174,385	7,878,385	5,358,385	6,470,385
Total of expensesexcluding the acquisition of means	4,724,385	4,028,385	5,358,385	**4,703,718**

The cost per ton is calculated taking as a reference the expenditure records for the year 2021, this being the year in which some of the current means began their operation. This resulted in a cost per ton of 511 Mt/ton. However, taking into account the experience of other municipalities and the need to include additional equipment maintenance measures and addition of personnel in the costs, an average cost of 600 mt per ton was considered. This cost includes vehicle maintenance expenses, purchase of fuel and lubricants, salaries and allowances for GRSU staff.

The MSRM sector is far from sustainable. Records show that the average percentage of expenditure coverage by sector revenue is 20%.

7.8.3 Fines corresponding to the health area

The Table below provides the proposal for fines corresponding to cleaning and GRSU, as proposed in the revised Posture.

Table 21: Fines proposed in the revised Posture

Article	Type of infraction	Corresponding fine
Article 20 of paragraph 2 (c)	Using equipment for purposes other than those for which it was intended (MSW depositories),	4,935.00Mt
Article 20 of paragraph 1 paragraph c)	Place domestic RS in public containers outside the stipulated time	822, 50Mt
	Deposit MSW on public roads	3,290.00Mt
Article 20 of paragraph 2 (a)	Dispose of ashes or burning charcoal in garbage containers	500.00Mt
Article 20 of paragraph 2 (b)	Destroy, damage or steal equipment as well as Burn and/or set fire to MSW containers and/or containers	500.00Mt
	Deposit MSW in quantities corresponding to large producers in public containers	3,500.00Mt
Article 20 of paragraph 1 (b)	Deposit special or dangerous solid waste in containers and/or on public roads	8,500.00Mt
Article 20 of paragraph 1 (a)	Depositing MSW outside containers and/or overfilling them	1. 750.00Mt
Article 20 of paragraph 1 d)	Remove, move or choose urban solid waste contained in MSW depositories	1. 750.00Mt
Article 20 of paragraph 1 (f)	Affixing posters, stickers or any other advertising materials to equipment without authorization from the Municipal Council	1. 750.00Mt
Article 20 of paragraph 2 d)	Collection and transportation of Domestic Solid Waste without a license for this purpose	16,450.00Mt
Article 20 of paragraph 1 paragraph e)	Place urban solid waste from large producers in public facilities	3,500.00Mt
Article 20 of paragraph 2 (e)	Failure to present the respective activity license duly updated when required by the competent authorities	6,580.00Mt

Article	Type of infraction	Corresponding fine
Article 20 of paragraph 2 Point f)	Failure to remove RSU within the stipulated deadlines	8,500.00Mt
Article 20 of paragraph 2 (g)	Deposit MSW in public containers reserved for small producers	3,500.00Mt

The imposition of fines, by nature, should not be used as a means to obtain income, but rather as a means to enforce compliance with obligations contained in regulatory instruments. On the other hand, fines, when recorded, serve to assess the degree of non-compliance with imposed obligations and serve as a contribution to decision-making on what steps to take to improve this situation. For the fines to have the described effect, joint efforts and coordinated actions between the Municipal Police and the Health Section will be necessary to intensify control over these aspects, register the fines with the necessary details on the type of infraction and sharing information and records with the Council that is responsible for GRSUs.

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 22: Fines proposed in the revised Posture

Aspect	Findings
Primary storage 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.

Aspect	Findings
	• Most traders (including markets) They do not use their own containers, resulting in the saturation of existing containers and/or the deposition of waste on the floor, making the collection process difficult for the CM.
Use of existing equipment (containers)	• Overloading of containers with waste from commercial activities, debris and others that result in damage to the containers • Some residents burn trash in containers, damaging them.
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. • In most public schools, waste is treated on school grounds (burning and burial)

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

Forces	Weaknesses
• CMVB has a PGIRSU, approved in 2020 by the Municipal Assembly and under implementation • It has private operators licensed and regularly engaged by the CMVB • Waste recovery is verified through informal collectors, however engaged by CMVB • Engagement with external actors on solid waste management issues by the CM (eg regular meetings are held with private and non-private operators, literacy activities for collectors and awareness raising among collectors) • Equipment maintenance services are outsourced • Knowledge on the part of the Municipality about existing unlicensed private operators.	• The revised stance has not yet been approved by the Municipal Assembly. • There is no sharing of data and information by private operators with the CM (records of waste generated) • GRSUs organizational structure without intermediate managers, • There are no supervisors allocated to GRSU activity • Difficulties in accessing waste collection in areas with unpaved access, especially during the rainy season (with a greater incidence in the Belo Horizonte neighborhood) • Existence of waste accumulation points on the ground in various locations in the municipality • Cleaning in municipal markets is carried out by staff allocated by the CM • The active municipal dump is not located in an appropriate location (on the side of the National Road, crossed by a high voltage line, without fence and without control) that does not comply with the criteria established by legislation (Decree 31/2018 Regulation on landfills) for location of trash cans. • Difficulties in managing the landfill by the CM (no staff allocated to control access and controlled disposal within the landfill) • Several unfulfilled objectives and targets, arising from the PGIRSUs approved in 2020 relating to Phase 1 of implementation (2.5 years from approval of the Plan) • MSWM costs exceed revenues associated with waste management • Limited number of personnel with higher education in the area of GRSUs • Failure to implement the 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 • In some areas (eg in the Massaca neighborhood where informal commerce predominates on the side of the road), waste is frequently spread on the ground. • There is no routine maintenance plan and records of equipment maintenance • Overflowing containers and waste accumulated around collection points are observed • Without a defined plan for the implementation of a sanitary landfill or actions to improve the management of existing landfills

Forces	Weaknesses
	• The operational waste bin is located in an inappropriate location that lacks supervision and control by part of the Municipality in the dumps • Lack of knowledge on the part of the Municipality about the capacity of the bin, resulting in the lack of a bin use plan and bin deactivation plan/goals • The existing PGIRSUs approved in 2020, defines actions and goals, however it does not assign specific responsibilities for each goal/action, taking into account the different internal actors (councils) and scope of intervention of each actor/council. Resulting in a lack of accountability for non-compliance with defined goals.
Opportunities	**Threats**
• Existence of an NGO (Ukula) active and with experience in implementing projects and initiatives linked to solid waste management • Primary waste collection pilot project successfully implemented by Ukula, which included the application of a collection rate different from the Garbage Tax • 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 • Use of organic waste for reuse in agriculture (composting, animal feeding)	• Existence of unregistered private operators • Closed collectors' market, controlled by a small group. Making it difficult for new collectors to enter • Reluctance on the part of collectors to provide information to the Municipal Council • Bad habits on the part of populations that deposit solid waste on the ground, instead of using containers • 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) • High incidence of poverty that leads to widespread collection of waste by informal recyclers (scavengers) • Lack of knowledge about demand in terms of recyclable waste • Lack of separation at the source of recyclable waste generation

9. Waste Management Strategy

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 review of the organizational structure proposed in the PGIRSUs of the Municipality of Boane (2020) received approval from the Municipal Assembly. However, as of the date of preparation of the current study, it has not yet been implemented. During the preparation of the current PGIRSUs, in the data collection phase, the main needs in terms of the Municipality's organizational structure were reconfirmed, which dictated the recommendation to review the organizational structure, which were:

- 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;

- Verification of the relevance of separating the sector's tasks more clearly (collection of MSW and cleaning of public roads / afforestation and gardening and green areas / maintenance and management of the rolling stock), both in terms of responsibilities and monitoring.

Therefore, the proposed review of the organization chart for GIRSU remains, as shown in the following figure (**Figure 16**) 9:

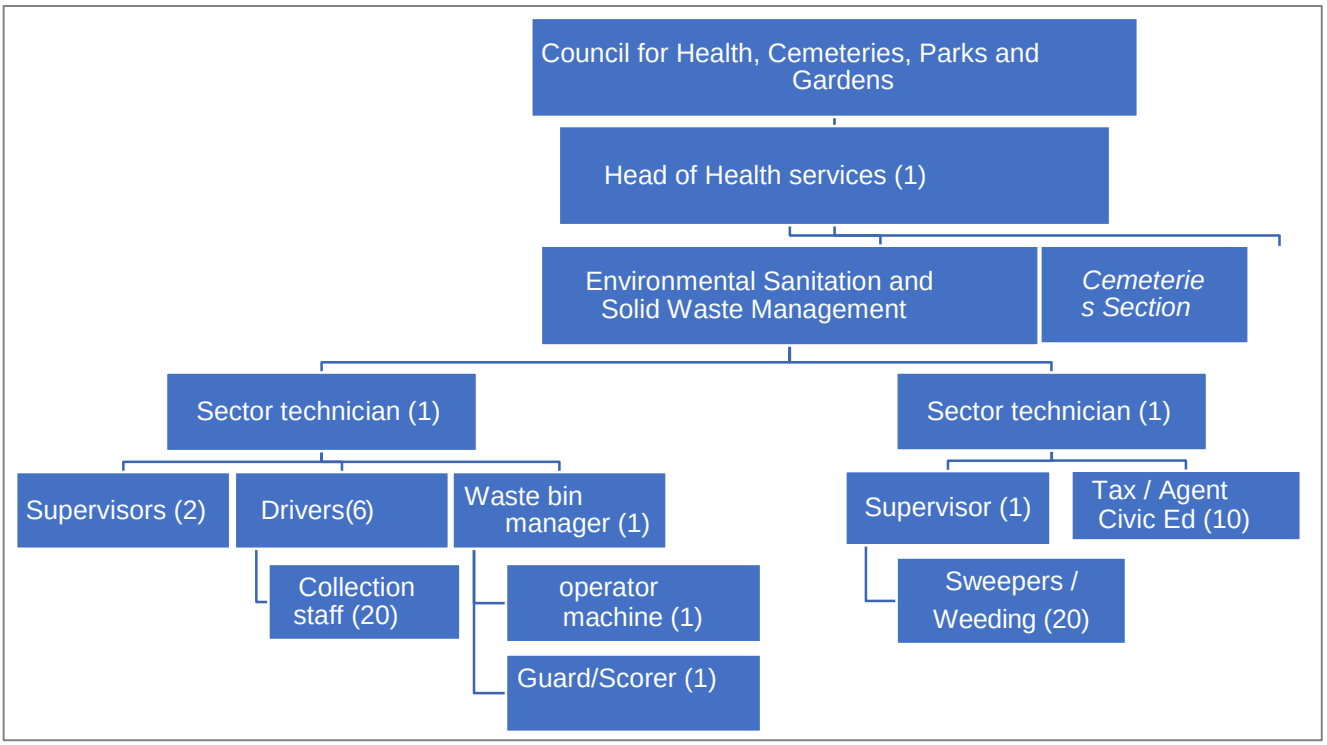

Figure 16: Proposed organizational chart review for GIRSU (PGIRSU de Boane, 2020)

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;

[9] *Indicative numbers should be progressively adjusted according to the evolution of service coverage*

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 (especially the associated specific weight);
- 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 costly in terms of 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 23: 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 (Bairro do Belo-Horizando and Campoane) - Whistle (door-to-door collection) -Equipment: dump truck
Suburban with difficult access	- System: Whistle or fixed trailer (door-to-door collection) - Equipment: Tractor with raised tailgate
Suburbanwith access	- In locations with containers - System: Collection in 6m3 communal containers - 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 - System: collection in small containers (in a first phase) - Equipment: tractor 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: Dump truck
Markets	*System 1* - At points with containers - System: Collection in 6m3 communal containers - Equipment: container truck

AREAS	SOLUTIONS/OPTIONS
	System 2 - System: fixed trailers (with raised tailgate) - Equipment: tractor
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 a time/day agreed along the road by 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 Fixed trailer system

The fixed trailer system for markets corresponds to the permanent placement of a trailer, which serves as a container for depositing RS in markets. To prevent possible theft, particularly of the wheels, a small wall can be placed around the trailer, or another similar system that prohibits access to detachable parts. The trailer full of RS is collected regularly by a tractor that immediately replaces it with another empty trailer. If the trailer is not completely full, the tractor can continue collecting at the collection points (containers) until it is full.

9.2.3 Whistle or fixed stop system

The fixed stop/whistle system consists of a containerless collection system. 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.

9.2.4 Street cleaning system

The system for cleaning the streets is made up of adapted vans, made up of drums (2) that allow the transport of large quantities of material removed from the roads, as well as small specialized equipment: “grab 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 in reducing and reusing.

9.2.5 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 24: 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 • Adequacy of collection vehicles to containers	• 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 • Develop 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.); • Recording and regular monitoring of fuel consumption.	• Preventative maintenance and records of breakdowns and repairs • Availability to be continued of fuel • 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

9.2.5.1 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 Sheet on Urban Solid Waste Management (Annex 4). 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 5) – daily record
- Registration form in the Municipal Waste Bin (Annex 6) – daily record
- Collection point inspection record (Annex 7) – monthly record
- Equipment inventories (Model provided in Annex 8) – 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 25**) presents calculations of the number of containers that are necessary for the projected production of MSW for the next 5 years. The table includes the proposal to acquire containers over a period of 5 years (2023-2028)

Table 25: Calculations of the number of containers needed

PGIRSU Implementation Phases	Year	Volume projection of MSW generated (tone)	Number of containers (6m3) necessary	Purchased containers	Total containers available	Percentageof the capacity of MSW deposited in containers
Current	2022	73	34	at	24	70%
Phase 1	2023	75	35	0	24	68%
	2024	77	36	6	30	83%
Level 2	2025	79	37	0	30	81%
	2026	82	38	6	36	94%
	2027	84	39	0	36	92%

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, as well as the availability of collection and transport vehicles and their respective productivity.

9.3.2 Dimensioning of the proposed collection system

Table 26: Collection System Sizing

PGIRSU Implementation Phases	Year	Projection ofvolumes of MSW generated (ton/day)	Total volgenerated (ton/year)	Total containers available	Vehicles (doorcontainers)	Schedule (proposed shift)	capacitydaily in containers no. containers	Days in week(proposed)	capacitycollection in MSW (ton/day)	Capacityannual collection	Vehicles	Schedule (proposed shift)	total in capacitydaily in container handling (number in containers)	Days in week(proposed)	capacityYearly in collection (ton/day)	CapacityYearly in collection (ton/year)	% coverage of CM collection services
					Collection system in 6m3 containers using the container truck						Door-to-door collection system (whistle or fixed trailer) with the use of 2 tractors and 1 dump truck						
Current scenario	2022	73	26645	24	(two door-containers)	8am	12	6	24.31	7606	trucktipper + 2 tractors	8	9.2	6	2878	10484	**39%**
Current Scenariooptimized	2022	73	26645	24	two door containers	8am	12	6	24.31	7606	1 truck tipper + 2 tractors	8am	12.58	6	3936	11541	**43%**
Phase 1	2023	75	27375	24	two door containers	8am	12	6	24.31	7606	1 truck tipper + 2 tractors	8am	12.58	6	3936	11541	**42%**
	2024	77	28105	30	two door containers	12pm	18	6	36,465	11408	1 truck tipper + 2 tractors	8am	12.58	6	3936	15344	**55%**
Level 2	2025	79	28835	30	two door containers	12pm	18	6	36,465	11408	1 truck tipper + 2 tractors	8am	12.58	6	3936	15344	**53%**
	2026	82	29930	36	two door containers	4pm	24	6	48.62	15211	1 truck tipper + 2 tractors	4pm	12.58	6	7871	23083	**77%**
	2027	84	30660	36	two door containers	4pm	24	6	48.62	15211	1 truck tipper + 2 tractors	4pm	12.58	6	7871	23083	**75%**

The proposed collection system has the potential to increase the coverage of the Municipal Council's collection services from the current 40% to 75% by the end of the next 5 years.

The system proposed in**Table 25** 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 27**) the main actions to be carried out to implement the proposed systems in the different implementation phases of the current PGIRSU are summarized.

Table 27: Actions to implement the proposed collection systems

PGIRSU implementation phase	Year	Actions
Phase 1	2023	• Optimized use of collection means • Management measures
	2024	• Acquisition of 6 containers to eliminate collection points on the floor • Increase in daily working hours (+4H) to 12H for each container ship • Management measures
Level 2	2025	• Management measures
	2026	• Acquisition of 6 containers • Increase in the collection shift for container carriers, tractors and dump trucks, operating every 16 hours each way • Management measures
	2027	• Management measures

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. A**Table 28,**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 28: Key characteristics of the proposed collection systems

Description	**Containers communal**	**Whistle or stop fixed**	**Door to door**
Collaboration of residents in transporting bins/garbage bags	Yes	Yes	Yes
Collaboration of residents in emptying rubbish bins	Yes	Optional	No
Need for scheduled services	No	Optional	Yes
Access of 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
Collection cost per household	Low	Average	High
Potential recovery of waste due to segregation	Low	Medium-high	High
Collection time	More reduced	Average	Longer

9.5 Final deposition system proposal including operation

MSW is disposed of in an open dump, located in the Marien Nguambi neighborhood, at a distance of approximately 8 km from the center of the village and 22 km from the furthest point of Recolha.

During the diagnostic phase of the preparation of the current PGIRSU, the potential of the current dump site to apply for a sanitary landfill was assessed, taking into account the rules and principles for converting open dumps into controlled landfills defined in Ministerial Diploma no. 31/2018 which approves the Directive for the construction, operation and closure of landfills.

The first step of the assessment was the analysis of compliance with the requirements of candidate landfill sites, taking into account the location of the current dump. Some conditions were thus identified that would potentially make a possible conversion of the open dump to a controlled landfill unfeasible. These being the following:

- The high voltage power line that runs through the dump
- The national road next to the dump.

Taking into account the potential unfeasibility of transitioning the current dump to a controlled landfill, it is recommended that the process that will lead to the implementation of a new landfill be initiated, following the steps proposed in **Table 29,** below

Table 29: 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

Phases	Main aspects
	- 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 - Medium compaction (0.6 – 0.8t/m^3) - Regular waste coverage - Burn ban
Monitoring	- Data logging - Leachate monitoring (observations of effluents and surface water to react in the event of pollution)

Since the process from identifying candidate sites for the new landfill to implementing the new dump can take a long time, with legal licensing requirements to be met, the guarantee of financing and the time required to prepare technical documents, It is necessary to implement actions aimed at improving the site conditions and operation of the current dump. Therefore, the following actions are recommended:

- Detailed analysis of the environmental aspects of the site (depth of 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 depositional system, the relatively flat topography of the terrain allows for both a depression depositional system (see**Figure 17**) or above ground. It will be necessary to analyze the depth of the water table to decide on the maximum excavation depth.

This system could be composed of cells or trenches, since the quantities currently deposited are still small. 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.

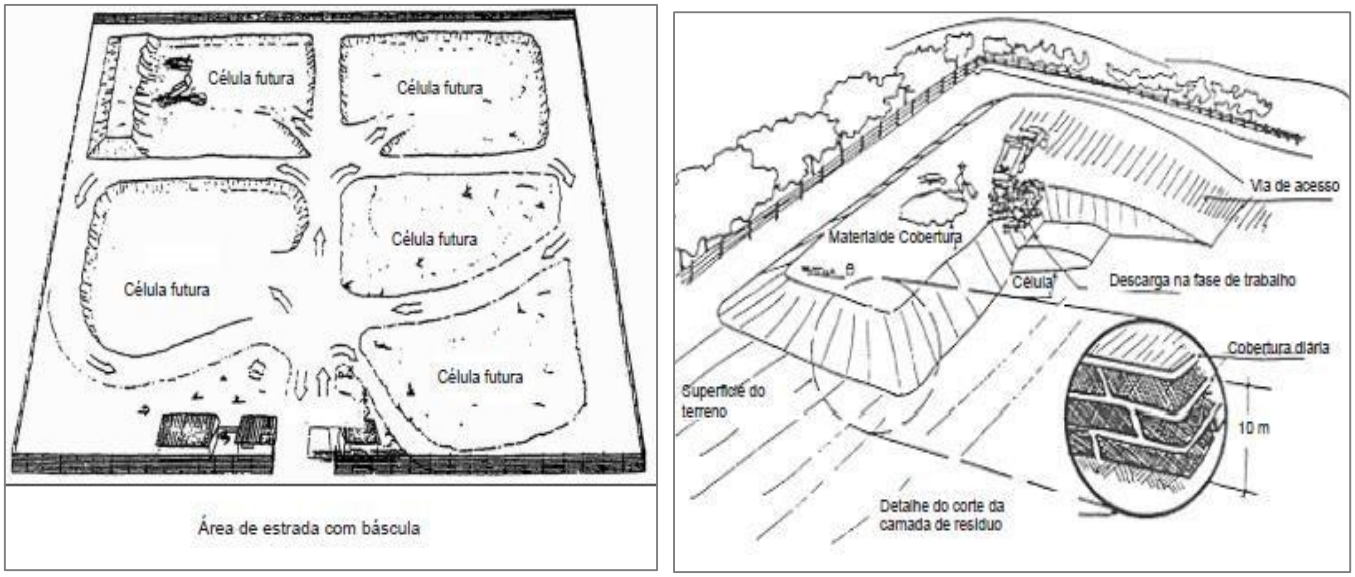

Figure 17: Landfill/dump organization schemes and disposal options[10](PGIRSU Boane, 2020)

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
- 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

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

- Change in population awareness about the use of waste as a resource.

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

Waste recovery requires a series of actions ranging 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 Boane, 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 (eg Boane Agrarian Institute)
- Encourage the reuse of leftover organic products from markets for animal feed. Joint initiative with associations of farmers and livestock breeders, with the Boane Agrarian Institute
- 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).

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 the Municipal Council promote actions with the aim of raising awareness among residents about the importance of adequate solid waste management and how each individual can contribute to a more sustainable future. 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.

9.8 Financial Planning

GIRSU's financial planning aims to propose actions that contribute to achieving the financial sustainability of the sector. To this end, a detailed analysis of the costs of the proposed system was carried out (reference to Section 8.3), see**Table 30** and the sector's revenue potential.

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 (900 Mt), essentially referring to the costs of maintaining equipment, purchasing fuel, purchasing lubricants, salaries and allowances for staff in the sector;
- Investment costs, primarily associated with the acquisition of containers, were therefore considered to be an approximate price of 110,000.00 Mt per container;
- 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 30: Estimated costs of proposed systems

PGIRSU Implementation Phases	Year	Purchased containers	Annual capacity collection (ton/year)	Estimated cost of collection (exc. Acquisition in equipment) - MZN	Equipment acquisition cost	Contingency (15% operating costs)	Total MSRM expenses
Current scenario	2022	at	10484	6,290,306	0	943,546	7,233,852
Optimized Current Scenario	2022	at	11541	6,924,780		1,038,717	7,963,497
Phase 1	2023	0	11541	6,924,780	0	1,038,717	7,963,497
	2024	6	15344	9,206,447	660000	1,380,967	11,247,414
Level 2	2025	0	15344	9,206,447	0	1,380,967	10,587,414
	2026	6	23083	13,849,560	660000	2,077,434	16,586,994
	2027	0	23083	13,849,560	0	2,077,434	15,926,994

To analyze the revenue potential, current rates were considered and several scenarios were developed that foresee an increase in tariffs. The scenarios were partially based on the tariff structure proposed in the new Municipal Policy (not yet approved). It was not used in full, due to the lack of precise data on the potential number of electricity consumers belonging to the different categories, as this is one of the criteria for defining the tariff. A conservative approach was therefore adopted, assuming the lowest proposed tariff levels. Resulting in the proposal framed in the following Table.

Table 31: Tariff structure for each scenario

	Scenario (Current)	Scenario 2	Scenario 3	Scenario 4	Billing method
Domestic tariff (M)	15	15	20	30	Charged by EDM with 25% commission
Commercial tariff (Mt)	45	80	125	125	Direct charge paid every 6 months at the commercial license fee (or alternative frequency to be proposed by the Municipal Council)
Industrial Tariff (Mt)	100	1000	2000	2000	Billed every 6 months or annually

The exercise took into account some assumptions, namely:

- Potential number of domestic taxpayers, with reference to population projection, assuming 60% coverage of EDM collection.
- Potential number of industrial and commercial consumers, based on the 2020 data contained in the PGIRSUs of the Municipality of Boane.
- Possible fee charging regimes (direct / via EDM).

Table 32: Potential number of taxpayers

Year	Population	Numberpotential of (domestic) taxpayers11	EDM billing %	Numberpotential contributors	Potential Contribution No. (Commerce)12	Potential no. Taxpayers (industry)13
2023	136 774	27 355	60	16 413	2517	32
2024	140 877	28 175	60	16 905	2769	32
2025	145 103	29 021	60	17 412	3046	32
2026	149 457	29 891	60	17 935	3351	32
2027	153 940	30 788	60	18 473	3686	32

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

[11] *Calculation of number of families/residences based on the average number of 5 people per family.*

[12] *Reference data from the PGIRSU of the Municipality of Boane (approved in 2020), forecasting a 10% annual increase*

[13] *Reference data from the PGIRSU of the Municipality of Boane (approved in 2020)*

Table 33: Scenarios (1-4) of revenues from domestic consumers

year	Monthly Fee Amount (Mt) - scenario 1 (scenario current)	Fee Amount (excluding EDM commission) - Mt	Total amount raised for CM (Mt/year)	Fee Value (Mt) - scenarios 2 & 3	Fee Amount (excluding EDM commission) - Mt	Total amount raised for CM (Mt/year)	Fee Value (Mt) - scenario 4	Fee Amount (excluding EDM commission) - Mt	Total amount raised for CM (Mt/year)
2023	15	11.25	**2 215 755**	20	15	2 954 340	30	22.5	4 431 510
2024	15	11.25	**2 282 175**	20	15	3 042 900	30	22.5	4 564 350
2025	15	11.25	**2 350 755**	20	15	3 134 340	30	22.5	4 701 510
2026	15	11.25	**2 353 725**	20	15	3 138 300	30	22.5	4 707 450
2027	15	11.25	**2 493 855**	20	15	3 325 140	30	22.5	4 987 710

Table 34: Scenarios (1-4) of revenues from commercial consumers

YEAR	Commercial Fee Value (MT) - scenario 1	Total amount raised for CM (MT/year)	Commercial Fee Value (MT) - scenario 2	Total amount raised for CM (MT/year)	Commercial Fee Value (MT) - 3 scenarios & 4	Total amount raised for CM (MT/year)
2023	45	1 359 180	80	2 416 320	125	3 775 500
2024	45	1 495 260	80	2 658 240	125	4 153 500
2025	45	1 644 840	80	2 924 160	125	4 569 000
2026	45	1 809 540	80	3 216 960	125	5 026 500
2027	45	1 990 440	80	3 538 560	125	5 529 000

Table 35: Scenarios (1-4) of revenues from industrial consumers

Fee Value (MT) Industrial - scenario 1	Total amount raised for CM (MT/year)	Fee Value (MT) Industrial l - scenario 2	Total amount raised for CM (MT/year)	Value of the Industrial Rate (MT) - scenarios 3 & 4	Total amount raised for CM (MT/year)
100	38400	1,000	384,000	2,000	768,000
100	38400	1,000	384,000	2,000	768,000
100	38400	1,000	384,000	2,000	768,000
100	38400	1,000	384,000	2,000	768,000
100	38400	1,000	384,000	2,000	768,000

Below, the results of the analysis of the 4 scenarios developed and the level of coverage of expenses resulting from each scenario are presented, using the potential revenues calculated from the Garbage Tax as a source of investment.

Table 36: Revenue Scenarios (1-4)

Year	Annual Expenses	RevenuesScene 1	% roof	RevenuesScenario 2	% roof	RevenuesScenario 3	% roof	Recipes Scenario 4	% roof
2023	7,963,497	3,613,335	**45%**	5,754,660	**72%**	7,497,840	94%	8,975,010	**113%**
2024	11,247,414	3,815,835	**34%**	6,085,140	**54%**	7,964,400	71%	9,485,850	**84%**
2025	10,587,414	4,033,995	**38%**	6,442,500	**61%**	8,471,340	80%	10,038,510	**95%**
2026	16,586,994	4,201,665	**25%**	6,739,260	**41%**	8,932,800	54%	10,501,950	**63%**
2027	15,926,994	4,522,695	**28%**	7,247,700	**46%**	9,622,140	60%	11,284,710	**71%**

As shown in the table of results from the analysis of the four scenarios considered, the current tariff scenario will increasingly distance itself from the goal of achieving financial sustainability in the sector. Scenario 4 appears to be the most advantageous, however, it requires more negotiation and user awareness efforts, especially with regard to increases in domestic and commercial tariffs. For this last group, small traders who produce waste are considered the most critical, taking into account their low income potential. To minimize this impact, the approach proposed in the new stance that differentiates rates according to the potential for waste generation would be the most practicable, due to the greater ease of implementing higher rates for large generators (potentially with higher incomes). 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 4 presented in**Table 36**, above.

For each year, it is highlighted with greater expression, in the**Table 36**, the scenario proposed in the current PGIRSU. Briefly, the following is recommended:

- *For the year 2023:*
  - Implementation of scenario 1
  - Maintain the current tariff structure
  - Interact with EDM in order to improve transparency with the Municipality regarding the charging process, providing records, projections and other data that allow EDM to provide financial planning for the sector
  - In coordination with the sector responsible for economic activities, update the inventories of commercial (including tourist) and industrial units; proceed with the categorization of potential generators and re-evaluate the tariff proposal (Revised stance)
  - In coordination with the economic activities council, identify possible synergies to simplify the billing process for commercial and industrial units, adopting joint billing measures (eg payment of garbage fees at the time of payment of the commercial license)

- Define the garbage rate for commercial and industrial units and obtain approval from the Municipal Assembly

- *For the year 2024:*
  - Implementation of scenario 2
  - Start charging new garbage fees for commercial and industrial establishments
  - Carry out detailed analyzes of the tariff proposal for domestic users, carrying out an assessment of potential users for each proposed category, analysis of users' ability to pay and willingness to pay. And reevaluate the proposed tariff structure for approval by the Municipal Assembly
  - Interact with the main actors to reset rates

- For the year 2025:
  - Implementation of scenario 2
  - Finalize negotiations with EDM (revision of MoU) for the implementation of revised tariffs
  - Obtain approval from the Municipal Assembly of the new tariff proposal for domestic users
  - Carry out the evaluation of a new increase in tariffs for commercial and industrial units and obtain approval from the Municipal Assembly (together with the proposal for the new tariff structure for domestic users)
  - Awareness and information campaigns on the application of the new tariff structure covering domestic, commercial and industrial users

- For the year 2026 and 2027:
  - Implementation of scenario 4
  - Application of new domestic, commercial and industrial user tariffs
  - Continuous improvement of collections (in terms of coverage, records and planning).

Other actions with the potential to improve the financial sustainability of the sector,are the following:

- Start negotiations with EDM in an attempt to reduce EDM's commission. Since at a national level, the value of this commission varies depending on negotiations between the CM and EDM from 5% to 25%.
- Implementation of a waste disposal rate in the municipal bin (proposing a minimum of 50 Mt per m3). However, its implementation can only take place after improving conditions at the dump and allocating staff to control entries and exits and records.

Regarding the tariff structure to be adopted, it is recommended to create tiers with different values, to consider ability to pay and quantities of RS produced (eg variations in values based on electricity consumption, size and type of commerce/industry, etc.).

The rate review process must follow different steps, including:

1. Verification of taxpayer numbers for different categories and possible sub-categories/categories (including connections to EDM);
2. Preparation of detailed potential revenue scenarios;
3. Definition of values, including some public consultations;
4. Preliminary negotiations with EDM;
5. Approval of values by the Municipal Assembly;
6. Signing of a contract with EDM (including negotiation of the commission amount, and obligations to provide justification for the number of contributors by EDM, together with 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 20% in the current scenario to 71% at the end of the 5 years of implementation of the current PGIRSU

9.8.1 Strategy for financial sustainability

As the objective of 100% financial sustainability is extremely difficult to achieve, it is important to define intermediate levels of sustainability, which can somehow allow the systems to be sustained in the long term (see table below).

Table 37: Definition of different levels of sustainability

Level	Definition	Observation
0	Revenues do not cover any (or little) of the GRSU costs *(Overall financial coverage < 15%)*	All funds come from other sources – difficult financial planning
1	Revenues cover GIRSU's operating costs (fuel, maintenance) *(Global financial coverage ~ 20-25%)*	- Possibility of consigning recipes to plan collection operations; - Other expenses (purchase of equipment, human resources) must still come from other sources of financing (Municipal Council, Partners)
two	Recipes cover: - operating costs (fuel, maintenance) - equipment acquisition costs *(Overall financial coverage > 65%)*	- Possibility of maintaining long-term service levels, both in operations and in the replacement of equipment at the end of its useful life - Need for revenue allocation and a financial management system to pay for equipment with revenues from more than one year - Only personnel costs must be covered by other CM funds - External financing can support larger infrastructure or equipment to expand services
3	Revenues cover 100% of GIRSU's costs. *(Global financial coverage > 100%)*	Greater financial flexibility for other investments in accordance with the waste management hierarchy (eg formal MSW recovery systems)

Without sustainability at least at level 1 (ideally at level 2), the GIRSU planning exercise will not be sustainable over time. Consequently,

Before expanding services, it is important to ensure that revenues ensure a minimum level of sustainability (level 1 or 2).

10. Objectives and Targets for GIRSU in the Municipality of Boane

This section presents the objectives that the Municipality intends to achieve during the PGIRSU implementation period (2023- 2028, 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 de Boane.

Taking into account that the PGIRSU was approved by the Municipal Assembly in 2020, the goals proposed in this plan were revisited and their fulfillment was assessed. Some of the goals proposed in the PGIRSU currently in the implementation phase were replicated in the current plan, others were excluded because they had already been implemented and others due to the fact that during the baseline survey and evaluation of their compliance, it was judged that they would not be feasible or not suitable for the current context. New goals and actions were identified and are reflected in Table 38.

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

Table 38: Objectives and Targets for GIRSU in the Municipality of Boane

Component	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. Replacement of seasonal contracts with full-time contracts e. 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) f. Approval of the Posture review by the Municipal Council
two	***Operational actions*** a. Increase in the number of collection days (+1) to 4 times a week (2023) b. Acquisition of 6 containers to eliminate collection points on the ground (2024) c. Increase in daily working hours (+4H) to 12H (2024) d. Implementation of records of collected waste (volumes) e. Implementation of a breakdown and maintenance log f. Maintain an updated (monthly) inventory of equipment and materials (model provided in Annex 8) g. Regular inspections at collection points and monthly registration (Annex 7) h. Biannual update of the Data Collection Form on Urban Solid Waste Management in Municipalities (Annex 4) i. Completion of the Daily Register for the collection of RSUs (Appendix 5)
3	***Waste disposal*** a. Definition of a waste bin operation plan including compaction actions, and regular coverage of waste, control of entrances and exits b. Land preparation (removal of vegetation, improvement of accessinternal, cell excavation, etc.) and marking the boundaries of the land with a tree curtain using native plants;

Component	Description of objectives/goals
	w. Regular intervention of the machine in the trash bin (2 times/month)
4	***Waste recovery*** a. Identification of waste recovery projects (conception and design and search and guarantee of financing)
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. 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 b. Direct billing for all non-domestic residents implemented (100% of businesses payable) c. Organized and separate record of expenses related to the implemented MSRM (personnel, fuel, maintenance and investment) d. Implementation of the "Collection test" for a more detailed and accurate analysis of the production and composition of RSC and RSI based on more reliable data on the number of existing companies and workers. e. Renegotiations with EDM (commission reduction) and greater transparency f. Review of the tariff structure based on the proposal presented in the Current PGIRSU and the revised Posture (not yet approved). g. 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:*** a. Reinforcement of the waste management team, including appointing the team to work in the waste bin. b. Replacement of seasonal contracts with full-time contracts c. GIRSU training program defined for each profile
two	***Operational measures:*** a. Acquisition of 6 containers and distribution to locations that were not previously covered by containers (2026)

Component	Description of objectives/goals
	b. Increase in collection days (+1) to 5 days per month (2026) c. Maintain an updated (monthly) inventory of equipment and materials (model provided in Annex 8) d. Regular inspections at collection points and monthly registration (Annex 7) e. Biannual update of the Data Collection Form on Urban Solid Waste Management in Municipalities (Annex 4) f. Completion of the Daily Register for the collection of RSUs (Appendix 5) g. Completion of daily registration in the Municipal Waste Bin (Annex 6)
3	*Waste disposal:* a. Appointment of consultants to prepare a closure plan for the current dump. b. Dumpster operation plan prepared and implemented c. Identification of candidate sites for future landfill d. Appointment of consultants for the preparation of Environmental Studies, Feasibility Studies (Technical, financial) and Engineering Project for the new landfill. e. Prepare and approve the closure plan for the current dump. f. Allocation of personnel to indicate disposal sites and monitor / register entries.
4	***Waste recovery*** Start the conception and design process and search for financing for at least 1 waste recovery project, (conception and design and search and guarantee of financing)
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*** a. Adjusted cleaning fee values (revision of levels and categories: businesses, industries) and approved by the Municipal Assembly b. Revised rates to maintain minimum financial sustainability even with the expansion of services (operation, fuel and maintenance costs covered) c. Implement the new tariff structure

Component	Description of objectives/goals
	d. Interact with the main actors affected by the tariff change in the waste tax, in order to inform and raise awareness

11. Monitoring Indicators and Goals

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

Table 39: Monitoring Indicators and Targets (2023 – 2027)

At the.	Indicator	Definition and measurement methodology	Target 2023	Target 2024	Target 2025	Target 2026	Target 2028
			Organizational structure				
	Review of the health sector organization chart and reinforcement of the team	Organic structure of the council	Revised organizational chart Specific drivers for RS collection means integrated into the organization chart	Managers appointed intermediaries	Recruitment plan for team reinforcement approved	Hiring in onereinforcement team	Hiring a reinforcement team
	Definition of profiles and tasks all staff	Records of the Resources humans	Description of tasks for O guys involved at GRSUs	Formalization of tasks	Task and Team Records informed about your tasks	Task records and Team informed about the your tasks	Task and Team Records informed about your tasks
	Replacement of contracts seasonal for time contracts complete	Records of the Resources humans	Recruitment plan include Theintegration in seasonal workers	Progressive integration of seasonal workers in staff of the city Council	Progressive integration of seasonal workers in staff of the city Council	Integration progressive of the workers seasonal within the framework of workers of city Council	All you workers seasonal framed at the city Council
	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
	Review of the municipal code of conduct and review the tariff structure	Municipal for the Assembly Approval	Review of the tariff structure of the Municipal Posture Code (section health) Approval of the revised posture code	Posture code revised and disseminated	Code in posture implemented	Code in posture implemented	Code in posture implemented
			Operational actions				
	Defining a route plan waste collection	Council document archive of Construction, Urbanization and	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	Revised route plan and optimized (if necessary)

		Energy				necessary)	

At the.	Indicator	Definition and measurement methodology	Target 2023	Target 2024	Target 2025	Target 2026	Target 2028
	Regular records of waste collected (estimated volumes)	• Documentary archive of the Council responsible for GRSU • Registration Form in the Municipal Waste Bin (Annex 6); • Daily Record Sheet for the collection of RSUs (Annex 5); • Data Collection Form on Urban Solid Waste Management in Municipalities (Annex 4)	• Data Collection Form on Urban Solid Waste Management us Municipalities (Annex 4) – 1 completed form • Daily Log Sheet for Collection of RSUs (Appendix 5) – Complete 3 Month Records	• Data Collection Form on Urban Solid Waste Management in Municipalities (Annex 4) 1 completed form • Daily Log Sheet for Collection of RSUs (Appendix 5) – Complete 6 Month Records	• Waste Management Data Collection Sheet Solids Urban in Municipalities (Annex 4) 1 completed form • Daily Log Sheet for Collection of RSUs (Appendix 5) – Complete 9 Month Records	• Data Collection Form on Urban Solid Waste Management in Municipalities (Annex 4) **1 completed form** • Form in Registration in the Municipal Waste Bin (Annex 6); - Complete 3 months records • Daily Record Sheet for the collection of RSUs (Annex 5) – Complete records **9 months**	• Data Collection Form on Urban Solid Waste Management in Municipalities (Annex 4) 1 completed form • Municipal Waste Bin Registration Form (Annex 6) - - Complete 6 months records • Daily Log Sheet for Collection of RSUs (Appendix 5) – Complete 9 Month Records
	Maintain an updated inventory (monthly) of waste collection materials and equipment	• Equipment inventories (Annex 8) • Collection point inspection record (Annex 7)	• Inventories in equipment (Annex 8) – 3-month records • Collection point inspection record (Annex 7) – Records **3 months**	• Inventories in equipment (Annex 8) – 6-month records • Collection point inspection record (Annex 7) – Records **6 months**	• Inventories in equipment (Annex 8) – 9 month records • Collection point inspection record (Annex 7) – 9 month records	• Inventories in equipment (Annex 8) – 12-month records • Collection point inspection record (Annex 7) – Records **120 months**	• Inventories in equipment (Annex 8) – 12-month records • Collection point inspection record (Annex 7) – Records **12 months**
	Acquisition of containers to eliminate collection points on the ground and expansion of collection services to priority areas not covered	Flat in activities ofcity Council Budget of city Council	• Include in the budget for 2024 the acquisition of 6 containers - approved budget	• Acquisition in containers It is distribution by thecollection points on the floor	• Include in the budget for 2026 the acquisition of 6 containers - approved budget	• Acquisition in containers It is distribution to collection points on the ground or locations not covered for the	at

						collection	
	Progressive increase in door-to-door collection days from 3 to 5 times. **Increase in working shifts.**	• Activity plan • Daily Record Sheet for the collection of RSUs (Annex 7);	• Collection increase of 1 day. Going from 3 to 4 in January	• Increase in daily working hours (+4H) to 12H	• At	• Increase of 1 day in door-to-door collection. Going from 4 to 5 in January	• At

At the.	Indicator	Definition and measurement methodology	Target 2023	Target 2024	Target 2025	Target 2026	Target 2028
Waste disposal							
	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 theadons planned On the ground	• To implementprogressively planned actions on the ground	• Implement progressively theadons 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 recruitment plan	• Process inr ecruitment for hiring	• Contracted and active personnel.

	Identification of candidate sites for future landfill **Preparation of Environmental Studies, Technical and Financial Feasibility Studies and Engineering Project 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	Identification in locationscan didates the future landfill	• 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	at	• Budget for hiring in approved consultants.	• Contracting of the consultant	• Approved Closing Plan
Waste recovery							

At the.	Indicator	Definition and measurement methodology	Target 2023	Target 2024	Target 2025	Target 2026	Target 2028
	Identification of waste recovery projects (conception and design and search and guarantee of financing).	Health sector activity plan Report in activities ofhealth sector	• Identification of participants/actorsin the area of valorization • Engagement with actors for identification purposes in projects in appreciation	• Identification of Projects in appreciation and selection of projects The to implement (at theminimum 1)	• Insert in the 2024 budget the hiring of consultants to begin the Project design and feasibility studies	• Contest an d hiring in consultants It is hiring of the consultant	• Feasibility and project studies executive, budget definition and guarantee in financing
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						
	Direct billing for all non-domestic residents	Revenue records	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	Direct billing for all non-domestic residents	Direct billing for all non-domestic residents	Direct billing for all non-domestic residents	Direct billing for all non-domestic residents
	Organized and separate record of expenses related to GRSU implemented (guys, fuel, maintenance and investment)	Records of sector of healthiness	Records updated semi-annually	Records updated semi-annually	Records updated semi-annually	Records updated semi-annually	Records updated semi-annually

At the.	Indicator	Definition and measurement methodology	Target 2023	Target 2024	Target 2025	Target 2026	Target 2028

	Implementation of the "Collection test" for a more detailed and accurate analysis of the production and composition of RSC and RSI based on more reliable data on the number of existing companies and workers.	Records of sector of healthiness	• Implementation of "Proof of collection" and updated records	• Implementation of "Proof of collection" and updated records	Implementation of "Proof of collection" and updated records	• Implementation of "Proof of collection" and updated records	• Implementation fro m the"Proof of collection" and updated records
	Renegotiations with EDM (commission reduction) and greater transparency	Activity plan and report	• Renegotiations with EDM (reduction of the commission) It is greater transparency (the renegotiationswill continue in the following years case nohas been completed)	• At	• At	• At	• At
	Review of the tariff structure based on the proposal presented in the Current PGIRSU and the revised Posture (not yet approved).	Posture Code Revenue Records	• Review of the tariff structure and approval by the Municipal Assembly • Information campaigns It is awareness to thetaxpayers about the new tariff changes	• Implementation of the new tariff structure	• Maintain implementation of the new tariff structure • Review the tariff structure again and obtain approval from the Municipal Assembly • Information and awareness campaigns for taxpayers about new changes tariffs	• Implementation fro m thenew tariff structure	• Maintain implementation of the new tariff structure

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Annex 1 – List of Main Actors and Engagement Plan

At the.	Actors	Characteristics	How are they affected by the Problem	134activities to consider 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 Council's internal work program Municipal
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, annual reports.	Internal activities of the Municipal Council	Monthly and in accordance with the Municipal Council's internal work program
3	Central Market Commission	Commission	Large waste generators	Waste collection, awareness	Regular meetings to raise awareness about waste segregation and sensitivity collection	Quarterly

4	Ukula	NGO, environmental protection,civic education	Association active in promoting good waste management practices 134waste	Awareness raising, waste collection and transportation services	Awareness raising and waste management improvement programs	Quarterly

5	Licensed private operators	Private sector	Responsible for collecting, transporting and disposing of waste	Collection, transportation and disposal of waste, licensing, payment of fees and records	Datingawareness about good practices, submission of records	Semiannually
6	Operatorsu nlicensed private	Private sector	Responsible for collecting, transporting and disposing of waste	Collection, transport and disposal of waste, licensing, payment of fees and registration	Meetings on raising awareness about good practices, licensing and 135waste135 and 135waste135 of records	Semiannually
7	Collectors	Local community	Waste recovery	Awareness, segregation of waste in the bin,	Awareness raising and data sharing	Semiannually
8	FIPAG	Public company	Water supply;	Data and information sharing	Exchange of information and synergies	Semiannually
9	Ara-Sul, Administration of Pequenos Libombos	Public company	Camp manager at the Pequenos Libombos Dam; Generator waste.	Data and information sharing	Information exchange and synergies	Semiannually

10	Boane Agrarian Institute	Educational institution	Waste generator; appreciation of waste	Knowledge transfer	Awareness programs, transfer 135 of knowledge	Annually
					scientific and research	
11	AIAS	Public company	Synergies with projects and initiatives sanitation	Data and information sharing	Information exchange and synergies	Semiannually
12	Farmers Association	Association	waste recovery (composting)	Waste recovery	Awareness for valorization	Semiannually
13	Neighborhood Chiefs	Local structure	Interface with citizens at neighborhood level;	Raising awareness of populations at the neighborhood level, education environmental.	Regular awareness meetings, exchange of information and synergies	Quarterly
14	AdministrationMunicipal Markets	city Council	Market cleaning services, environmental education for vendors	Market cleaning services, awareness raising and education of sellers	Work meetings (internal to the Municipal Council)	Monthly(minimum) and in accordance with the Board's internal work program

						Municipal

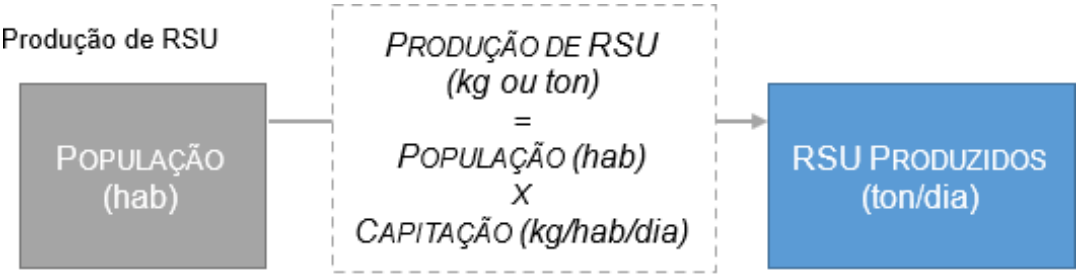
Annex 2 - Support Matrix for Baseline Information Collection

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
	2.1. CM/GD general organizational chart	CouncilI n s t i t u t i o n a l
2. OrganizationInstitutional	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	
	3.1. List of available equipment (brand, model, condition,collection capacity, etc.)	MSW/Workshop Management
3. Equipment	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

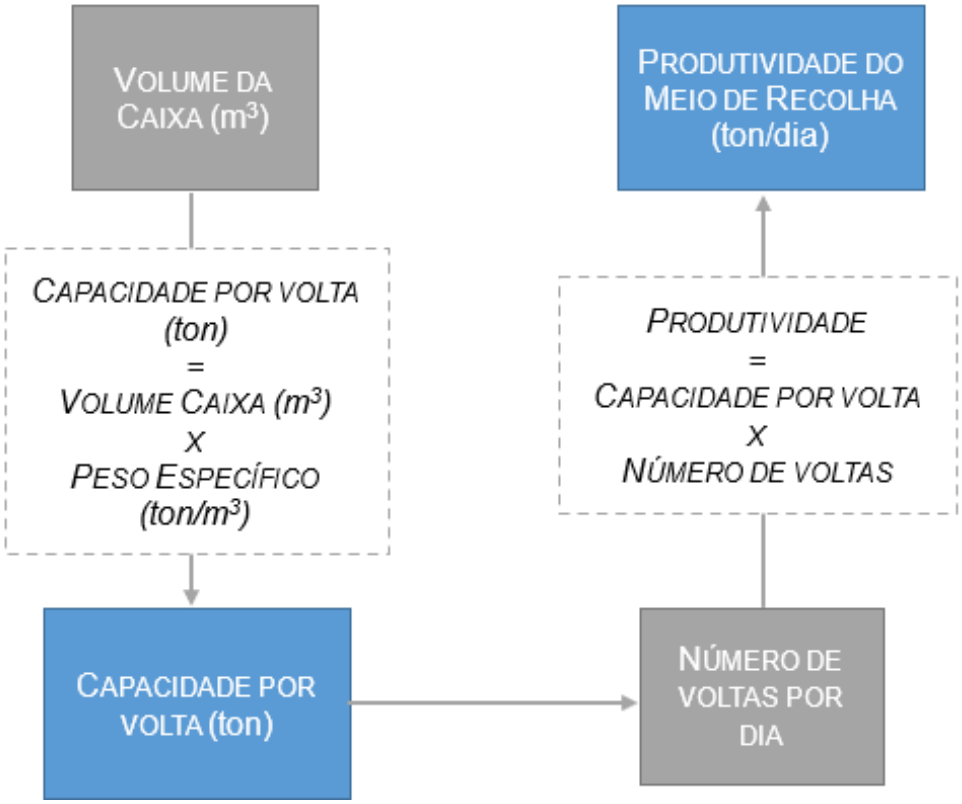
Theme	Description	Possiblesource/responsible for information
6. Systemcurrent GIRSU	6.1.4. Vehicles used	MSW Management
	6.1.5. Existing routes	MSW Management
	6.1.6. Records of work per vehicle (collection time,transport to waste bin, number of laps, etc.)	MSW Management
	6.2. Existence of informal 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

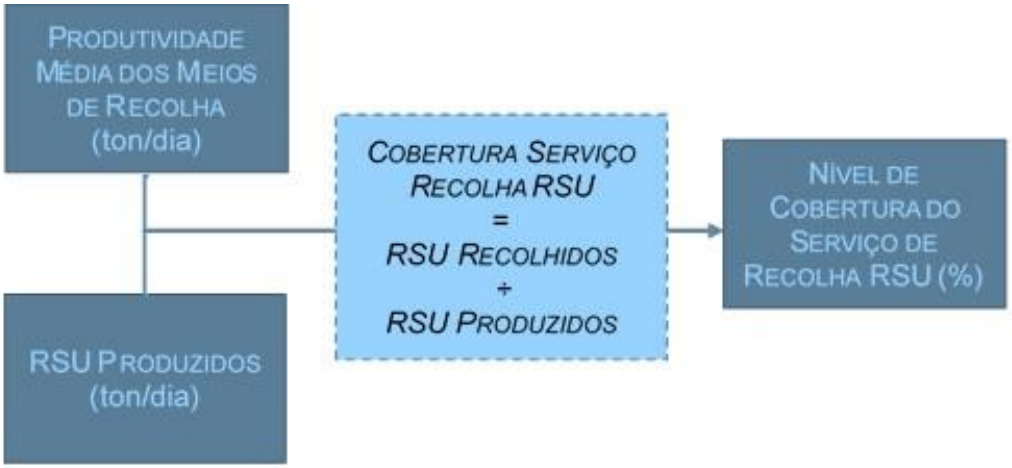
Annex 3 – Sequence of Calculations

Produção de RSU



Produtividade do meio de recolha de RSU





Custos médios diários

Custos unitários

Annex 4 – 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: Municipal Council of Vila de Boane
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 belonging to the Urban Solid Waste Management area, indicate how many are permanent and how many are casual:

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 project execution**
$Project_1$				
$Project_{two}$				
$Project_3$				
$Project_4$				
$Project_5$				

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 Municipal Posture Code approved?

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

☐ Yes ☐NoIf yes, mention:

20) Is there an Urban Solid Waste Management plan?

☐ Yes ☐ ☒No

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) Are there inspectors specifically employed 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 to annual data from 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 and training campaigns in the area of urban solid waste	
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 amount of the fee charged_____

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

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

III Section – Characterization, collection, treatment and disposal of Urban 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 serviceautonomous

_____

29) Have any studies or campaigns to weigh and characterize waste been carried out 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 of the following means are used for collection in difficult to access neighborhoods?

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

40) Who collects 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, checking 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) Is there 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) Are private companies operating in the area of Urban Solid Waste Management licensed?

☐ Yes☐No

54) If so, who licensed 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 5 – 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									
7									
8									
9									
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27									
28									
29									
30									
31									
TOTAL (laps/month):								**AVERAGE (laps/day):**	
								AVERAGE (m^3/day):	
								AVERAGE (ton/day)	

Annex 6 – Registration Form in the Municipal Waste Bin/Landfill

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

Arrival time	Vehicle identification					Origin of Waste	Estimated composition[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 (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 7 – 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 8 – 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 9 –

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 40: 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 Municipal Council of Boane is collection in containers. Fixed-stop door-to-door collection is essentially carried out in the neighborhoods of Belo-Horizando and Campoane, where approximately 3000 people and 8500 people live respectively (Municipality data from 2021). Door-to-door collection uses a dump truck with a total collection capacity of approximately 5.2 tonnes per day. Door-to-door collection is also carried out by private operators who have their own equipment.

The Municipal dump in operation covers a small number of collectors without associational ties who normally work selectively collecting MSW and sell it to the few micro-recycling companies in Maputo and intermediaries who then resell to beer production companies. 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.

However, there is a high untapped potential for waste recovery in Vila de Boane, 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 de Boane, 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 41: Composition of urban solid waste14

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 73 tons/day, are produced annually in the Municipality
6.6 tons of plastic, 4.8/day tons of cardboard and 4.8/day tons of metal. 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 de Boane. 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.

[14]*Reference characterization campaign carried out in Boane (2019)*

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 de Boane over the next 5 years.

Table 42: Proposed RSU collection and transportation options

AREAS	SOLUTIONS/OPTIONS
urbanized center	*System 2* - Residential urban area with good access (Bairro do Belo-Horizando and Campoane) - Whistle (door-to-door collection) -Equipment: dump truck

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);
- Availability in parts It is capacity in maintenance of equipment.

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. 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 program (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 de Boane 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 de Boane.

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 de Boane 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 Municipal Council of Vila de Boane intends to implement a Project for the collection and transfer of recyclable waste in Vila de Boane. 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 the production of recyclable solid waste generated in the Municipality, to subsequently support the analysis of the viability of the project.

implementation of the Project, determine 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[15].

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).

[15] *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.*

- Assessment of the potential environmental impacts of 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.

DOCUMENTS TO BE PRODUCED

- 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 THE ENGINEERING 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 studiesage and design of the Project.

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 Boane. However, during the feasibility study phase the specifications must be reviewed.

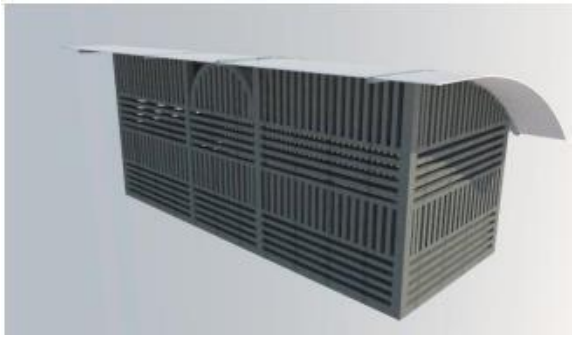

Figure 1: Conceptual design proposal for temporary storage facility after sorting and treatment

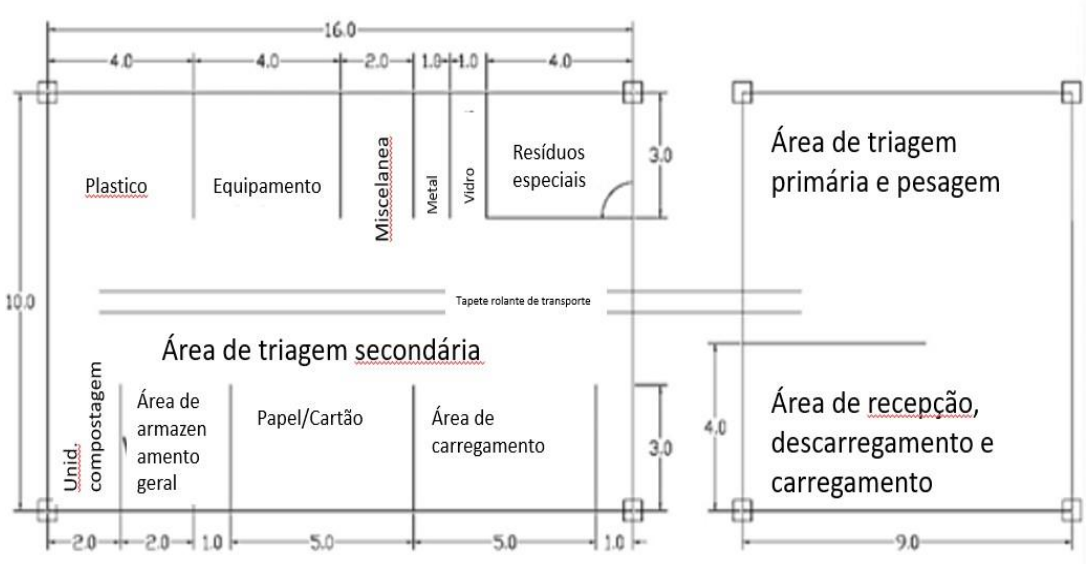

Figure 2: Proposed layout of the main building of the recyclable waste collection and transfer facility

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)
- 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: Indicative budget for the implementation of the Center

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 and authorizations required for the construction and implementation of the project

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 the Land (to be obtained by the contractor) - Municipality	Vila de Boane Municipal Council
Marketing license	Single Service Counter (BAÚ)
Cleaning License	Single Service Counter (BAÚ)
Recyclable waste transportation license	Vila de Boane Municipal Council
Construction License	Vila de Boane 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 inside

Scratchs	Measurements
	installation in containers/storage containers
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).

Scratchs	Measurements
	• 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. • Ensure the availability of fire-fighting equipment in strategic areas.
Risks of accidents involving solid waste transport vehicles	• Placing signage on the premises of the installation • Setting speed limits inside and outside the facility • Training It is awareness aboutdefensive driving •

Scratchs	Measurements
Noise caused by equipment (footcompressors, conveyor belts, etc.)	• 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.

Annex 10 – Attendance List for the Public Consultation Meeting of the Vila de Boane Integrated Solid Waste Management Plan (06/08/2023); Photographic Images of the Meeting;

MUNICÍPIO DA VILA DE BOANE
CONSELHO MUNICIPAL

Lista de Presenças na Reunião de Auscultação e Apresentação do PGIRSU

Data: 08 de Junho de 2023

Nº de Ordem	Nome	Proveniência	Contacto
01	Francisco Muavele	B. Campone	848903823
02	Filipe Ricardo Bila	Município	846155613
03	[illegible]	Município	845666541
04	Afonso Eubélio Mauinga	L. Guegue[illegible]	846173083/84617308[illegible]
05	Lopes Raul Monjane	Massaca 1	842948521
06	José Bento	V. Salubridade	848942225
07	Jo[illegible] Joaquim [illegible]	V. Salubridade	845288362
08	FERNANDO AUGUSTO	ASS. UKULA	842100004
09	Abimer Arone Covane	lider C. B 1	842290465
10	JUMA JOSÉ CINTURÃO	C. Municipal	845566003
11	Tomás Paipe Sitoe	Bairro-3	846786898
12	Daniel Emílio Quintas	SDPI Boane	877030220
13	Fátima Jusse Macande	M. B. 7	846160355
14	Claudio Derril Mauengue	C.M.V.B.-V.M.F	848530590
15	Angelina Jichanga Dinda	C.M.V.B. VI	847112848
16	[illegible] Sitoe Muendane	C M.V.B	847138857
17	CASIMIRO BONIFÁCIO [illegible]	COMISSÃO [illegible]	843462184
18	Francisco Ernesto	Umpala	
19	José Francisco	Umpala	

20	Esperança Virgínio Machanda	Antigo Combatente	844473840
21	Daniel Cometa Juares	CMVB	870743911/8412
22	Nelson Machel	CMVB	841283706
23	Zaida Augusto Sozinho	CMVB	849507374
24	Armando R. Gastante	CMVB	865312964
25	Gerson Chirindza	CMVB	844056508
26	Maimi Bachir	CMVB	847157774
27	Francisco Pedro Trangto	CMVB	873640848
28	Emídio Isaías Nhaturi	CMVB	844487657
29	Yassin Abdul	CMVB	879326024
30	Bernardo Chimuanoge Costa	25 de Setembro	840782316
31	Arsénio Leonel Luís	CMVB	876794927
32	Armando Jamo	G.B.2	850776839
33	Araújo da Costa Nata	chefe da localidade	847691790
34	Amade Amade Luís	Picoco	845695224
35	Marieta António Bebate	B7	842360120
36	António Machanga	B7	872223060
37	Leonel Soares	B.6	876184250
38	David Gome	Picoco	846640848
39	Ivan Tinga	CMVB	864393720
40	Lucas Muerere Machava	B-5	848615041
41	Virgílio Manjate	CMV.B	844597622
42	Célia Safira Manjaze	CMVB	847717758
43	Adélia Firmino Tagaia	CMVB	846671697
44	Amélia Feliz Cono	CMVB	847627723
45	Amélia J. Matola	CMVB	8490901
46	Catarina José Matave	CMVB	845416723
47	Rosalina José Fastudo	CMVB	852373606
48	Judite Rafael	P.Mões	87 52 41 821
49	Monica Vasco	B3	86 88 22 732
50	Tânia Joaquim	B2	84 71 32 622
51	Vitória Daniel	B4	82 32 71 324
52	Celis Vasco Victória	B1	85 77 81 840
53	IRIS DIMENE	Solans	86 155 2992